DRAWING AS A METHOD OF ANALYSIS AND TRANSFORMATION IN RELATION TO THE HUMAN FORM

How the study of human dissection and the practice of drawing
can be brought together to describe simultaneous views
of the interior and exterior of the body

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ABSTRACT

The purpose of this practice-based research has been to gain knowledge of the history of Western anatomical representation and display, to study and learn to practise human dissection, to develop my drawing skills and bring these three elements together to produce an original viewpoint and an original understanding of how drawing can be used to describe simultaneous views of the interior and exterior of the human body.

Historical research has focused upon anatomical collections, in particular La Specola at the University of Florence and the Hunterian Museum at the Royal College of Surgeons of England, also selected anatomical theatres such as those of the Universities of Leiden and Padua, and the reconstructed Old Operating Theatre of St. Thomas's hospital in London. A survey has been made of anatomical drawings, prints and artificial models with particular focus upon the works of Leonardo da Vinci, Freidrich Ruych, Jan Wandelaar, Gaultier d'Agoty, Clemente Susini, Felice Fontana, Gaetano Zumbo, Honore Fragonard and Gunther von Hagens. Studies of human dissection have been conducted in the anatomy department dissecting rooms of the University of Oxford, Guys Hospital and University College London. Eight large-scale drawings comprise the main body of work and these reveal the evolution of my research. They are supported by a portfolio of drawn studies and this dissertation.

Through the development of this research I have gained knowledge of gross anatomy and I have moved from being an observer to a practitioner of dissection. I have learned dissection not just as practical skill and key to visualising and drawing the interior of the body, but also to understand the works of other artist-anatomists. I have learned to envisage, open out, draw and make clear the internal structures of the body. Through this I have evolved my drawing skills and use of line. The evolution of my drawing has been consistently informed by my study of anatomy, and my practice of dissection was crucial to meeting the objective of my research; the simultaneous representation through drawing of the interior and exterior of the human body.

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AUTHOR'S DECLARATION

I declare that the work in this dissertation was carried out in accordance with the Regulations of the University of Bristol. The work is original and no part of the dissertation has been submitted for any other degree. Any views expressed in the dissertation are those of the author and in no way represent those of the University of Bristol. The dissertation has not been presented to any other University for examination either in the United Kingdom or overseas.

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INTRODUCTION

Section 1 A brief history of human dissection in Western Europe

The ancient civilisations of the Orient and of Egypt were the first to develop the practice of medicine and surgery (1), but it was the Greeks who first separated medicine from Magic and began to base both medical and surgical practice upon observation and investigation (2). The founder of Greek medicine was Hippocrates. He was born on the island of Cos in 460 B.C. and died in Thessaly in 377 BC. He became known as the Father of Medicine. Hippocrates and his followers sought to remove the artificial separation between medicine and surgery and overturn notions that illness was related to the supernatural. He established his medical practice upon the observation of the constitution of the patient and their particular circumstances (3). Human dissection was first practised in Alexandria about 300 B.C. Some accounts suggest that the Alexandrians also practised human vivisection. This practice was brought as a charge against the ancients by Celcus and Augustine and this haunted dissection theatres throughout the early modern period (Sawday, 1995, p 80). Alexandria was founded in 332 B.C. and thrived until the death of the last ruler Cleopatra in 30 B.C. It was an important centre for the advancement of Greek medicine and Surgery, which reached its height during the first century A.D. (4).

The greatest physician to follow Hippocrates was Galen. He was born in Pergamum in Asia Minor in A.D. 130. He had the largest practice in Rome and was physician to the Roman Emperor Marcus Aurelius. He wrote 400 separate treatises on the practice of medicine and also founded experimental physiology. Galen was eclectic and freely borrowed ideas from the works of his medical and philosophical predecessors. It was his recognition of Aristotle's treaty on the *Utility of Parts* which ensured that his own work dominated western medicine for more than 1500 years (5). This was primarily because, though 'Galen was not a Christian [...] his belief in one supreme creative power was highly acceptable to the early Church Fathers' (Zimmerman, 1961, p 44). Galen would have observed 'autopsia' in Alexandria but he also promoted the study of Barbary apes and pigs and he based some of his own descriptions of human anatomy upon observations of these animals (6).

After the decline of Alexandria, human dissection continued at a few centres in the Middle East, but during the Dark Ages in Western Europe, it was prohibited by the church. An ecclesiastic ruling of 1163 declared that the church abhorred the spilling of blood (Richardson, 1989, p 34). With the spread of Christianity, healing became the concern of the Church. Medicine and surgery were once again separated. The practice of surgery was forbidden to priests and so passed into the hands of barbers.

(Although one of the first principles of Christianity is healing, disease was regarded as a curse or punishment from God and something to be endured with patience and resignation.) 'Treatment during the Dark Ages consisted of rest in a peaceful atmosphere, intercession, prayer and the development of a cult of healing (or rather suffering) saints' (Bishop, 1960, p 58).

The first Western Medical School was founded at Salerno, south of Naples in the ninth century A.D. According to legend, Salerno was founded by four masters, a Jew, a Greek, an Arab and a Latin (Bishop, 1960, p 61). It seems possible that this is a reference to the texts which were used. During this period Galen was translated into Latin from Arabic (7). From the ninth to the late thirteenth century, medicine was taught from manuscripts rather than observation. 'Physicians were learned men, graduates in art and medicine [...] they never carried out any manual procedures' (Bishop, 1960, p 61). During the eleventh and twelfth centuries, important Universities were established in Paris, Bologna, Oxford, Montpellier, Cambridge and Padua (Bishop, 1960, p 61). At these universities, medicine continued to be read as an extension of philosophy and the primary text was Galen. Subsequently, human dissection was taken up again in c.1281 in Bologna and soon after in Padua, Venice, Florence and Montpellier. Many of these early dissections were performed outdoors on temporary scaffolds or else inside Churches. They were sensational public events, enacting postmortem punishment upon a reviled criminal - usually a murderer. Tickets might be sold for the outdoor events, and following the dissection, parts of the body might be auctioned (8). In Italy a tradition grew where the public dissection of criminals became a part of carnival. Public dissection constituted both deep philosophical inquiry into the likeness of God and a fate worse than death.

Mondino de Luzzi, known as Mondinus, was born in Bologna in 1275 and died in 1326. He was the 'restorer of anatomy' (Hilloowala, 1995, p 10), and the first to reintroduce systematic human dissection since the Alexandrians. He performed many public dissections himself and wrote the first practical manual of anatomy, *Anatomia*. In spite of Mondinus' reforms, dissection was still seldom done more than once in every two or five years, and its purpose remained the delivery of state punishment and the provision of an aide memoire in following the thousand year old texts of Galen. The usual procedure was that the Professor would read a second or third hand translation of Galen, while a barber cut the body and a demonstrator pointed to the area under question with a stick. It was realised by many early scholars that Galen's anatomical descriptions (based upon pigs and apes) did not correspond well to the dissection, but Galen was never rejected because it was commonly believed that the human body had changed since Galen's time (Bishop, 1960, p 77). The limited provision of corpses would have given the barber little dissecting experience and the complexity and bloodiness of the dissection, together with the intense drama of the

event, could have made it hard for observers to dispute the accuracy of the text. There is also tremendous power in suggestion; it is often easy to see those things which we are told we are looking at.

During the middle ages, the University of Montpellier in France dominated anatomical study. 'Official statutes of 1340 provided for one dissection every two years. This was soon increased to one body per year, yet in spite of state sanction, records show that bodies were not delivered' (Hilloowala, 1995, p 11). This was in part due to the strength of prevailing belief in the sanctity of the human body. Therefore, from the middle ages to the end of the nineteenth century, popular opinion and the feelings of the relatives and friends of the potential subject often obstructed the anatomist. Even today, we continue to experience profound uncertainties about the body in the period between it's death and burial, during which for centuries it has been considered as neither fully alive nor fully dead.

The development of humanism during the Renaissance brought the human body back to its significance. Some trade in bodies took place between academic centres in Italy as early as 1422 (9). There was very little increase in the official practice of human dissection during the Renaissance, despite the resurgence of interest in the classical body and the need to explore its internal structure and function. During this period the most important researches were made by Italian artists such as Leonardo da Vinci, Michelangelo, Tintoretto, Ghiberti, and Signorelli (Petherbridge, 1997, p 98). Leonardo in particular carried out extensive research. He dissected many bodies, made discoveries well ahead of his time and planned new instructive texts on the human body. However, he did not complete these, and his works were lost to view after his death for some three hundred years. Subsequently his discoveries were surpassed by other anatomists, particularly Vesalius.

The Founder of Modern Medicine was Andreas Vesalius of Brussels (1514 - 1564). He is the greatest figure of the Anatomical Renaissance along with John Caius in Cambridge and Gunther of Andernach in Paris and he challenged and overturned the authority of Galen. Vesalius studied medicine in Paris, taught in Bologna and held a dual professorship in anatomy and surgery at the University of Padua. This position was succeeded by a long line of famous surgeon-anatomists such as Fallopius, Columbo and Fabricus ab Aquapendente who was the teacher of William Harvey (Zimmerman, 1961, p 115). Vesalius wrote several anatomical books including *Epitome* 1543 and *Tabulae sex* 1538. His most important publication was *De Humani Corporis Fabrica*, Basel, 1543. This was written as a text book for surgeons, not as an anatomical atlas. Today, Vesalius' *Fabrica* is widely regarded as the greatest anatomical text book of modern history and some bibliophiles count it as one of the most beautiful books ever published.

The *Fabrica* contains an exceptional volume of more than two hundred Venetian woodcuts made after drawings by Stephan Calcar, who worked with Vesalius and who was a pupil of Titian. It is composed of seven books (208 chapters with 663 pages) According to Herrlinger (p 119), it justifies its praise because it contains 'excellent layout, high quality paper, easily readable type, a large number of clear illustrations, integrated into the text with explanatory captions, and detailed keys or legends, marginal notes are used, and Vesalius prepared the index himself.' Vesalius was so widely attacked for daring to challenge the dogma of Galen that he resigned from academia and science and went on to become physician to Emperor Charles V and Philip II of Spain. His work was immediately and very widely plagiarised, particularly by the Spanish anatomist Juan Valverde de Hamusco, and it has directly influenced most anatomical publications ever since. Stephan Calcar's images made under the direction of Vesalius, established the order of standard dissecting procedures until the mid seventeenth century. Rembrandt can be seen to have quoted Vesalius in his painting of the dissected human brain in the *Anatomy Lesson of Dr Joan Deyman* in 1656 (Sawday, 1996, p 155).

Following the revolution brought about by Vesalius, surgery attained a higher position. It was taken out of the hands of the barbers and was developed and practiced by university-trained academics. Subsequently, sixteenth and seventeenth century anatomy was developed through field surgery rather than dissection. Material was amply provided by the many religious wars in Europe, and great attention was given to the development of surgical treatment for gunshot wounds. The most prominent Italian Renaissance surgeons include John of Vigo, Guido Guidi of Pisa, and Gaspare Tagliacozzi of Bologna (who founded modern plastic surgery) (Bishop, 1960, p 84). In addition to field surgery, important developments were made in understanding the viscera of the body. Eustachius mapped the ear and Fallopius mapped the female reproductive organs. Jonathan Sawday describes the progress of this era as similar to New World exploration. 'These early discoverers dotted their names [...] over the terrain which they encountered. In their voyages, they expressed the intersection of the body and the world at every point, claiming for the body an affinity with the complex design of the universe' (Sawday, 1996, p 23).

The first anatomical theatre was built by Fabrici at the University of Padua in 1446 (fig 1). As medical schools were founded, they usually centred upon a dissecting theatre. These semi-circular or oval constructions were made of wood, or later in the eighteenth century - stone (figs 4, 5). They were tall, narrow and steeply tiered. The design of these theatres helped to provide a large number of people with a clear view of the subject, but as a result, the viewers standing at the top, had to deal with both the subject, and with the act of looking down onto it from a great height, balanced on a narrow platform, with often only a thin rail for support. Sawday describes these

anatomy theatres as 'occupying a position in the urban community analogous to the playhouse. They were fashionable places in which to see and be seen' (Sawday, 1996, p 190). Audiences would have included representatives of the civil authorities, the papal power and the spiritual church alongside students, members of the public and the medical profession.

> 'The anatomy theatre was a register of civic importance, an index of the intellectual advancement of the community, and advertisement for a city's flourishing cultural and artistic life [...] The anatomy theatres of Bologna and Padua rivalled classical antiquity's in their attraction to foreigners. English travellers returning to their own country from the continent, sometimes expressed dismay that public anatomical dissections did not flourish to the same extent that they were encouraged abroad'. (Sawday, 1996, p 42).

It is interesting to note that Inigo Jones built an anatomy theatre on Monkwell Street in London in 1784, though little seems to be known about this building and it was later demolished.

The oldest surviving operating theatre in Britain today (which is a post war reconstruction using some original features) is a wooden semi-circular room situated at the top of the tower of the chapter house, of Southwark Cathedral, opposite Guys Hospital at London Bridge. It was used for teaching and performing surgery between 1822 and 1861. Inside the theatre, five curved stalls rise around a small central space in front of the back wall. A low bench occupies the centre and this stands over a box of sand. Chairs for visiting surgeons are next to the operator's cabinet, his tray of tools and the wash stand. A gas lamp lowers itself from the glass panelled ceiling to point at the foot of the table and it seems to measure the line of hierarchy which would have governed order and viewing in the stalls (fig 2) (10).

The most famous anatomical theatre was built at the University of Leiden in 1593 by Dr. Pieter Pauw (fig 3). It was influenced by the structure of Padua and it occupied part of a disused church. The theatre was used for lecturing and for demonstrating anatomy. A wall was built between the choir and the nave, and the amphitheatre was constructed in the apse. Large windows let in day-light (candles or lamps were used in Padua) and the theatre also became known as a Cabinet, 'and hence a place for unspoken scientific and moral instruction' (Roberts and Tomlinson, 1992, p 307).

The rest of the building was converted into a gymnasium and a library. Dissections were usually only done during the cold winter months when putrefaction was slower. Sessions usually lasted four days. The central dissecting table, which is thought to have been able to revolve during demonstrations, was surrounded by several tiered wooden stalls built up on to a scaffold. These appear to be divided by narrow wooden

rails. Observers would have stood in the stalls. During the summer months, the table was removed, and the stalls were converted into a museum of skeletons, Egyptian mummies, archaeological finds, and other curiosities. Leiden was internationally renowned for its wealth of material and was referred to as a cabinet of death (Sawday, 1996, p42). The summer exhibition effectively displaced the audience to the centre of the museum, and the seasonal exchange between the living and the dead, appears to have given way to a most terrifying form of theatre in the round. The engraving seen in fig 3 advertises the opening of the theatre to the public. It incorporates all of the theatre's activities and leaves a cool indistinctness between the observer and the observed. This is a quality which I have tried to develop in my drawings.

During the sixteenth and seventeenth centuries, Italy continued to lead Europe in anatomical teaching (Richardson, 1989, p 32.) Prominent anatomists often trained there, for example William Harvey who went to Padua. However, from this period onward, the history of dissection is better documented in Britain than elsewhere in Europe. In Scotland, dissection received royal recognition and patronage in 1506. In England, Thomas Vicary (1495-1561), Surgeon to Henry VIII and at St. Bartholomew's Hospital, wrote *A treasure for Englishmen, containing the anatomy of mans body*. Published in 1548, this remained a key text in Britain until the seventeenth century. Vicary was instrumental in persuading Henry VIII to unite the guilds of barbers and surgeons under the name of The Masters and Governors of the Mystery and Commonalty of the Barbers and Surgeons of England. He was elected first master in 1540 (11). In the same year, the united guild was granted four hanged felons each year - for dissection.

'These Royal grants represent the inception in Britain of a relationship between the medical profession, the ruling elite and the judiciary on the one hand and between dissection and exemplary punishment on the other, which are crucial to the history of anatomy in Britain.' (Richardson, 1989, p 32)

The number of bodies granted for dissection at this time, was restricted, although each year, an average of five hundred and sixty people were hung at Tyburn (Sawday, 1996, p 56). This seems to confirm that while people could be hung for less than theft, dissection was reserved for murder, and it was not yet a threat to the law-abiding general public. In later times however, dissection was carried out upon non murderers and this gave rise to particular public fears. Revival of a person after incomplete hanging was not uncommon. If this did occur, it was seen as the will of God and the person was pardoned. There are several recorded cases of hanged persons being found alive in the dissection theatre. If so, they were recovered by the surgeon and looked after. There are however records to confirm that often the discovery of life was not until after dissection was in progress (Sawday, 1996, p 61).

Medicine and surgery quickly refined themselves. By the eighteenth century anatomy was taught privately in a large number of schools, particularly in London and Edinburgh, where there was a critical shortage of subjects. So few were successfully retrieved from the gallows that corpses became a valuable commodity and could command a very high price (12). In 1694, an act of the town council of Edinburgh ordered new sources of supply for the anatomy theatre. Eligible persons included 'The bodies of foundlings "after they were off the breast" [...] such as may be found dead in the streets... such as die violent deaths...who shall have nobody to own them', and unclaimed suicides. Similar steps were taken in Europe: records in Rotterdam include strangers who died in hospitals (Sawday, 1996, p 58).

The earliest grave robbers recorded in Edinburgh 1721 were therefore surgeon-anatomists and their pupils. Once they were discovered, the fear of public outrage and lost reputation led the medical establishment to employ resurrectionists. These were men of 'rough character' who were paid handsomely for each corpse they delivered (13). Commonly known as body snatchers, rival gangs of resurrectionists worked seasonally - winter only, using dim lamplight, and with one or more persons standing on look-out. The most vulnerable and 'profitable' graves were those of the poor (14). New graves meant that soil was easy to move. Sheets of canvas were laid out for the earth to be put on and to protect the surrounding grass. Then a narrow hole was dug down to the head of the coffin and hooks or a crow bar were put under the lid. Sacking was pressed down to deaden the sound of the lid snapping. The corpse was then pulled out of the head-end of the coffin and stripped. The grave clothes were thrown back and the earth replaced in the hole. Then the corpse was trussed by its neck and feet, before being wrapped in a sack and delivered to the surgeons (Richardson, 1989, p 59).

The activities of the resurrectionists evoked tremendous public trauma which increased throughout the eighteenth and nineteenth centuries. Richardson (p 78) provides a powerful account of disturbance on a mass scale.

'In February 1795, three men were discovered leaving Lambeth burial ground carrying five human bodies in sacks. The vestry records continue " in consequence of such a discovery, people of all descriptions, whose relatives had been buried in that ground, resorted there to, and demanded to dig for them [...] being refused, they in great numbers forced their way in and in spite of every effort the Parish Officers could use, they began like mad people to tear up the ground. [Many empty coffins were found] Great distress and agitation of mind was manifest in everyone, and some, in a kind of phrensy, ran away with the coffins of their deceased relations'.

The resurrectionist's trade constituted an enormous black market, although officially bodies were still being supplied from the gallows.

In their attempt to dissociate themselves from the 'odium of exhumation' (Richardson, 1989, p 104) and the extortionate prices charged for a corpse, anatomists searched for alternative means of studying the body and preserving anatomical information. Ideas ranged from the development of plaster or resin casts, highly detailed engravings, artificial corpses or dummies made of wax or cloth to life size anatomical wax models. Two examples are those waxes made by Joseph Towne at Guys Hospital in London between 1808 and 1879 and the collection of waxes belonging to La Specola at the University of Florence, made by Felice Fontana, Giuseppe Ferrini, Clemente Susini and Paolo Mascagni between 1775 and 1893. However, in the production of these collections, an enormous number of corpses was used for reference, and as works of art, the waxes could commanded a great price. Nevertheless, dependence upon resurrectionism continued.

Two brothers William and John Hunter, stand amongst the greatest anatomists in the eighteenth century. They are most famed for their research upon the gravid uterus and the establishment of modern teaching methods in Britain (15). In an introductory lecture to pre-clinical students given circa 1780, William Hunter stressed that 'Anatomy is the basis of all surgery, it informs the head, guides the hand and familiarizes the heart to a kind of necessary Inhumanity' (16). William Hunter was also appointed professor of anatomy at the Royal Academy of Art Schools in 1768. He gave annual lectures at the Academy, teaching artists the structure and function of bones and the position of superficial muscles. Anatomy continued to be taught at the Royal Academy until early this century, and as a result, what we know as the life class was referred to as the death class. The Academy schools still retain plaster casts of two dissected male bodies, one of which was prepared by William Hunter. In 1775, eight smugglers hanged at Tyburn were delivered to the Royal College of Surgeons (Richardson, 1989, p 37) One was so finely built that Hunter felt he would be of benefit to artists. The corpse was transferred to the Royal Academy Schools 'whilst it was still warm'. It was set into a pose and allowed to stiffen. The body was then flayed and cast into plaster. The cast known as Smugglerius remains in a cabinet in the corridor of the RA schools, where it has been a subject for many artists (fig 6).

John Hunter also established the Hunterian museum of comparative anatomy, which - in much reduced form owing to war time bombing - is now housed at the Royal College of Surgeons in Lincoln's Inn Field. The remarkable collection of preserved specimens, skeletons and resin casts includes the Skeleton of the Irish Giant, whose presence underlines the power and control which anatomists long held over society. A man named O'Brien died in London in 1783. He was over seven feet tall. In spite of O'Brien's careful funeral arrangements and express wish to be buried at sea, so as to avoid being dissected, John Hunter bribed the undertaker and bought

his body for £500 (17). Such power was similarly asserted by Sir Astley Paston Cooper (1768-1841), one of the most distinguished British surgeons. Sir Astley once announced to the House of Commons Select Committee that 'There is no person, let his situation be what it may, whom, if I were disposed to dissect, I could not obtain'. (Richardson, 1989)

In May 1828, Sir Henry Halford stood before the Select Committee and issued a warning against the continued support of resurrectionism. He stated:

'They ought not be tolerated at all if possible, and for the reason I will now present to your minds: when there is a difficulty in obtaining bodies, and their value is so great, you absolutely throw a temptation in the way of these men to commit murder for the purpose of stealing the bodies of their victims' (Richardson, 1989, p 132).

In respect of this, the Burke and Hare murders in Edinburgh became critically significant to the history of British anatomy (Richardson, 1989, p 132). In 1831 cases of 'Burking' occurred in London and these instigated the passing of the 1832 Anatomy Act. The act set out to end the black market trade in corpses and it dramatically changed the course of British anatomical history. After 1832 grave robbing stopped. Dissection ceased to be a penalty reserved for murder, every person who died in the work house or hospital, who was without relatives, or whose relatives were unable to reimburse the council the full cost of his/her treatment and care, was sent for dissection. Moreover, as new operations were developed, there was a need for experimentation and practice, ideally upon patients who were not from families capable of damaging the reputation of the surgeon in the event of failure. Free surgery was offered to the poor, usually at the cost of their lives. These experimental operations were prolonged and often observed by students so as to offer additional instruction in anatomy. Many took place at St. Thomas's theatre (fig 2).

Methods of chemical preservation were developed during the nineteenth century. They are now highly refined, and since the instigation of the Welfare State, the British public has been encouraged to donate it's own bodies to medicine. The study of anatomy in medical departments today is tightly controlled by government legislation, i.e. the current Anatomy Act. A body - which is termed a cadaver or subject - may only be used for teaching medical students. Surgeons may not use them for practice without special permission. Individual schools do not all prepare their own cadavers. For example Guys Hospital prepares and distributes them to several other schools in the UK, including the Royal College of Surgeons of England. Bodies are transferred from the hospital ward to the anatomy department within six hours of death. All of the blood is removed and the cadaver is perfused or fixed with a chemical solution which includes water, formaldehyde and methylated spirits. This is pushed through the arterial system, displacing all of the blood. Three large barrels of

fixative might be used per body and the process takes three days. The flesh becomes inert, incapable of decay and it may be kept indefinitely in water. Cadavers which are kept whole, and dissected by students are only retained for one academic year. Cadavers which are separated into parts and prosected (dissected by staff or surgical students for use in demonstrations) may (in Britain) be kept for up to three years.

Donation is now sufficiently popular in Britain, for anatomy departments to be selective. Modern cadavers are normally between 5' 4" and 5' 8", average to light weight, over 65 (18), without disease, deformity, bed sores, or excessive muscle wastage. Many donations are turned down if they are inappropriate, or returned if they will not easily perfuse. In 1995 Richardson and Hurwitz carried out a survey to establish why people in Britain now choose to donate (19). The survey shows a prevalent belief that body donation assists medical research and is therefore of benefit to humanity. Many donors also share a need to give value and meaning to an event (their own death) which might otherwise have none. Some wish to express their gratitude to the hospital which treated them and others wish to avoid a religious ceremony. George Bridgeman, head of the dissecting room at Guys Hospital, gives two further reasons for people choosing to donate. Funeral costs are now very high, but if a person agrees to donate their body (or their families donate them), all expenses after death are paid by the Government and all arrangements are taken in hand by the hospital (20). The second reason is that most donors die with a misconception of what will actually happen to them. Few understand the nature of dissection or that it will be carried out by inexperienced undergraduates. The medical profession usually refers to the procedure in terms of a careful anatomical examination and an opportunity to advance knowledge for the benefit of others.

Section 2. Anatomical artists who have most influenced the project

(Introduced in the order of their influence upon the project)

Leonardo da Vinci 1452 - 1519

The anatomical drawings of Leonardo are the most important graphic works to my research. This is because they are unparalleled in their invention of a living dissected body. He is one of the only artists ever to draw the dissected interior of a life like body, in terms of partial transparency; and he made interpretative drawings of bodies he had dissected, for his own research. Of all the graphic artists I have studied for this project, he is the only one who is not a medical illustrator. Leonardo gave great emphasis to visual description and unlike his successors, such as Vesalius, he endeavoured to describe a spiritual as well as a physical body. He made drawings of the skull, with lines converging to show the exact position of the human soul (Keele, 1977, p 16). He wrote extensive notebooks and planned a study of man, rather than surgery. His knowledge and understanding of the human body was considerably in advance of contemporary science. This was because descriptive anatomy was not practised until Galenic anatomy was overthrown by Vesalius, in his publication of the Fabrica, twenty-four years after Leonardo's death. However, Leonardo contributed nothing to the development of science because he did not complete his proposed book. His work passed through generations of private hands and remained largely unknown for 300 years. His drawings were shown privately between 1537 and 1545. Kenneth Clark has found that Durer made some copies of Leonardo's drawings in his Dresden sketchbook (Popham, 1947, p 84) Leonardo's influence may also be found in the anatomical drawings of Berengario from 1521 (Herrlinger, 1970, p 74). They were not properly published in facsimile edition until the late nineteenth century. In spite of this, his drawings are regarded as the finest in the history of Western art and science. When they were finally brought to public view, four hundred years after their making, they had a great impact upon representations of the body in nineteenth and twentieth century medical textbooks. This impact may be traced in, for example the works of Spalteholz, Tandler and Hermann Braus (Herrlinger, 1970, p 74).

Leonardo was most intensively involved in his anatomical studies circa 1504 to 1509. He was interested in comparative anatomy (21) and the flight of birds, but he concentrated his research upon 'the conception and development of man' (22). He was not 'a man of letters' (23), though he is thought to have read Mondinus and made close studies of *De usu partium* by Galen -several of his drawings repeat their

erroneous amalgamation of human and animal anatomy. He consulted the Paduan and Pavian anatomist Marcantonio della Torre (d.1511) (Popham, 1947, p 81) and Leonardo may have 'admired Galen and his latter-day disciple for the intellectual precision of their method and for their grasp of anatomical detail, [but ...] he found their traditional technique of verbal description [...] "tiresome and confusing" to use his own words' (Kemp, 1981, p 291). It is possible that Leonardo decided to write his own book on the body as a result of finding that Galen's text did not correspond well to his own findings. (Herrlinger, 1970, p 67) This is also important to my research because in my own studies of dissection I have found differences between text book illustrations of the body and the actual flesh I have dissected. Leonardo gave priority to drawings over text from the beginning (Herrlinger, 1970, p 69), though he did not altogether dismiss the importance of text - 'It is necessary to illustrate and to describe' (Kemp, 1981, 291) In 1510 he wrote 'Dispel from your mind the thought that an understanding of the human body in every aspect of its structure can be given in words; for the more thoroughly you describe, the more you will confuse: it is therefore necessary to draw as well as describe'. He later reaffirmed this saying 'I advise you not to trouble with words unless you are speaking to blind men' (Herrlinger, 1970, p 70).

Leonardo established particular methods for studying and representing human dissection and wrote extensively about these (24). Several of his anatomical methods are so evident in both contemporary and historic practice that it seems they have always existed and it is easy to take them for granted. He was also amongst the first to experiment with wax injection (25), later developed (particularly by Freidrich Ruysch) to cast arterial systems, lungs and the ventricles of the brain. The following methods laid down by Leonardo have formed the foundation of my own practice and run through the development of my research. He recommended that each part of the dissected body should be treated from the inside to the outside and built up in eight ordered layers: bones, ligaments, muscles, tendons, nerves, arteries, veins, skin. During the earliest stages of my anatomy studies as an undergraduate at Oxford University (between 1992 and 1994), I referred to Leonardo's order of parts. However, as I developed my studies and took up the practice of dissection, I extended his order to 13, to include viscera, fat, fascia, cartilage and hair. I also gained useful instruction from Leonardo's method of reducing muscles and tendons to cords, the better to show their origins, insertions and function. He wrote 'First make a demonstration with thinned muscles in the form of threads, and in this way you will be able to represent them above one another as nature has placed them' (Kemp, 1981, p 289) (figs 7, 8). In addition to this, he made cross sections of limbs so as to show topographical relations. These are similar to twentieth century cross-sected specimens. Leonardo was also the first to develop the scheme of showing dissected aspects of the body in rotating views, i.e. front, side and back (fig 8). He

wrote: 'If you wish to understand all the parts of an anatomized man, you either turn him or your eye through all the various positions [...] turning him about and searching for the origins of each member' (Kemp, 1981, p 288). I followed this example in making my own drawings, particularly of dissected heads (figs 46 - 49).

Leonardo's most striking drawing of a partially transparent body is his composite study of the respiratory, vascular and urino-genital systems in a female body (fig 9) In this image, Leonardo appears to make an almost impossible leap from the outside to the inside of the body, using a modelled outline of the flesh, shadowed viscera and threadlike systems such as arteries and veins. In other drawings such as the study of three legs (fig 8) he modelled the transparent form using bones and muscles reduced to threads. This is precisely the point at which I locate my research. In developing my own studies of life-size figures, particularly *Prone females 1, 2,* and *3*, I have attempted to develop these techniques established by Leonardo and test whether it is possible to make a successful drawing of a transparent body, which describes the relationship between its outer skin and its internal structure. In the development of my studies I have observed that transparency very rarely plays a role in the history of anatomical representation. With few exceptions, it has mostly been confined to the practice of studio life drawing.

Anatomy drawings may be loosely divided between two groups, those made for art and those made for medicine. The tradition of fine art has been to study how superficial muscles relate to bone and how together, they influence the skin. The body is most often shown as flayed (ecorche), as in the drawings of Michelangelo, Signorelli, Rubens or Gericault and many artists begin to study anatomy by drawing the outline of the body and placing the bones within it. These ultimately interior-exterior drawings of bone in relation to skin also form a substantial part of the fine art anatomy tradition. The notion of transparency between skin, muscle and bone may have been taken furthest by Jean-Galbert Salvage in his drawing of a gladiator in combat, made in Paris in 1812 and engraved by Jean Bosq. Selected superficial muscles, for example sartorius, gracilis and gastrocnemius, are drawn in red dotted outlines over other superficial muscles such as quadriceps, the adductor group and soleus, which are modelled tonally in brown ink. Selected bones such as the clavicle, femur and tibia are then described within the flesh using a black dotted outline. This diagrammatic drawing achieves transparency by showing musculature over bone, but it is then restricted by its placement within the fine art academy tradition of showing the athletic form of the body, without its viscera, nerves or blood supply. These aspects are nearly always excluded because, with the exception of very minor details, such as raised veins on the hands, or the abdominal viscera in most women, these elements do not affect the surface form of the body.

Along side the fine art tradition of anatomical studies, the wealth of drawings which illustrate the history of medicine can also be divided into very particular categories, in terms of what they present and how. It is most important to note that until this century, studies of different systems were normally separated into different images, so as to deal with only the issue in question. For example a study showing the musculature of the chest would not then also describe the functions of the heart. The different modes in which medical figures have been drawn seem to be as follows. During the medieval period there were schematic figures drawn in outline with any one particular system (i.e. bones, veins, or nerves) mapped into the centre. Several of Leonardo's drawings were developed from this tradition, in particular fig 9. From the Renaissance onward (Vesalius) there are more lifelike representations of figures who may be flayed as in the fine art tradition (fig 6), or deeply dissected into solid layers, (Vesalius , Van Riemsdyck, Wandelaar, Stubbs, Landseer), or opened out into thin sheets (d'Agoty, Mascagni), set into exploded view (Leonardo, Bourgery) or cross sected (Leonardo, Estienne). Systems may also appear complete, alive and isolated from their infrastructure of bone and muscle, for example the astonishing drawing of an arterial figure walking through a landscape by Stephan Calcar made for Vesalius's Fabrica (fig 14). However, there is no tradition in the modern history of medicine of drawing the interior of a human body within a perspective of lifelike transparent structure (26).

Jan Wandelaar d. 1754

Wandelaar was artist and illustrator to Bernard Siegfried Albinus (1697 -1770) in their making of *Tabulae sceleti et musculorum corporis humani*, Leiden 1747, which includes 28 engraved plates of skeletons and muscles. It took more than thirteen years to complete the project and Wandelaar lived with Albinus from 1721 until his (Wandelaar's) death. He trained with Jacob Folkema from whom he learned his engraving techniques and he previously worked for Freidrich Ruych. Like Leonardo, Albinus-Wandelaar plates had a profound influence on subsequent anatomical illustration and this continues to the present day. Their influence extends not only to anatomical texts but also to the wax models of made by Clemente Susini and Felice Fontana, which are kept at La Specola. George Stubbs and Joseph Wright of Derby were also influenced by their work. (Roberts and Tomlinson, 1992, p 327).

Albinus was a prodigy who entered Leiden University at the age of twelve. He studied under his father Bernard Albinus. When he was 24, his father died and he was elected to succeed him as Chair of surgery and anatomy. He taught in the famous University Theatre (fig 3), and developed upon the research of Vesalius. The most important aspect of Albinus-Wandelaar's work, in relation to my project, is their representation of a living corpse within real space. Their figures seem react to where they are in the engraving and they each appear to have a complex psychological relationship to their environment.

Roberts and Tomlinson (pp. 320-328) provide some account of Albinus-Wandelaar's working processes. Albinus observed that some of Vesalius errors in depicting the skeleton were due to the removal of ligaments. Albinus planned to overcome this by preparing a skeleton with its ligaments intact, and he describes in his notes how he kept the flesh moist with vinegar. He adds:

'during the time that the first figure was a-taking off, a hard frost coming on, the whole skeleton was frozen, which was the best thing that could happen both for keeping it firm and preventing the putrefaction [... I] employed a thin man of the same size as my skeleton - and making him stand naked in the same position, I compared the skeleton with him, especially the hip-bone, spine, thorax, scapulae and clavicles [...] He [Wandelaar] came back to it repeatedly for some days, checking with the living subject. The frozen state of the [suspended] skeleton was disturbed by the fire, which we were obliged to have always when the naked man stood; for he neither could nor would stand without it.' The positioning of the skeleton, standing with the weight on one foot [...] was achieved by a complex system of weights and pulleys, suspended from rings in the ceiling.'

The room was otherwise filled with two grids of measuring cords, the pulling and adjusting of which took many days. Framed copies of Wandelaars engravings are hung on the walls around the Ruskin Drawing Studio, where I began to study anatomy. I knew of these as an undergraduate, but I did not examine them critically until I undertook this research project. It is interesting to note, that in spite of his meticulous preparation, Albinus still appears to have mis-observed certain anatomical aspects. For example, the size of the deltoid muscle is often exaggerated.

Each figure is placed outside in an exquisite garden landscape with plants, sculpture and in one plate, a grazing rhinoceros (fig 10). Albinus explains this as 'serving to not only fill up the empty spaces of the tables and make them appear more agreeable; [to patrons] but likewise that [...] the light and shades of the figures might be preserved, and heightened, and the figures themselves appear more raised or rounded.' Wandelaar's figures are graceful in their gesture, dignified and elegant. Shadows cast by their feet show them moving through an impossible world which is composed of familiar elements. There is tremendous depth in the space which they occupy and a delicacy given to their inquiring consciousness and apparent personality (fig 11). These qualities have particularly influenced my own drawings of the anatomised body, more than say the illustrations of Stephan Calcar for Vesalius Fabrica. Though 'alive' and placed in landscapes, Calcar's figures bear no convincing relationship to their environment. Their feet cast shadows onto what might be a wall, with a picturesque landscape projected onto it. Their classical gestures often appear mannered and their averted gazes, empty (fig 12). Mixed references to classical athletes and gallow ropes seem harsh in comparison to the figures of Albinus-Wandelaar. Compare fig 13 to fig 11. It is interesting to note that in Juan Valverde de Hamusco's Spanish version of Vesalius, *Historia de la composicion del cuerpo humano*, copied and published in 1556, changes have been made, to many illustrations, which unexpectedly add elements of lifelike consciousness. See for example fig 15 which emphasises touch. In all my research, this is the only image I have found which shows a direct physical relationship between two anatomised figures. This is particularly important to my studies because of the implication of conscious intimacy. I have striven to achieve this in much of my own drawing, as in *Table with five figures* figs 57 - 59 or the drawing book studies figs 64 - 66.

Jacques Fabien Gautier d'Agoty 1711-85

Gaultier also called himself d'Agoty. He was a French artist, engraver, printer and publisher. He worked in Paris for G.J. Duverney, anatomist at Le Jardin du Roi (Roberts and Tomlinson, 1992, p. 523). He had three sons who assisted him in running a printing press and he sought to develop mezzotint printing techniques which would give the quality and depth of oil painting. As anatomical reference, Gaultier's prints are less clear and have a more sensuous emphasis than those of his contemporaries and predecessors such as Wandelaar and his pupil Jan Van Riemsdyke. The mysterious darkness which encloses and passes through so many of his anatomical figures beautifully extends their expression of the interior and exterior of the body. (fig 16) This is the main reason for my interest in Gaultier's work in relation to my research. He also made life-size figures, and in some images suggests anatomical detail beneath transparent unbroken skin, as when in 1748 he published eight mezzotints for *Anatomie de la tete en tableaux imprimes.* These show the distribution of blood vessels in the transparent necks and faces of apparently living female marionette heads.

Freidrich Ruych 1638 - 1731

Ruych was born in the Hague. He read medicine at Leiden University, worked as a doctor during outbreaks of bubonic plague, practiced human dissection and is most famed for his studies of lymphatics and the development of injected specimens. He also lectured in botany and he lived until he was ninety-two. Many historical anatomists and surgeons have formed private collections of specimens and curiosities and these have often been donated to or bought by larger museums. For example the Glasgow and London collections of William and John Hunter. But none have ever been as bizarre as the Ruych Anatomical Cabinet. He wrote a ten-volume illustrated catalogue for his thirteen hundred piece collection, entitled *Het eerste anatomiche cabinet.* In 1717, Tsar Peter the Great bought Ruych's Cabinet to add to his *Kunstkammer* in Petersburg (Roberts and Tomlinson, 1992, p 294).

> 'His museum or repository of curiosities, contained such a rich and magnificent variety, that one would have rather taken it for the collection of a King than the property of a private man. But not satisfied with the store and variety it afforded, he would beautify the scene, and join an additional lustre to the curious prospect. He mingled groves of plants, and designs of shell work with skeletons, and dismembered limbs ; and, that nothing might be wanting, he animated, if I may so speak, the whole with apposite inscriptions, taken from the best Latin poets. This museum was the admiration of foreigners: generals of armies, ambassadors, electors, and even princes and Kings, were fond to visit' (Robert James, London 1743).

Some of these objects were later translated into engravings by C.H. Huijberts and one may be seen in the Hunterian Museum, London (fig 17). These engravings appear to belong to the Flemish tradition of the Grotesque. Ruych's figures are woven into a fictional landscape or tableaux, which is modelled from preserved human material. For example bladder stones and tracheo-bronchial trees are used to create rock gardens and bushes. I have used a similar device in my own drawings. For example in *Circular Theatre*, *Table with five figures* and *Interior Cabinet*, details of the anatomised human body such as muscle fibres or lengths of intestine are drawn on an enlarged scale and used to create details of architecture or furniture. Sheets of skin are described as interchangeable with paper and cloth and the mass of open books in *Interior cabinet*, has been drawn to resemble closely the microscopic detail of bone lamellae. Freidrich Ruych also made strange narrative additions to certain Jar specimens. Fig 18 show a cylindrical glass jar containing the severed arm of a child. The arm, which has not been dissected, is dressed in a lace cuff made by Ruych's daughter Rachel and it is holding up a human eye socket for us to see.

Joseph Towne 1808-1879.

Towne was born in a small village outside Cambridge in England. He is the only known anatomical wax modeller to have worked in Britain and his interpretative skills are parallel to those of Susini. In 1826 Towne travelled to London to present a small wax model of a human skeleton to Sir Astley Paston Cooper (27). He was eighteen years old and this was his first anatomical model. Sir Astley was so impressed by the accuracy of the skeleton that he employed Towne at Guys Hospital in London Bridge, to make models of dissected human specimens (28). During the fifty three years that he worked at Guy's he produced more than 200 models, based upon the dissections of John Hilton the demonstrator. These include a large number of dermatological waxes most of which were sent abroad. Towne sculpted the anatomy of parts of corpses which appear to have been hanged or to have died of disease. Unlike many other artists before and after him, he did not endeavour to bring his models alive or capture them in some ideal state. They are made with astonishing accuracy (figs 19, 20). The stubble of shaved hair looks as though it is actually growing out of dead flesh and fluid is made to look wet. It is not understood how he made these waxes, but it is thought that some details may have been carved (29). In this respect, Towne even managed to create the familiar fibrous, fatty or even partly dried qualities of real flesh which has been dissected. In his work I saw both an expression of flesh astonishingly close to life and an interior tension and space which could not be produced in a real dissection because as fascia is cut, the body collapses. These qualities showed me that I could not research the relationship between drawing and human dissection without also comparing the nature of real and artificial flesh

and it was therefore the work of Joseph Towne which led me to seek that of Fontana, Susini and Zumbo and to travel to Florence to study them. My subsequent observations of La Specola's collection became very important to the development of my research.

Felice Fontana 1730 - 1805

Fontana was an eminent scientist who studied mathematics, anatomy and physiology at the Universities of Padua and Bologna. He was also an accomplished artist and wax modeller. He travelled extensively throughout Europe gathering documents, rare books and instruments. He is credited with fundamental research in anatomy, chemistry and physics. He also planned and established La Specola (Hilloowala, 1995, p 61). In 1765 Fontana was invited to Florence by the Grand Duke Peter Leopold of Lorraine. He was made Director of the Physics Laboratory at the Pitti Palace and in 1771 he made plans for the Imperial and Royal Museum of Physics and Natural History, of which he became first director in 1775. A block of houses was purchased by the Grand Duke on Via Romana, close to the Pitti Palace and these formed the premises of the museum and the anatomical workshop where La Specola was made. Fontana worked particularly closely with the artist Clemente Susini and together they produced the finest models in the collection. Fontana was also responsible for making the copies of their work which were sent abroad (Hilloowala, 1995, p 54), particularly to the Josephinum in Vienna. Fontana worked at La Specola until the end of his life.

Clemente Susini 1754 -1814.

Susini was born in Florence. He trained in bronze casting, glass painting, copper engraving and scagliola (Hilloowala, 1995, p 64). In 1773, he became an apprentice to Fontana and his then assistant modeller Giuseppe Ferrini (Hilloowala, 1995, p 65). Susini's exceptional talent soon led him to surpass Ferrini, and in 1782 he became the principal craftsman of the workshop. He lived close to the museum in a house granted by the Grand Duke and he worked on La Specola for more than forty years, until his death in 1814. He produced most of the models which are now on display in the museum, especially the three prone females at the centre of the collection, shown in figs 22 - 25. These have been very important to my research. He also assisted Fontana in making the copies seen in figs 26 - 28. Susini is regarded as the greatest of the Florentine wax modellers. He lived a very modest life, on a small wage and like Fontana he suffered from continual illness, frequently catching diseases from cadavers. Tragically it appears that he also passed these on to his own family, losing all of three of his children. It is supposed that Susini committed suicide after a very long depression and the contraction of tuberculosis.

Gaetano Zumbo 1656 - 1707

Zumbo was an abbot from the island of Sicily. He had no formal medical training, but he was an artist with a particularly morbid fascination for anatomy and an extraordinary sensibility and skill. He was described by Giacopo Giovanni as 'The most illustrious Gaetano Giulio, noble man of Sicily, Proteus of virtue and accomplishment, Prometheus of the waxen world, most watchful and marvellous Minervappollonean Argus of Nature and Art'. He was forced to emigrate to mainland Italy after an unidentified 'troublesome incident' (Hilloowala, 1995, p 68) relating to his anatomical practices. Following an invitation to the Medici court from Grand Duke Cosimo III in 1691, he spent three years in Florence. There he completed several of his most important works, which are now kept by La Specola. A small room in the museum is dedicated to five of his pieces. There are four miniature tableaux made of wax which are entitled 'The Plague', 'The Triumph of Time', 'The Corruption of the Body' and 'The affects of Syphilis'. There is another in the Victoria and Albert Museum, London. These exquisitely modelled scenes show rotting plague victims possessed of terrifying sensuousness set within pits of broken architecture. One model has been described by Le Marquis de Sade as:

> 'Executed in wax coloured so subtly and modelled so cunningly that the thing itself could be neither more expressive of nature nor more authentic. So powerful is the impression produced by this masterpiece that even as you gaze at it your other senses are played upon, moans seem audible, you wrinkle your nose quite as if you could detect the evil odors of mortality.'

The fifth model on display at La Specola is his most famous anatomy of a Christlike head (fig 21) which is modeled onto a real skull. It is this piece which has been most useful to my research and I refer to details of the head in *Circular Theatre*.

Section 3 Anatomical museums that have most influenced the project

(I). The Hunterian Museum at the Royal College of Surgeons of England, London.

(II). The anatomical waxes of Museo Zoologico della Specola, Florence, Italy.

(III). The work of Honore Fragonard at L'Ecole Nationale Veterinaire d'Alfort, Paris.

(IV). Korperwelten: A temporary exhibition of plastinated cadavers at the Landesmuseum fur Technik und Arbeit, Mannheim. October 1997 - February 1998.

(I). The Hunterian Museum at the Royal College of Surgeons of England, London

The entire development of my studio drawing has been closely informed by studies of selected anatomical museums and exhibitions. These have comprised an extension to my dissecting practice. At an early stage in my anatomy studies, I saw a need to look beyond the dissected interior of the body, to the actual environment of the laboratory or museum. I realised I could not study the relationship between the interior and exterior of the body, without also looking at methods of museum preparation, containment and display, particularly different qualities of dissection and fixture, and the juxtaposition and restraint of specimens. On my first visit to the Hunterian (30) in April 1995, I found no clear division between scientific exposition and the kind of artifice normally associated with art and this showed me that it would be possible to begin developing my drawing within the same territory (31). Even though it is primarily a didactic collection, the museum also presents itself as a landscape of the mind made physical, with layers of reflective glass and endless variations of specimens, creating a kaleidoscopic perspective of ideas and imaginative possibilities. One can see how delicate relationships are between the observer and the observed and between the perceived interior and exterior of the body and how they may be subtly altered by the particular presentation of a subject.

In the Hunterian there are preparations from as early as the seventeenth century and some of these reveal almost surreal qualities in their attempt to demonstrate and explain anatomical detail. Consider the set of four pine wood panels known as the Evelyn anatomical tables, which were brought back from Padua in 1653 by John Evelyn FRS. Each one carries a complex map of real human arteries, veins or nerves glazed to its surface. It would have been necessary to dissect and dispose of several entire bodies in order to produce these fine observations, yet they now appear to be physical drawings in which it is difficult to detect the difference between the trace of

a pen or that of a scalpel. The additive and the subtractive have met, and hang like ancestral portraits in the open stair case between the floor and the balcony. I have visited the Hunterian regularly throughout the development of my research, as an extension of my dissection studies. The preparations mentioned above (and in the end notes) informed my research by showing a particular clarity of structure and form. The atmosphere and physical organisation of the collection excited and stimulated my imagination and the combination of anatomical detail and particularity of place have been key components in the development of my drawing.

(II). Museo Zoologico della Specola, Florence, Italy

La Specola was opened under the directorship of Felice Fontana in 1775. It contains more than eight hundred life-size wax models which were sculpted directly from dissection between 1771 and 1893, by Felice Fontana, Giuseppe Ferrini, Clemente Susini and Paulo Mascagni amongst others. La Specola is one of the most important wax anatomy collections in the world. This is because Fontana, who planned the collection, intended it to take the place of a treatise on anatomy (Hilloowala, 1995, p 51). The models were designed to represent collectively an entire body in all its known detail and therefore eliminate the need to teach from a putrefying cadaver. Fontana persuaded Grand Duke Peter Leopold to fund the project, knowing how strongly he objected to the practice of dissection (Hilloowala, 1995, p 51). In the early years of its construction, La Specola was so greatly admired, particularly by visiting surgeons, academics and world leaders, that copies were ordered and sent abroad. Napoleon requested a copy for Paris (32) and Emperor Joseph II of Austria requested a copy for Vienna. There are also waxes from La Specola at the University of Leiden and the Semmelweiss museum in Budapest. Some smaller models were later brought to London and these can be found in the Science Museum. The models retained at La Specola are considered to be the finest the workshop ever produced and they continue to serve artists, writers, surgeons and scholars in pursuit of anatomical study.

The workshop established by Fontana occupied three rooms on the ground floor of the Royal and Imperial Museum of Natural History. A carrier was employed to take a basket and collect cadavers from the hospital. These were brought back to the workshop, laid out on long wooden tables and rapidly dissected. As many moulds as possible were taken directly from the flesh and it was usually possible to cast the bones and certain visceral organs. Muscles and tendons had to be copied into clay and then the clay cast into wax. It seems likely that some adjustments would have been made, to allow for the different sizes of cadavers. The base material of each model is white Smyrna or Venetian wax, which was thinned with insect oil and

sperm oil or pork fat. Colours were produced from Chinese or insect cochineal ground with white powdered lacquer and turpentine. A warm mixture of the colour and of the base wax was then either poured or hand painted into each plaster mould. The wax pieces were built up in fine layers, beginning with the most translucent surface and moving towards a deeply coloured interior. The process of dissecting, re-modelling and then producing a mould of each part of the body meant that it was possible to reproduce a large number of accurate copies. It is therefore probable that most figures in the collection share copies of the same heart, skull, ribs or pelvis et cetera. Finer structures such as veins, arteries, nerves and lymph glands were made separately by pulling cotton threads or fine wire out of liquid wax and most beautifully, the silver sheen on the tendons was produced by concealing gold leaf beneath the most translucent layers of white wax.

The complete collection of La Specola demonstrates almost every conceivable aspect of normal anatomy. Details are repeated case after case. The walls are filled through three hundred and sixty degrees with a myriad of intricate human parts. Every room is lined with three rows of wooden boxes, each panelled with Venetian glass. They are tilted upward to face the electric lights, so as you try to look into them, the surface appears to vibrate with an even glare. Small cabinets are grouped together by subject. Walls are filled with dismantled heads, arms, legs, thorax, or abdomen. Some cabinets contain large sections of the body, while others hold silk covered boards on which are laid tiny details, for example individual vertebrae, pelvic bones, sections of a jaw, the ligaments of finger joints, visceral organs, ears, the cross section of a tongue, breast or eye. In the centre of each room are different arrangements of freestanding antique cabinets, each containing a full length human figure, dissected to demonstrate different aspects of human anatomy. In one room, the walls are filled with wax bones and surround a wax skeleton, who sitting up inside its glass coffin, demonstrates an intricate web of fibrous ligaments. Curiously, the bony creature has been modelled with more than just the cartilage of its ears, though with no other suggestion of remnant flesh. There is some pathetic humour in its smile, as if it has just pushed itself up onto its elbows, honour bound to greet yet another visitor, its smooth bowed limbs drooping to show the true demand of hot summers and very old age.

At the centre of the museum there are three parallel cabinets containing life-size reclining women made by Clemente Susini. (figs 22 - 25) They are young, beautiful and entirely naked, wearing lace bridal veils and wigs of long blonde hair. Each of them raises one thigh slightly to cross the other and their arms reach down by their side to clasp their bed or else lift their braided hair. Their bodies have been opened to reveal bright viscera, and they tilt their heads to smile faintly at their viewer. They all have the same face, even those models which were copied and sent abroad, but it is

not known if it is an ideal face or a portrait of a particular woman. These models have been fundamental to my research because they are astonishing interpretations of the dissected female form, and the way in which their sex is expressed, invests each model with a dramatic and moving eroticism. The figures I have drawn in *Circular Theatre*, *Table with five figures* and *Interior Cabinet* directly respond to the Susini female models and the concluding drawings of my research *Prone female 1, 2* and *3* attempt to make parallel images which invert the distressing icon of a carefully violated woman.

In June 1997 I made a brief visit to the Josephinum in Vienna to compare its qualities and characteristics with La Specola. It is a surgical teaching museum which contains the most important collection of Florentine waxes outside Italy. They were commissioned by Emperor Joseph II of Austria in 1780 and they were made over a period of five years by Felice Fontana, with some assistance from Clemente Susini and Paolo Mascagni . Although they were otherwise engaged in the development of La Specola (Hilloowala, 1995, p54). In 1786 the replica collection was transported to Vienna across the Alps on the backs of several hundred mules. It is not known how many models were lost on route but today the Viennese collection holds about 800 pieces. It is also noted by a few historians that some of the female waxes were destroyed by a band of drunk French soldiers, who broke into the collection, and who were so convinced by their coquettish display, that they attempted to rape them (33). It is interesting to note that together with the waxes, the installation of the Viennese collection is a careful replica of La Specola. The cabinets and charts are identical and even the shelves appear to have originally been painted with the same colour green. I found no striking difference between the models of La Specola and the Josephinum, except for occasional finishing details such as pearl inlay on some of the cabinets and the fact that the reclining women lie a little flatter than their Florentine twins. They also wear highly valuable double pearl chokers and their skin has been painted pale pink at a later date. Perhaps as an attempt at restoration.

(III). The work of Honoré Fragonard (1732 - 1799) at L'Ecole Nationale Veterinaire d'Alfort, Paris

Fragonard was professor of anatomy at L'Ecole d'Alfort, where he made numerous experiments with resin to preserve dissected flesh. With some similarity to Freidrich Ruych (1638 - 1731) he animated his dissections, creating life size scenes out of human and animal material. His surviving works are kept in two very tall, narrow, glass cabinets which stand at the back of the veterinary school's museum of pathology (34). In one cabinet there is a dried dissected human body mounted on a dried dissected horse which is charging through the case (fig 30). The light frame and delicate facial features of this apocalyptic figure confirm that it is a woman. In the opposite case a dissected man stands up in front of a dissected cow; the jawbone of an ass raised in the grip of his right hand and he appears intent to kill with the blow. This is undoubtedly a reference to Caine killing Abel (fig 31). Behind and on the floor beneath these figures are an arrangement of odd dried preparations such as an arm, a leg, two heads (fig 32, 34) and an injected human vascular system, parts of an antelope and a llama and, dancing amongst these, an even more disconcerting collection of dissected human infants and similar sized monkeys. Stretched into a thin white line at the very top of one cabinet, is a dried spinal cord taken from perhaps a cow or horse. Intercostal nerves hang down like tendrils and the whole cord thickens as it nears the brain, which is preserved in full, together with the eyes hanging beneath it. The dried muscles, tendons and nerves of all these preparations are dusty and fade from grey to brown, looking like old paper, or leather, or at times the thin membrane of a dead petal (35). Ligaments cling to joints as if under suction and the whole interior frame of each body unfurls itself in dozens of brittle layers; a curious tension being held between the dried recession of flesh and its explosion into space like a deformed flower. Remaining at each centre, wound closely to the bones, are reams of bulging or sometimes ruptured arteries and veins, which have been forced full of coloured resin or wax.

Fragonard was the first significant anatomist to make lasting statuesque models using actual adult human bodies in a state of preservation. His work stands between the smooth, vital, artificial ideal of wax and the collapsed distortion of a modern medical cadaver. The brittle layers of his work also form particular drawings in space. They allow the eye to travel beneath each layer, deeper into the body. It is possible to see through receding structures to the hollow cavity of the interior, or even through to the other side of the form, particularly in the hands and feet. These different levels of opacity and transparency are similar to the woven layers I construct in my drawings.

(IV). Korperwelten: A temporary exhibition of plastinated cadavers at the Landesmuseum fur Technik und Arbeit, Mannheim. October 1997 - February 1998

The most modern method of preserving human cadavers for permanent use is Plastination. This process has been invented and developed by Professor. Dr. Gunther von Hagens, Director of the Institut fur Plastination in Heidelberg. Plastination is a vacuum process which involves replacing the water and lipids in biological tissues with a reactive polymer such as silicone rubber, epoxy or polyester resin. (von Hagens, Tiedemann, Kriz, 1987, p. 411) Plastinates are made for anatomical teaching and I first became aware of them at Guys Hospital (36). In February 1998 I visited the Korperwelten exhibition in Mannheim (37), to compare plastinates with specimens which have been soaked in formulin, or prepared with resin. I wished to see how plastinates may be used to display relationships between the interior and exterior of the body and also compare them with the works of Towne, Fontana, Susini, Fragonard, Zumbo and Ruych.

Plastination marks a particularly crucial development in the history of anatomical display, because it allows real flesh to support real bone and to be fixed in exploded view with only a minimum of distortion. Fragonard attempted to do this, but was unable to resolve problems of desiccation. Compare fig 34 to 35 and 33 to 36. Limited 'exploded views' have been achieved in wax, particularly by Clemente Susini, but the actual anatomised body has never been extended into space as far as is now possible using plastination. See for example see fig 37 which shows a single cadaver, seated and opened upward like a totem pole. This is the most original representation of the anatomised human body in the Korperwelten collection. No known artist or anatomist has ever drawn or modelled a dissected body to look like this. Several figures in the collection appear to quote historical images, such as Valverde's man holding his own skin. There are also humorous models as in a skeleton creeping up to tap the shoulder of its own musculature and other figures might be running, smoking or playing chess. Together with these upright specimens, fine (3mm) slices have been taken through whole bodies or small parts and these form exquisite maps, in which every structure is drawn by the coloured lines of fine membranes. They appear highly polished and shine like agate. At the exhibition many of these were illuminated and floated inside perspex cabinets (fig 38).

Whole body plastinates are not only unique in terms of their extended display. They also place the anatomised body in a position which is between a cadaver, an artistic image and an artificial teaching model. The surface of plastinated tissue appears similar to a wet specimen, except it is visibly solid and it glistens (37). Plastinates are also prepared using scalpels and they retains the rough, fibrous texture of dead dissected flesh, contrasting greatly with the smooth, voluptuous perfection of wax.

MAIN SECTION.

Section 4 The development of my studies of human dissection

The relationship between drawing and human dissection is the starting point of this research project. Since 1992, I have studied dissection regularly in support of my drawing practice. This has been to gain knowledge of the interior structure of the body and its relationship to the exterior form. I began by making observed drawings of prepared specimens and then I worked towards taking up the actual practice of human dissection. This led me to find parallels between the physical act of drawing with a pencil or pen and the physical process of dissection using a scalpel. My comparison of these processes and the knowledge I have gained from them has directly informed my studio research. The following chapter explains the development of my anatomical studies and shows how I have gained knowledge to support my research. It comprises four sections.

(I). Studies at the Department of Human Anatomy, University of Oxford, as an undergraduate of the Ruskin School of Drawing / Christ Church, 1992 - 1994.

(II). Studies at the Department of Human Anatomy, University of Oxford, as a research student of Cheltenham and Gloucester College of Higher Education, 1994 - 1996.

(III). Studies at Guys Hospital and The Royal College of Surgeons, 1996 - 1997.

(IV). Studies at University College London. 1997 - 1998.

(I). Studies at the Department of Human Anatomy, University of Oxford, as an undergraduate of the Ruskin School of Drawing / Christ Church 1992 - 1994

I began to study human anatomy in Hilary term 1992, as a first year undergraduate at the Ruskin School of Drawing, University of Oxford. Drawing and anatomy were a compulsory part of preliminary exams. This involved life studio classes at the Ruskin with John Carter (Tutor in drawing, Ruskin School of drawing) and sessions in the dissecting room (henceforth DR) of the department of human anatomy (38). There I attended lectures and demonstrations given by Dr Matthew Wood, using a skeleton and a specially prepared cadaver, set aside by the department for teaching artists (39). Information from these lectures was taken back to the drawing studio and applied to

the study of life models. In 1993 I followed the course for a second time and afterwards the cadaver was kept out in the DR for me to draw it. This marked the beginning of my regular, independent studies of human dissection as part of my studio practice.

I began by making a life size pencil study of the whole cadaver seen from the left side. (*Anatomy drawing 1*, represented by fig 41) This was made on white Fabriano paper stretched over a board measuring 62"x28". It was the most advanced observed drawing I had ever made, and it was intended to develop my observational skills and teach me to draw a full size human body accurately. Twice a week for two months, I was locked into the DR, wearing thick clothes as protection from the cold. Often the length of time I could stay was determined by the cold, though I found that the temperature greatly sharpened my concentration. I began by removing the plastic and muslin from the cadaver, then I laid any loose parts in their correct positions and sprayed the whole body with water to prevent it from drying. I used my lap and the dissecting table to support the board, and measured the body, making a small plan of the superficial muscles. I then sketched the whole body onto a larger sheet of paper, developing the details of surface attachments and the places where bones came close to the surface. This established a particular method of drawing which I went on to develop over the following four years.

My first year experiences of studying anatomy in the life room, looking for anatomical structure beneath the skin of living models, had shown me that to gain more knowledge of the interior of the body, I had to study dissection. I also realised a need to look deeper into the body at what underlies the most superficial structures and to do this, I had to learn how to see the inside of the body, which was previously only familiar through pictures and comparable animal and bird carcasses (40).

Learning to read dissection was much harder than anticipated. First I had to identify what I was looking at, and then learn how to see it, not only differentiating similar textures, but also identifying and ignoring enormous distortions. Most noteably deep splits in muscle fibres which are caused by drying and the removal of skin and fascia. These can be misleading when they look like the separation of different muscles. Soft tissue is also prone to deep corrugated folds forming all over its surface. This is caused by dehydration during the embalming process, and the folds do not smooth away with dissection. Moreover, bodies brought in from the hospital throughout the year are preserved and stored in water tanks until the autumn, and over the months, cadavers become compressed against the flat sides of the tanks and against each other. As the soft flesh hardens it retains the deep impressions and flattening caused by neighbouring forms. The bodies may therefore arrive in the dissecting room full of dents and looking very nonhuman. These distortions have to be recognised and

edited, particularly when analytical drawings which are to appear to relate to the living form are made. I have often found it necessary to make large adjustments between what I see in front of me and what I visualise and draw on paper. Often the most striking rhythms, contours and shapes suggested by a specimen have to be ignored because they are only distortions which describe death, embalming and anatomisation rather than human anatomy. This adjustment of what is seen can create a conflict between what is actually seen and any subsequent anatomical reconstruction by the artist.

Following the return of the Ruskin cadaver to storage, I began to draw from prosections. These are separated parts of the body which have usually been dissected by surgery students, to a higher standard than whole cadavers, which are dissected by first year undergraduates. Each term, several tables are covered with prosections and reserved for medical exams. I was able to make drawings of these and study the anatomical detail that resides deep inside the human body. At this point, my anatomy studies followed the timetable of the medical syllabus. If medics were being examined on the upper limb, I drew arms, if their next project was the head, I drew heads. It was useful to be able to touch and move these parts, feel their weight and texture and look at them in the round. It is not possible to move a whole cadaver to look at different aspects, because it is so heavy, wet and rigid.

Sitting at a table covered with twenty heads or thirty seven feet or eight legs or eleven arms, I was presented with my first experience of the extremely bizarre visions which can regularly occur in the study of anatomy. The full implication of these sights may not be observed by clinicians and they are perhaps beyond the scope of a work of art. However, aspects of these unexpected experiences have emerged in my studio drawing. For example my lack of distinction between life and death and instinctive animation of separated body parts might not have been visualised so clearly had I not witnessed flashes of intimacy in a pile of arms which drape, entwine and look as though they are softly touching one another (41). A pile of heads cut in half, makes an obvious reference to a pile of fruit and very knowing expressions can be exchanged between a crowd of heads who stand on their necks to face each other with their dissected mouths and eyes.

Together with making drawings from prosections, I began to reconstruct dissected cadavers (42). I did this to learn where to find major muscle groups and their attachments, how to differentiate between nerves and arteries (43) and between superficial and deep forms. Superficial forms are those which are closest to the skin. Deep forms are those closer to the bone. It was also a convenient means of locating the skeleton inside the flesh, rather than only guessing its position from the points where bones come close to the surface, as happens with a life model. I selected an

area, then found that section in a dissecting manual. I read what I should look for, and how it should be dissected and then unravelled and laid out the cut flesh infront of me. After pressing deep structures back against the bones in what seemed to be the right place, I tried to identify different groups of superficial muscles and arrange them back in order, according to the book, looking for their origins and insertions and examining the appearance of tendons.

I frequently drew prosections while medical student lectures and group tutorials were taking place. The acoustics of the room and the repetition of questions and answers all afternoon meant I could hear very clearly, and I gained a useful knowledge of gross anatomy, i.e. those elements which are palpable, as opposed microscopic. During these sessions, I would select and draw from several similar specimens, for example two or three right arms dissected to show the same muscle groups, together with the bones of a right arm, or three similarly cut heads together with a whole skull and parts of a skull. It was important to do this because specimens of dissection are not familiar objects and the repetition of parts helped me to distinguish common attributes from the peculiarities of one dissection. I also found it helpful to use a combination of both prosections and jar specimens and put them together on the table in front of me (44). At first I was conscious not to create a tableau, though it was often necessary to lean parts against each other, to keep them from slipping across the table and it was always difficult to ignore the gestures and expressions which every specimen called to mind.

One of my first drawings from prosections, made December 1993 to February 1994, (3rd year Bachelor of Fine Art), shows a study of ten human feet. (*Anatomy drawing 2*, represented by fig 42) There were more than thirty on the table and I was uncertain how to draw them because they presented such an extraordinary and powerful sight. This outweighed my approach to them as anatomical specimens. I selected the nine clearest pieces, found a skeletal foot and laid them out on a piece of wet muslin. I concentrated upon exploring the texture and visible depth of the flesh, including many of the cuts, folds and distortions. I allowed my enquiry to encompass textures, structure, function and the apparent gesture of each specimen. As the drawing developed it became like a landscape, solid forms flowing into each other like rocks, fields and paths. This drawing also showed me that I needed to develop the accuracy of my line and this can be seen in the far left foot, where the brightness and tension of the interior begins to contrast with the bulbous duller exterior. This study moved both my eye and my perceptions into the interior of the body. It is interesting to note that this, my first drawing of prosections, now appears to be my most distant drawing of them, as if the specimens have been scrutinised through a telephoto lens, life size and close, but untouchable and immeasurably far away. This drawing also seems to mark the point at which I found the importance of 'touch' in my work and these

particular feet reappear as objects placed on the lip of the balcony inside *Circular Theatre.* Looking at my anatomy drawings in chronological order, the most striking quality and continuity throughout, is the development of my use of line. As the drawings progress, and my knowledge of anatomy increases, lines become carefully tuned like an instrument. This tuning is also visible throughout the development of my studio drawing.

Anatomy drawing 3 describes a right inner thigh and knee joint. (A detail is shown in fig 43) I recognised a particular clarity in this prosection because it had been very well dissected. It appeared to be cleaner, more smooth and shiny and I saw a need to find methods of drawing which would be equivalent to these qualities. My previous drawings had been made with short marks, each feeling back and forth across surfaces. This specimen needed to be translated with longer, cleaner lines, which would allow each surface to move. Having sought to achieve this, the drawing now shows my first (unconscious) use of line as a scalpel, (or pre-scalpel), dissecting the complexities of the interior form. The previous drawing of feet describes a landscape-exterior. This drawing of a leg is a study of the interior of the body, and so it is perhaps also my first drawn dissection. The lines appear to push into the interior of the body and they achieve a greater clarity than is seen in previous work. This study taught me to observe the thickness of the knee joint and the protected passage of tendons, nerves and blood vessels running behind and along side it. The specimen also appeared particularly beautiful because the fascia had been removed from the tendons, leaving them to gleam silver. The layer of fascia closest to the muscle fibres was left in place and this gleamed pale hues of pearlescent pink, blue and green. In my later experiences of dissecting, I found this unexpected inner beauty of the body to be a wonderful reward for cutting down through laborious layers of unpleasant fat.

(II). Studies at the Department of Human Anatomy, University of Oxford, as a research student of Cheltenham and Gloucester College of Higher Education, 1994 -1996

In July 1994 I completed my Fine Art studies at Oxford University and in August I attended Cheltenham and Gloucester College of Higher Education as a research student where I began this research project. The department of Human Anatomy at Oxford gave permission for me to continue using their facilities. It took a few months to formulate this research study, but there was no interruption in the development of my anatomy studies and I continued to draw from prosections, using this process to understand the interior structure of the body and inform my studio drawing.

Anatomy drawing 4, represented by figs 44, 45, is the first anatomy drawing I made as a research student at Cheltenham. It describes two arms laid across each other, a third suspended in a flat jar and two bones of a forearm. This drawing combines elements of the three previous drawings and also points to development in future work. The upright arm is the first specimen that I ever drew through glass. There is a strained sense of looking in so as to see further in, but not actually reaching past the textured surface, which appears flattened beneath the thick lens of the glass (45). The lines of the upright arm are composed of short movements which are more expressive than observed and the division of muscles and fibres are marked by qualities of desiccation and shrinkage. There is also a sense of hesitancy and this is similar to my first drawing of the whole cadaver. The arms laid across the centre of the drawing are composed of lines which move over the exterior surfaces, holding each form in space and showing the weight of the arms as they lie on the table, but there are also finer more controlled lines which do begin to move into the body and explore its interior. By contrast to the flesh of these arms, the two bones floating at the top-right corner of the study show a new economy of line. There is a minimum of hesitancy. Instead the surfaces of the bones reveal a speed and clarity of line which is not present in earlier drawings. At this point I realised I must concentrate upon the relationship between the interior and exterior of the body.

The relationship between interior and exterior is explored more directly in *Anatomy drawing 5* (figs. 46 - 49). This pencil study of nine dissected heads was made in April 1995. The drawing is supported by four more drawings, numbered 6, 7, 8 and 9 which are not illustrated in this text. These are all studies of dissected heads and skulls and they will be submitted in a portfolio. In drawing 5, each specimen floats while slowly turning in the air. Lines are used to describe layers of transparent flesh over bone, the relative positions of the parietal and occipital bones, the foramen magnum, trachea and the oesophagus (46). I found it particularly useful to turn the same prosection over and over and draw the relationship of parts from different views, especially upside down. To the left and along the lower edge of the drawing I made three studies of a head which was cut in half underneath the nose. I was particularly interested in changes which occurred depending upon which way up this object stood. If the head was placed upright it was unpleasant, but acceptable as normal and familiar, but by turning it upside down, it became a bowl with a face on it, filled with a soft wet substance like set milk. The bowl of half of a head, placed upside down on a table, is a normal object in an anatomy department, but when it is placed in a drawing, it becomes more alive than a head seen the right way up. It is repellent and shocking because it stands outside all normal conditions of experience, but it is also very engaging as an image.

Throughout the time that I studied anatomy at Oxford, as an undergraduate and then as a visiting student, it was never necessary for me to observe any preparation procedures such as perfusion or the dismemberment of an un-dissected cadaver. When I began to visit Guys Hospital in March 1996, I was introduced as an artist rather than as a student. I explained the conditions under which I had been able to draw at Oxford, but it was presumed that I would be fully accustomed to preparation procedures. As my studies began to involve a number of different anatomy departments I quickly realised that they could each interpret the Anatomy Act with varying emphasis and I would have to learn and observe the rules of each department and never confuse them. For example the Royal College of Surgeons permits photography and drawing, while the Gordon museum bans drawing. At Oxford I may freely draw the face of a head, elsewhere my drawing would be confiscated. At most departments the brain is displayed in a prosection, at one department, brains are removed to 'avoid upsetting students'. Some departments display cancers and fetuses, others lock them in cupboards. One department soaks cadavers for a minimum of a few months, another sends them to be dissected within five days. Two departments leave visitors to carry their own specimens and put them away, one asks them not to carry anything and insists they telephone for a technician. One requires everyone to wear rubber gloves as a safety procedure (47), while another considers that no one really needs them, and the squeamish may provide their own.

(III). Studies at Guys Hospital and The Royal College of Surgeons. 1996 -7.

In February 1996, Professor Deanna Petherbridge invited me to organise and teach a course in anatomy drawing for M.A. students at the Royal College of Art. I contacted Guys hospital and arranged to take the students to draw from cadavers. Following this course, the staff of Guys DR invited me to return and use their facilities for my own research. Guys Hospital DR is very large, since it must accommodate 260 students per dissecting class (48). The room is not chilled and the space is divided into bays by specially designed tables, over-looked by security cameras (49). Around the walls are large numbers of especially high quality jar specimens (50), plenty of skeletons, including two dwarfs, several apes and a nineteenth century anthropological collection of human skulls, each with its origin painted on the frontal bone. There are also multi-coloured resin casts of human lungs (51) and more modern preparations which look like giant microscope slides. These are horizontal thin slices of a body pressed between sheets of glass, made by freezing the cadaver and slicing it with an electric saw.

On my first visits to Guys DR, with RCA students , I was required to demonstrate from a number of specimens and supervise the students drawing. Preparing to teach anatomy through drawing to fellow artists improved my knowledge of anatomy immeasurably. I knew that until then, my studies had been too selective and I had only focused upon what interested me. I needed to revise my studies, begin a more systematic approach, aim to cover all aspects in both detail and functional order, and become fluent in explaining it. Teaching was the catalyst to my doing this. Throughout 1996, I memorised (and therefore learned to envisage) the structure of the skeleton and most of the superficial musculature in the head, neck, thorax, abdomen, upper and lower limbs, I also learned to identify prominent viscera, and developed ways of explaining tendons, ligaments, fascia, and fat in terms of their importance to drawing the body.

This was achieved by several means. I usually worked at Guys Hospital or the Royal College of Surgeons (RCS) for five consecutive days, once a month. At Guys I was provided with a moveable work space comprising a skeleton and two parallel demonstration tables, on which I arranged paper, drawing materials, specimens, bones and an anatomy atlas. I spent time walking around the dissecting room attempting to identify and explain to myself the main features and functions of all the specimens on the shelves, which related to normal human anatomy, including the viscera of the body. I did the same at the Hunterian museum and this became particularly important to the development of my drawing following my studies at La Specola. I did not include pathology, dentistry or comparative anatomy, of which there is so much at the Hunterian, because this would have only confused the issue. I also talked through prosections, with the help of a manual, pulling apart muscle groups, starting at the bone and explaining the function of each part as I put it into place (52). I was helped enormously by staff of the department, particularly Mr. George Bridgeman (head of the dissecting room) who organised my access to material, gave me tutorials and answered any questions.

In Autumn 1996, I made *Anatomy drawings 10, 11, 12* and *13*, showing the superficial musculature of several arms, and at the same time in my studio in Cheltenham, I made *Anatomy drawings 14 - 16* referring to the college plastic skeleton and my own arms. These were the last group of drawings I made before I moved on to practise dissection. *Anatomy drawing 10* (fig 50) was made at Guys Hospital from two exquisitely dissected male forearms suspended in oblong perspex containers of water. It is the only observed pencil study of dissection I have made which begins to suggest that the subject is alive. The fingers of each hand are stretching out as if to touch something, the limbs are supple, full, and each arm seems to be aware of the other. Lines fade from the interior to the exterior and the flesh is peeled away in smooth layers, which lift to reveal new contours underneath. Each joint looks poised to move and the smoother texture, speed and length of each muscle

and tendon suggests a very purposeful movement. I went on to make drawings 11, 12 and 13 which are not as successful as drawing 10. They are too smooth and almost stylised by comparison. The sinews are folded like satin rather than appearing as taut flesh, but they contain useful information and have informed my studio research. The specimens I drew from were thoroughly dissected with the result that each muscle draped between its attachments, like the strings of a loose bow. The normal contours of the limbs were lost and these needed to be reinvented through drawing.

After making these drawings I began to question the necessity of stretching each sheet of paper. My car was parked by the preparation room and filled with spare materials, so I could travel up and down stairs to use the boot as a work space to stretch and dry the paper. The time involved in this process and the discomfort of leaning across boards on my lap to draw, persuaded me to stop using stretched paper and change to small loose sheets and pen and ink, with which I could work much more quickly. I selected an upper limb from a female cadaver and over a period of five days I made eighty seven ink drawings, turning the limb over and over, repeatedly studying its musculature. Figs 51, 52, show how I used loose, thin, rounded lines to pass around and through the surfaces of the muscles and straighter broader marks to measure the width and length of parts and divide the form into facets. The drawings also record how the movement of the radius over the ulna effects the exterior contours of the arm.

At this point I was given a scalpel with which to clarify the details of the arm. I moved back and forth between drawing with a steel nibbed pen on paper and dissecting the arm with the steel scalpel. This allowed me to compare the process of each metal blade as it described and defined the interior and exterior contours of the body. This comparison of the scalpel to the pen as I used them both became crucial to the development of my studio research, particularly in the later development of *Prone female 1, 2* and *3.* The scalpel and the pen are two fine metal blades, one of which adds (ink) while the other takes away (flesh) and their linear movements often seem to mirror each other. The scalpel gently opens, dismantles, identifies and cleans structures which are concealed deep inside the body. It strokes away fine fibres and draws out each linear contour. Like a scalpel operating in reverse, the pen adds, cutting through the illusory space of the paper and laying down ink to reveal a similar form to the dissection. The pen is used to edit, describe and rebuild the dissected body, part by part often retracing the marks and divisions made by the scalpel. There are similarities in handling each tool. Each works best when drawn backwards in one direction, neither of them work as well if they are pushed. They can be tilted and lifted onto their points to control different depths of mark or incision. The blade and the nib are also both wet and fast and have to be carefully controlled and their marks cannot be changed or eradicated.

After the completion of these drawings I recognised the importance of learning how to dissect specimens for myself. Using a scalpel to clarify the details of the arm had helped me understand and memorize its structure far better than if I had only observed and drawn it. I felt that if I could dissect a cadaver from skin to bone, I would gain direct experience of feeling and describing passages from the exterior to the interior of the body and the memory of this physical, tactile process could be brought directly into my studio drawing. I was invited to learn how to dissect at Guys Hospital, but my teaching commitments at the Royal College of Art determined that instead, I went on to learn with Dr Bridget Landon at University College London (henceforth UCL) in April the following year.

My studies at Guys Hospital increased my knowledge of both anatomy and dissecting processes and procedures. I also developed my skills in making drawings from dissection. The department presented me with a notable contrast to what I had seen and learned at Oxford, and working within the hospital prepared me to go on to UCL. As I learned more about the practices of anatomy, I frequently questioned my motivation and determination to study it first hand, however as a result of persisting with this course of study, I now feel very at ease with the necessities of the practice and I am certainly able to approach dissection with clearer intentions. The 'rites of passage' through which I seemed to have to pass, included studying dissection in an environment of both living and dead patients. Since Guys is a teaching hospital, campus buildings and anatomy department facilities necessarily embrace casualty areas, outpatients, and corridors full of people sleeping on trolleys waiting for a bed and there seems to be little environmental difference between one area or another.

In preparing to draw, I had to select prosections from tanks filled three or four feet deep with water and chosen limbs often had a nasty way of sinking into blackness when I tried to take hold of them. In the dissecting room, I had to become accustomed to technicians gathering around tables next to me to dismember cadavers needed for dentistry using twin handled saws, and the staff supervisor and I would frequently work until seven p.m., by which time all other staff had gone home, the building was locked, and we would have to exit via the body lift through the preparation room. On the first of these occasions, I was warned that the trainee technician was not yet good at perfusion. The lift, which is narrow and gated arrived in the basement in darkness. The supervisor asked me to step forward and stand still, while he went to put on the lights. The air smelled particularly sweet and I was standing close to the table. The bright over head light snapped on to reveal the inflated, milk white corpse, of an enormous young man, who I still remember as being eight feet tall and over thirty stones, (though I am sure he wasn't). My drawing boards were taken from me, so I could step clear of the complexity of tubing, and

shavings of hair which covered the floor. All these procedures are calm, relaxed, systematic, and indifferent, never far away from cigarettes, magazines and half cups of coffee, which as an outsider always strikes me as being at odds with the sense of mortality and obvious, perpetual violation. The reality of studying anatomy to inform my studio drawing has presented an ever increasing contrast to the qualities I have striven to obtain within my drawings.

My studio drawings are celebrations, which refuse to distinguish between life and death. There is no violence, death, hurt, bleeding or intrusion into a persons body. Some figures, particularly *Prone female 2* and *3* are transparent but not dissected. They are alive, fully conscious, observant and allowing the interior of themselves to be seen. Other figures in my note books or theatre drawings may be taking themselves apart so as to examine their own insides, or have chosen to separate themselves into pieces and move in different directions, but they have not suffered an accident to break their body and none of them are dissected.

(IV). Studies at University College London, 1997 - 8.

It was in the dissecting room of University College London, Rockefeller Building that I was taught how to begin to dissect the human body and I gained invaluable experience and knowledge from this experience. Again my introduction was through the Royal College of Art. In February 1997, I took RCA students to UCL to be lectured in anatomy. There I met Dr Paul O'Higgins, head of the dissecting room, and Dr. Landon, lecturer and prosector. At this time, UCL was undertaking an experiment with a new method of embalming, which they referred to as soft tissue preparation (53). Dr. Landon was responsible for dissecting a trial body for the department. She needed an assistant and invited me to join her. Our plan was to dissect one side of the body each, working either side of the table so that I could follow what she was doing. Unfortunately this plan was suspended, due to the shortage of cadavers created by a Government inquiry into the theft of body parts from the Royal College of Surgeons (54). We therefore began to work on smaller specimens in particular a leg. Then I went on to dissect a hand by myself. I will describe the process of these dissections so as to explain the skills and knowledge I gained to inform my studio research, and to show how the actual practice of dissection has been invaluable to the realisation of my research objectives. The leg we selected had been stored in a cupboard filled with shallow trays of a strong solution of formaldehyde. It was brought out, put on a high steel table, moved to the centre of the room under an electric light and left to 'fume' (55).

The leg was male, of light build and cut across the top of the pelvis, just below the iliac crest. This excluded the origin of the gluteal (buttock) muscles, which was probably done to preserve the insertion of the lower back muscles on the next section. In terms of anatomical sections, the buttocks seem to be in a no-mans-land between the back and the legs and are not often dissected. Perhaps this is because they are a comparatively simple structure to understand, where muscle fibres are coarse and where there is particularly dense fat. I soon discovered that body fat is the most unpleasant aspect of dissection. Aside from its repellent texture, it also makes dissecting tools slippery and hard to hold in rubber gloves. Unaccustomed hands soon ache trying to keep a grip.

The prosection was to be (and is now) reserved for teaching art students and so we were free to dissect it as we wished. The leg had been separated from its pair exactly along the mid line of the body, providing most of one buttock, the lower part of some abdominal muscles and half a pubic bone. We aimed to retain as much skin and fascia as possible, dissecting each layer in sheets which we kept hinged to the surface of superficial muscles. This was to limit the number of editorial decisions that we made and so preserve as much information as possible for students using the specimen after us. We preserved as many fine nerves and blood vessels as possible, exposed tendons and separated muscle groups, but we aimed to keep every part attached at as many points as possible so that the limb could be unfolded in small areas, one at a time. This helped to preserve the limb's shape. The only substantial part we removed was fat and this seems to be every prosectors worst job, it is messy, slow, laborious and thoroughly unpleasant. There are no short cuts, nothing can be taken away in bulk, because it is run through with valuable nerves and blood vessels.

The anatomical position, from which all aspects of human anatomy are measured and described, cannot be held by a cadaver. This is another feature which along with distortion, has to be ignored. The anatomical position is standing upright, with arms straight and palms facing forward. The cadaver not only lies down, but it would also have to be both alive and awake to hold its palms forward. The anatomical position requires palms to be held forward because this straightens the muscles of the forearm. When relaxed, the muscles automatically roll the arm, so that the back of the hand faces out or forward. This action is because of the exceptional design of the ulna and radius. These bones form a strong joint with the humerus at the elbow, but at the wrist, the ulna is loosely attached to the bones of the hand by a ligament which can twist, enabling the radius to pass over it. The movement of these bones is an important detail which many accomplished artists fail to observe (56).

Dissecting equipment includes, a lab coat, with buttons remaining so it can be done up, one or two pairs of thin, rubber gloves (57), a scalpel with a selection of broad or narrow blades, a pair of tweezers, some scissors and sometimes a hacksaw. It is useful to have towels and a bucket of water together with a small mop for keeping the specimen moist (58). A large quantity of paper tissues is useful for wiping greasy hands and tools and also - I later discovered - for stuffing into liquid fat pockets which unexpectedly burst (59). We removed the skin in one sheet working from the anterior to posterior surfaces. This was kept aside and wrapped around the limb after each session, so as to keep it moist. It was also retained as a valuable part of the leg. The thickness of the skin varied between one quarter and three quarters of an inch, notably thinning around the knee and ankle, and thickening toward the buttock. The skin of a cadaver which has been preserved in formalin is a pale grey or buff colour with some dark brown or purple patches and it is heavy, like a sheet of wet leather. Deep corrugated folds usually occur on the back of the thigh, across the shin, and below the knee, running the length rather than the breadth of the body and these can be very problematic. It is time consuming to make an incision through this effect and the fragile layers of fascia and the surfaces of muscles also crease into the folds. Removing skin seems to be very straightforward, since it peels away very easily. Too easily - I did not anticipate the difficulty I would experience in identifying the difference between skin and fascia: where one is seen to end and the other begins. The difference has to be learned, almost by practice more than by sight. It took me about four hours to learn to see the difference between deep skin and the superficial fascia which wraps like a stocking around the body.

Fascia is a fine, white, fibrous, elastic substance, found throughout the body. The thinnest is like a few strands of cotton wool and the thickest is like a sheet of rubber. Superficial fascia connects the skin to the deep fascia and it enfolds a lot of fat which can greatly increase its depth. It is most thin in the eyelids and most dense in the scalp and on the palms of the hands and feet. Deep fascia which is found in different thicknesses, wraps around and encloses every single structure inside the body, including muscles and viscera. Fine layers create pockets through which each muscle slides smoothly. Slightly thicker layers bind muscle groups into separate compartments. Thicker still, it can form attachments across muscles, and even run in thick shafts to the bone. In dissection, superficial fascia may be referred to as a stocking and to inadvertently cut holes in this, is to create windows. I was skilled at making windows until I learned how to see fascia. I achieved this by removing seven eighths of the depth of skin in one piece and then removing the last part, single layer by layer, pulling away fibres with tweezers and guiding them with the tip of the blade. The hidden complication was that fibres of deep skin and of fascia were identical; the same colour, the same texture and the same finely layered structure,

containing the same type of fat. Eventually I was able to feel the difference, fascia fibres were only just perceptibly stronger than deep skin fibres; more elastic and less gelatinous, and this was easier to detect when my hands were at a comfortable temperature and wiped clean of grease.

Fascia is the most important substance I gained knowledge of through learning dissection with Dr. Landon. This has been vital to the development of my drawings, particularly *Prone female 1, 2* and *3* (figs 73 - 82). I did not expect to learn about the role of fascia in shaping the body, because previously at Guys Hospital and at Oxford I used specimens which were in an advanced state of dissection. They were therefore always drier and less oily, with little remaining fat or fascia. Consequently I was hardly aware of either substance throughout the time I studied at Oxford University, Guys hospital and the Royal College of Surgeons. The extent to which they were always removed from specimens, made them more of a surprise to discover when I began to dissect the body for myself. Lessons in how to deal with fat and preserve fascia dominated my first dissecting sessions. Manuals make no substantial reference to dealing with either matter, and both seem to be disregarded as waste and so it came as a surprise to me to find how important both are to the appearance of the body, particularly for artists. They each shape the body from inside to out. I found that there are at least four distinguishable types of fat in the body. The most superficial appears as firm clusters of yellow beads. The second, found deep in the body, is unformed, translucent grey. The third is stringy fibrous and runs between muscles. The fourth is like an emulsion of oil and water trapped in fragile membranes; usually acting as cushions between tendons and behind joints. I had not anticipated how much there would be inside the body, particularly deep by the bone.

Most donated bodies are very old people who may have been largely immobile for a time before their death and so their muscles are often wasted and thin. The cadaver also loses moisture in preservation and once the fat has been removed, what is left in terms of musculature is often very slender. Muscles in the limbs are like interlaced straps and in the torso they may be thin fibrous sheets impressed with the underlying shape of bones. This is often particularly clear in the pectoral muscles which lie over the ribs. The presence of fat and water would refill and soften the familiar contours of this skeleto-muscular frame. In addition to this, fascia travels as a membrane throughout the body, wrapping around and holding together every single part. If it could be imagined by itself, intact within a transparent living body, it would perfectly describe all of the interior and exterior volumes and contours of the body. As I was dissecting out layers of fascia I realised how much it is like a hidden drawing of the body and this idea greatly assisted my development of *Prone female 1, 2* and *3* (60).

As I observed the thickening of fascia into tendonous attachments onto the bone, for example in the ilio tibial tract, I also saw how fibres can blend imperceptibly with those of ligaments. Ligaments are densely layered, fine, translucent fibres, which encase joints. They effectively tie together the bones of the body. They are barely flexible and if torn they do not mend. They look like slightly melted bundles of nylon thread and can be found in exquisitely fanned patterns which overlay each other. These run in different directions and perfectly describe the depth, surface and complex curvature of each joint. Individual fibres are of varying thickness, length and opacity and they appear exactly like the lines of a drawing. There is no difference between their description of a surface inside the body and the way in which I would try to use lines to describe a surface in a drawing. This is something which I learned through the practice of dissection.

An important issue raised by my practice of dissection is that of editing and selection. The problem of how to edit and select applies to both drawing and dissection. However a key difference between the anatomical practices of artists, anatomists and medical illustrators in dealing with dissection may be that the artist remains comparatively uninhibited in their selection of information, while the anatomist and medical illustrator are bound to follow established codes of what should be seen and how. Of course what the artist sees, the choices they make, and how they interpret those choices, will also be determined by preconceived notions, cultural conditioning, and their knowledge of anatomy. Before practising dissection at UCL, I had spent five years studying from prepared specimens and these determined that my knowledge of anatomy was based upon the editorial rules of contemporary medical practice. I had learned to see the structure of the body according to how contemporary medicine needs a clinician to understand it. This did not occur to me until I began to practice dissection and found structural differences which did not correspond with my previous understanding (61).

From December 1997, Dr. Landon and I began to work on separate specimens, while sharing discussion of our progress and taking joint decisions about the particular demonstration of parts. Dr. Landon worked on the fascial muscles of a head, while I dissected the hand of an elderly woman. It was a tiny delicate limb separated from the body half way along the forearm. The change of scale and complex structure of the hand offered a great contrast to the male leg which we had previously worked on. It weighed very little and felt more like a dry bird than a human hand. Given the small delicate build of the woman there was hardly any fat, apart from on the palm and the skin seemed tightly drawn over the bones of her wrist, knuckles and fingers. The concentration of tendons and superficial blood vessels in the hands and feet seem greater than in any other part of the body. Certainly from the point of view of

an artist, the hands and feet are where blood vessels can have the most distinct effect on surface form. For example when a living hand feels hot and is held downward, veins rise and create contours in the skin which disguise those of other parts, such as metacarpal bones, muscles and tendons. Looking at transverse sections of the wrist, there appear to be as many as twenty-one tendons passing from the muscles of the forearm into each hand to operate the fingers, and there are many other smaller tendons inside the hand. There are short strong muscles between the bones in the palm and particularly operating the thumb, but there are no muscles in the fingers, only pairs of tendons wrapped in dense fibrous sheaths. The skin of the hand separated from the fascia very easily, and since there was little fat to remove, it was possible to become immediately involved in teasing out complex patterns of blood vessels and nerves. The removal of successive layers revealed tendons, ligaments and their fibrous attachment onto bones (62).

By January 1998 the knowledge I had gained from dissection was sufficient to form the basis of my concluding studio drawings (*Prone female 1, 2* and *3*). I therefore suspended my dissecting studies and concentrated upon developing drawings which specifically tested the relationship between the pencil and the scalpel in drawing and dissecting the human body. Throughout the development of *Prone females 1, 2* and *3* I revised my anatomy studies through teaching, particularly at UCL and at the Department of Human Anatomy at the University of Oxford (63).

Section 5. Materials and methods used to construct my studio drawings.

The four largest studio drawings of the project, titled *Circular Theatre*, *Table with five figures*, *Interior cabinet* and *Unravelled Body* were all drawn with compressed charcoal, grade HB, on white Fabriano paper. To a lesser extent I also used HB pencil and India ink. I find compressed charcoal a particularly appropriate drawing medium because it can produce fine black lines, it does not shine or smudge and it cannot be entirely removed from the paper; only faded with a rubber. This is important because as a drawing develops, faded and over-drawn images begin to leave shadows and traces of movement beneath and these lend a more substantial spatial depth to the drawing. Where these marks become too dense and the surface of the paper begins to shine and repel the application of more lines, I cut small new pieces of paper and collage them onto the surface. This helps to bring light back into dulled areas of a drawing and it also reinforces and hides prominent joins between larger sheets of paper. In making *Circular Theatre* and *Table with five figures,* I also used white gouache as an experiment to bring back the white of the paper. This was less time consuming than sticking on new pieces. At the time, the paint and the paper were the same colour, but the paper quickly yellowed and left the paint more visible than was intended. In making *Unravelled body*, I used a third method of bringing back the white of the paper, which involved putting masking tape over unwanted lines, applying pressure to the reverse of the tape and then carefully pulling it off. This method removes fine paper fibres and after several applications it can restore the white of the paper. Clean tape can then be stroked over the surface, to restore its finish. I developed this method further when using pencil to make *Prone female 1, 2* and *3.* By drawing with a sharp tool on the back of tape, I could create fine lines of light which appeared to cross over the dark lines beneath.

All of my studio drawings were made on the walls of my studio and my viewpoints during their construction were continually altered by my working at different heights. I stood on tables, chairs and step ladders to reach the areas I worked on. I also used a dressing mirror to reflect each drawing. This was leant against the opposite wall to where I worked. By standing in front of the mirror, tilting it, and looking back at a drawing, I could double my distance from the work and take a wider view. This simple device also revealed errors and distortions that could not be seen the right way round or at close range.

The figures in my drawings are informed by reference to the human skeleton which is always in my studio, my anatomical studies and my knowledge of anatomy, the latter having been advanced through my participation in the practice of dissection. The model I use in all of my studio drawings is a projection of my own body and this

has become an essential source of reference. As a consequence all of the figures in my drawings have a strong physical relationship to my own body. Were I to use a life model, this relationship, that is so central to my practice, would be removed. Instead, as previous experience has demonstrated, I would be unable to project the visual intensity into my drawings that is the very reflection of my own anthropomorphism. To preserve this quality, my studio drawings have become life size or near life size. Also in relation to this, it is not appropriate to my practice to make sequences of small preparatory studies for each large studio drawing, because the former prevent the reference to my own body. Each studio drawing is therefore a compilation of preparatory sketch through to finished work, that is made possible through the techniques I have described in the previous paragraphs.

The pencil and ink drawings that I made during my anatomical studies at Oxford University and Guys Hospital, have been essential to the very detailed process of looking into, opening out and attempting to memorise the interior details of the body. Consequently, these drawings have served to record views and structural relationships which would not normally be illustrated in anatomy text books (64). They are therefore very valuable studio reference. However, while these studies provide a valuable repository of information that has informed my studio drawings, they have never been copied directly. As my drawing led me to take up the practice of dissection, and to compare the use of a scalpel and a pen, I realized the importance of learning to feel the subtle textures and sensations of the interior of the body and recall these into my drawing. This became particularly important to making *Prone female 1, 2* and *3.* They each attempt to describe the complex interior of a life-size body, using lines which differentiate the textures of bone, flesh, skin or hair. This could not have been achieved without the knowledge I gained from the dissected interior of the body.

Section 6. Discussion of *Circular Theatre* and *Table with five figures* made in anticipation of studies at La Specola (*Outside the cabinet* - confined to supporting portfolio

Circular Theatre (figs 53 - 56) is the first studio drawing I undertook as a research student. It was made along side *Table with five figures* (figs 57 - 59). Both drawings were completed prior to my studies at La Specola. They are concerned with the notion of theatre in relation to anatomical dissection and how the study of dissection can be brought into the practice of drawing. They also represent my first experiments to find relationships between the interior and exterior of the human body and methods of extending its interior into an exterior environment. They were directly informed by my studies of dissection at Oxford University and collected photographs of models made at La Specola, particularly figs 21 - 29. The drawings also reflect upon my initial survey of the history of Western anatomical practice and representation, particularly the graphic works of Leonardo, Ruych, Wandelaar, Vesalius and d'Agoty and the importance which is given to the environment of the anatomised body in each of these artist's works.

C*ircular Theatre* measures 101" x 102". It was made between April and August 1995, using compressed charcoal on white fabriano paper. It shows a view across an imaginary anatomical theatre. From high up on a circular balcony, the viewer looks across and down onto a life size anatomised woman who lies balanced on the edge of the balcony. Her body is partly opened and overlaid with her intestine, which she reaches up to touch. Her position and attitude is very like those of the women in La Specola. She also shows kinship to figures in historic illustrations such as those of d'Agoty or Berrettini, in that she is at ease with her dismemberment and she is attempting to draw our attention to it. Her body is not an expression of myself or my own identity. I purposely avoid all autobiographical details and my drawings are in no way psychological portraits, although I recognize that using my body as reference gives the figures of my drawings a certain visual likeness to me.

The woman at the centre of *Circular Theatre* is the only figure in the drawing and she is surrounded by twisted skeins of cloth, baskets, glass domes, books, human heads, feet and other objects associated with human dissection, museum containment and the act of study. All of these elements are moving towards and over the edge of the balcony from which there is a long hidden fall into the depths of the building. This is a compositional device which suggests that the drawing has a perilously deep void at its centre. Lower stalls are visible in the distance and they fall away very steeply. The main attention is focused upon the foreground. The middle ground is

given to open space and in the distance it is possible to see the pale structures and curves of opposite balconies and walls. These distant walls are important because they confine the space represented in the drawing and their circularity brings our attention back to the foreground. Throughout the drawing there are continual patterns of reversal and exchange between interior and exterior elements of the anatomised body and its surrounding architecture.

At this stage in my research, I was studying dissection from my own reconstruction of dissected cadavers. It was therefore these studies that informed the anatomical aspects of this drawing. Their collapsed disfigurement and confusion of cut tissue was nevertheless presenting me with enormous difficulty in terms of its transformation into a convincing human structure. By contrast, photographs I had found of La Specola showed enormous clarity in anatomical detail and the most striking image described a life-size reclining woman, whose delicately swollen intestine was lifted out and laid over her like an exquisite gown (fig 24). Her viscera produce a surprise exterior flowering and leave an impossible interior cavity. This cavity is impossible because there is no space inside the living body. All the elements fit together tightly, embraced by fat and fascia. The photographer's lighting also appears to have given the wax a shining brightness and surface tension which would not be found in a real cadaver. The woman at the centre of *Circular Theatre* was drawn in direct response to fig 24. I was particularly interested in the visual exchanges between the interior and exterior of her body and in the notion of a woman wearing, or being concealed by, her own interior. Subsequently, this theme, together with that of a woman being a conscious participant in her own display, became central to my studio drawing and I went on to explore it throughout the project. See figs 65, 66, and 73 - 82. The questions concerning the sexuality of these figures -those of La Specola and of my own drawings - are complex and difficult. They are also beyond the scope of this dissertation. I have deliberately kept clear of this discussion, so as not to muddy the central focus of my research. I am aware of the astonishing history of representing the anatomised female body, particularly during the eighteenth century, and I have attempted to reinterpret this tradition through my concluding drawings.

During the early development of *Circular Theatre* I was introduced to the Hunterian Museum, the Gordon Museum and the postwar reconstruction of the Old Operating Theatre of St. Thomas's (fig 2). I noted that in historical anatomical theatres such as Padua (fig 1), Leiden (fig 3) and St. Thomas's, curved viewing stalls were both steeply raked and delineated by slender partitions or hand rails. I visited St. Thomas's to study its construction and on my return I created the circular support beneath the female body, based upon my observations. However, the tiers of the finished drawing now appear to be almost vertical in their descent, rather than

stepped. This reflects the influence of the Gordon museum, which is a square Victorian viewing hall, built with iron and glass. It incorporates two levels of shallow galleries set one above the other and it is possible to look over the rails of these, down onto the Towne waxes, which are on the ground floor at the centre of one of the rooms. At this stage in my research I was spending three afternoons per week in Oxford DR studying cross sections of human heads. My visits to St. Thomas's had led me to observe the contrast between a modern DR with its central focus diffused across level rows of cadavers, and a historical theatre, with steep curves rising above the focus of one body. I realised the importance of exploring the microcosm to macrocosm relationship between a dissected subject and its surrounding architecture. My study of heads seemed particularly apposite and I began to compare the circular volume of the cranium, the container of the brain and physical cup of the imagination, to the traditional circular container of an anatomical theatre and perhaps even to the glass jars that contain anatomical preparations. I returned to my studio with several sheets of pencil drawings (figs 46 - 49) describing the details of anatomised heads and I continued to develop the architecture of the imagined theatre in response to their structure. For example, I drew four cross sections of heads pressed into the cloth surrounding the female body (fig 54, a, b, c, d). These face toward her and reflect her own opened head. Circular and semicircular motifs taken from the bowls, shelves, ventricles and membranes of these heads were then echoed repeatedly throughout the drawing, to orchestrate passages of movement between the smallest details of ink bottles (e), intestines (f) and dismantled vertebrae (g), through organic swathes of paper and cloth (h), into the huge balcony of the theatre.

When studying the dissected heads in the Oxford DR I had noted how delicate and thin fascial muscles are, especially around the eyes and nose and I also observed how muscle fibres form groups of fine, almost parallel lines, which follow the contours of the skull so closely that they appear actually to draw the face onto it. The muscles of the face are attached directly into the skin and their contraction pulls it, causing the surface to crease or stretch into an infinite range of expression. Some facial lines on the skin run parallel to underlying muscles, for example above and below the eyes and beside the nose and mouth, while other facial lines run across underlying muscle fibres, for example across the forehead and beside the eyes (fig 39). Near the centre of *Circular Theatre* there is a single head pressed between the rim of the balcony and a bowl containing a disarticulated spine (fig 55). In forming the skin of this face I tried to envisage and follow the contours of underlying muscles, particularly around the eyes and nose, therefore bringing the interior of the face into a visible relationship with the exterior. This was achieved using knowledge I had gained from both my observations of dissection and the photograph of Gaetano Zumbo's study of a head (fig 21), particularly the structure of its eye socket, temporal bone and ear.

In the DR at Oxford there are stacked boxes full of bones used for teaching first year pre clinical anatomy. The most interesting bony objects were human vertebrae threaded onto strings. When lifted up, they could be fitted together and pulled tight to form a spine. Stored in the box however, they curled up into loose rings. I attempted to draw a dis-articulated spine from memory, placed in a bowl at the centre of *Circular Theatre.* This sits above a substantial column which may be the spine of the drawing (fig 55). The circular qualities of the vertebrae and the bowl are echoed by the fibres which wind around them and these are also drawn from my observations of dissection. The balcony of the theatre is pulled and held in tension by a dense mass of cords which appear to lift and extend from the female body. Some are made of paper and turn into books or splints of wood and others describe the blood vessels, intestines, nerves and muscles of a deeply dissected body: These details show how the interior and the exterior of the body have been drawn to reflect each other as a whole.

Through knowledge gained from my research I have placed *Circular Theatre* within particular traditions of anatomical display. The female figure refers to the tradition of visceral display and she is very much alive and intimately involved with her surroundings. The problem of a living corpse or a body which lives in an impossible condition, is one that has faced all anatomical artists: whether to depict flesh as deceased and near to decay, or alive, posing and fully engaged. There are particular historical images showing living dissected figures, which have directly informed this drawing by their qualities of intimacy, sensuality and engagement with space. Alongside the females made by Clemente Susini and Felice Fontana (22 - 29), and the engravings of Jan Wandelaar for Albinus (figs 10, 11), I looked at the works of Jaques Fabien d'Agoty, in particular, his mezzotint of a young woman seated in darkness, with her long hair pinned up to show the bloody muscles of her back decoratively unfolded like great Egyptian silk fins. She turns her head with lowered eyes to acknowledge our admiration and this appears like an act of coquettishness. (fig 16) In developing *Circular Theatre* I referred to a reproduction of this print, but I was later able to study an original exhibited at the Museum of Art and History in Geneva, in June 1998, as part of 'The Quick and the Dead' touring exhibition curated by Professor Deanna Petherbridge and Claude Ritchard (65). There, it was possible to see in several works by d'Agoty how he saturated and distressed his paper with dark pigment, to create suggestive textures and depths. Each of his figures appear isolated, as if viewed quietly at night. They are drenched by the black air which surrounds them and their bodies extend and open, to hold space, as if it is as dense and impenetrable as their own flesh.

In contrast to these magical figures of immortality (made by d' Agoty), anatomical collections which involve pathology or surgery (such as the Hunterian or Gordon Museums) seem to be unavoidably engaged with the display of sickness and death. This is because, while anatomy describes the interior of a perfectly formed body, pathology is concerned with investigating what can go wrong (illness and abnormality) and it is then the role of medicine to heal it. Through studies of selected anatomical collections I have observed that these roles divide the traditions of medical art and display. Pathological specimens are normally presented as dead and disconnected from the whole body. They are either preserved or illustrated plainly, as part of a catalogue of abnormality, disease, atrophy and malfunction. Surgical displays are concerned with healing the body and they must convey technicalities and methods of procedure. Where a patient's body (or part of it) is represented, it is nearly always passive or a victim and it may be overlaid with directive hands and tools. If the surgical subject is presented as whole and alive, it does not normally interrupt the surgeon's demonstration to challenge its viewer or engage in another activity. So, it is the anatomical figure who is most free to carry on living, to investigate the interior of its neighbour (fig 15), play chess (fig 36), arrange its hair (fig 25), stride through their garden (fig 11), charge on a horse (fig 30) or stand up and fight (fig 31). The subtle differences between displays of anatomy, pathology and surgery may also reflect the historical position of anatomy as the more ancient and noble tradition; the revelation of God's creation and divine likeness. Disease and disorder were for a long time seen as punishment from God, to be healed through prayer and intercession rather than the examination, collection or comparison of effected parts. Surgery did not achieve 'respectable' status until as late as the eighteenth century. Anatomical displays have a unity to them, as if they could collectively represent a whole body and some even achieve the status of art, whereas pathology and surgery only offer disconnected symptoms; a fragmentary appendix of what might otherwise occur.

Circular Theatre can therefore be clearly placed within the tradition of anatomical display, but it also works against museum display and order. The elements of the drawing are not arranged into a system of order characteristic of a museum. Instead, in my drawing, each element, including books, containers, fabric and human parts retains a human quality, and they are all presented in a way that is apparently random. As a result, the organic forms of the drawing jostle with each other, reach out and move, as if testing their space, as does the formal depth of perspective and the depth of psychological intention. Signs of the act of study such as open books and ink bottles, interact and communicate with elements which may be seen as the subjects of study, for example parts of heads, feet, intestines and a dismantled spine. The anatomised woman at the centre lies proud in her landscape. She has not been separated from us by a mechanistic view of death and she does not occupy the

traditional position of a passive formal subject at the centre of a circular building. Instead, she has moved to join the audience, where she reveals herself as being neither alive nor dead. She lies comfortably on the edge of an infinite drop into space and to some extent she holds back the mass of the drawing, which is also alive and progressing towards, and over the edge. She makes this leap into the audience, by her gesture towards us and the fact that part of her is poised ready to fall into the undisclosed interior of the building and part of her is leaning toward us. The equilibrium between life and death becomes the equilibrium of the drawing.

" There is nothing in nature so demoniacaly impatient as he who stands on the edge of the precipice and meditates the plunge." E. A. Poe.

Table with five figures (figs 57, 58, 59) measures 57" x 87" and it was made in July 1995 alongside *Circular Theatre.* At this stage in my research, my anatomy studies had led me to begin reconstructing dissected cadavers. The physical contact with the body's interior and the process of unravelling and rearranging relationships between its parts led me to take a closer and more intense view of figures in my drawings. *Table with five figures* is therefore smaller than *Circular Theatre* and it is suggestive of a known and more intimate space. A table which may belong to a library or dissecting room fills the centre of the paper and it is strewn with books, papers and anatomical specimens. On top of these lie three closely entwined human figures. They hold on to each other tightly and a fourth figure is seated beside the table. To the far right, there is a woman, submerged to her waist. With her back turned to us, she appears to wade through the table, pulling the whole image past us like a raft in water [fig 59]. This is the first studio drawing in which I attempt to reveal intimate relationships between partly dissected people. In contrast to *Circular Theatre,* I have placed the composition low on a solid platform and we (the viewers) are brought close, almost to a point of contact. I have chosen that the figures of the drawing should not see us. Their implied indifference emphasises our act of looking in, as if we are trespassing upon their complicated and impossible embrace. As voyeur we become the exterior looking into their interior space and our position is one of being caught. This confrontation may be similar to my later experiences in the preparation room of Guys Hospital. The constant motion of *Table with five figures* is an ellipse, which sweeps up from the lower left foreground, past the central figures and around the woman on the far right who draws the scene across the table. Her posture suggests enjoyment and the tension in her cradling movement offers a contrast to the more static position of the seated figure. Both of them are partly submerged in the paper, the woman is concealed up to her waist and the seated man has no visible head. His head is only suggested by the curve of the table above his shoulders.

I began the drawing by visualising a single figure lying on a table. As I drew each of their limbs, they changed scale, age and sex and began to separate and suggest the presence of two, three and then four people in the drawing. As more arrived they began to demand each other's space. This led me to join them together, amputate certain limbs and begin to remove areas of skin to explore the interior mass of their joined bodies. In developing each figure I used my knowledge of anatomy to visualise bones, overlying muscles and fat. I used lines to describe how each structure determines the contour of the skin. The ellipse of the composition was repeated at its centre, by opening the leg of the largest figure. Within this I drew the quadriceps muscles of the thigh. I was conscious of needing to answer the question of how line can describe simultaneous views of the interior and exterior of the body and so I removed skin from the thigh, to test if I could directly describe the interior of the leg. I quickly found I did not yet have sufficient knowledge of the musculature to draw it, and removing areas of skin evoked an element of the macabre that I did not wish to bring to the drawing. I therefore turned to folding and modelling the skin to describe the interior. For example, the top of the thigh is folded to suggest the gluteal muscles running into the iliotibial tract and a sheet of fascia revealed along the thigh becomes fused into the skin covering the knee.

The table on which the composition is placed also takes on anatomical conditions. There are structures which look like blood vessels beneath the cover of the book to the centre left of the drawing and pieces of folded material spread across the table could also be human skin. Most cadavers which are in the process of being dissected lie on top of, or are surrounded by, pieces of their own skin and this is echoed by the tradition of putting folded cloth beneath or around anatomical models. I have quoted details of skin and cloth in the first three of my studio drawings: *Circular Theatre, Table with five figures* and *Interior cabinet.*

Table with five figures shows a particular development upon my previous drawing in that it explores notions of intimacy between anatomical models. This was influenced by my observation of how dissected specimens can lean, drape and press into each other to form gestures. Fig 15 taken from Valverde's *Historia de la composicion del cuerpo humano,* published in 1556, shows a composite of two plates directly copied from Vesalius' *Fabrica.* These have been used to create one of the only known images in the history of anatomical drawing which shows one dissected subject investigating the body of another. The completion of *Circular Theatre* and *Table with five figures* confirmed the importance of developing drawings of human figures in a transient state of being neither alive nor dead. *Table with five figures* also points to compositional developments found in later studio drawings. For example, the woman to the far right is placed at a tangent to the main composition, where she

draws the focus of our attention away from the centre. This device is next seen in *Interior cabinet*, where a figure stands to the left of the main composition (61), looking out to the museum, while also reaching back to touch another figure.

In August 1995, before leaving for Florence, I began a third studio drawing. This was intended as a companion piece to *Circular Theatre*, examining a similar place from a different view. I will call this drawing *Outside the Cabinet.* I had only begun to develop the image when I left for Florence and on my return, I felt that the information I had gathered from La Specola was so urgent that it needed to be treated directly in a new drawing. I therefore stopped work on *Outside the Cabinet* and as a result, it is confined to my portfolio as a supporting study.

Section 7. Research at Museo Zoologico della Specola, University of Florence.

I travelled to Florence in September 1995, following written arrangements which confirmed that I might visit and study within the University department. When I arrived, I found that Dr. Vannini, with whom I had made my arrangements, was away. Therefore, for my first week, I was bound to the one-and-a-half hour opening times of the museum, under constant staff surveillance to ensure I never stood too close to the cases. I was repeatedly told that I was not allowed to use a drawing board. I was able to make an appointment to see Dr Vannini at the beginning of my second week. He was very accommodating and introduced me to staff in the Entomology department below the museum. From this day on, I arrived shortly before closing time (11.15 a.m.), was locked into the museum, and drew until the staff downstairs wished to go home. For a few days different people came to collect me at some time between three and four in the afternoon. La Specola is enclosed at the very heart of the natural history museum. The windows are blocked and each doorway turns corners into other rooms. Sealed by a series of self-locking doors, these are set along an extensive one way system of corridors. By the beginning of my third week, entomologists had stopped coming to collect me, and for the rest of my stay in Florence, I was left to lock myself out at what ever time I wished.

Being entirely alone in the museum for several hours each day gave me the opportunity to examine and contemplate the space in what ever way I wanted. Much of my time was spent sitting and watching the collection, studying individual waxes and also looking at the overall construction and layout of the space and the curious relationships which were suggested between animated waxes shelved in adjacent layers of cabinets. I had decided that it was important not to pre-determine my studies in Florence, but rather, travel with an open mind and wait until I saw the museum before deciding how I would approach it. Inevitably, it is impossible to prevent yourself from forming expectations and dreaming possible plans. However, my assumptions about La Specola and how I could respond to it gave me some confidence in approaching it.

I anticipated finding clear anatomical structure in the models and an imaginative exposure and exchange of interior and exterior elements. Being accustomed to the atmosphere and circumstances of a dissecting room, and the sense of detachment the place demands, I also expected to experience a particular freedom at La Specola; that the waxes would be removed from the morbid terror of the dissected corpse. I did not expect this aspect of the body to have been converted into something even more challenging, which would take several months to unravel and understand. This related to the artificiality of the models, not their anatomy. They challenged my

motivation for studying dissection more than they gave insight into the subject of anatomy. The collection presented the body as having transcended death and as taking pleasure in mortal violation. The anatomical wax tradition grew out of the Catholic tradition of wax votives and the figures of La Specola show some affinity to models of Christ and the Virgin Mary which are in so many Italian churches. They demand a similar level of attention.

I experimented with making small pencil and ink studies of selected models in the wall cabinets, particularly upper halves of the body, wax ligaments of feet, and demonstrations of nerves in the upper limb. I could see in these, a quality of weightlessness, and lifelike tension which contrasted strongly with my experiences of the collapsed cadaver. I also tried to make drawings of the three reclining female waxes at the centre of the collection, made by Clemente Susini. This proved very difficult. Partly because of the restriction of the cabinets and the layout of the museum, and partly because they seemed to defy being drawn. It took time for me to understand why this should be so. In struggling to produce satisfactory or at least useful drawings of the waxes, I resorted to making diagrams, and drawings of the room. I laid out sheets of paper on the floor and drew from memory what was behind me. I also laid paper on top of the glass over the reclining bodies and peeling it back gently, I traced the forms like maps.

The reflective qualities of the handmade Venetian glass proved to be very obstructive to my study. I could not avoid the difficulty and so I decided to work with it. The glass reflected the electric strip lighting (see figs 22, 23), placed restrictions upon my view of each wax, and prevented me from entering the same space as the models. It was only by chance that the freedom I was given to use the museum after public hours, also gave me access to the central light switch box of the whole building. Being alone in the building for much of the time, and having such difficulty with the lighting, I decided shortly before returning to England, to turn all the lights off, put the museum in complete darkness and then try to re-light the waxes from external windows. This experiment was to have an extraordinary effect upon the subsequent development of my studies. The light switches were outside the museum, and as I have previously explained, the different rooms filled with stuffed tropical birds, insects, fish, snakes, turtles, antelope, elephants and horses etc. were set on a long circuit, with the human waxes in the centre. It was a long journey in the dark, navigating by minute reflections of light caught in glass eyes, tusks, cabinet fronts and polished floor tiles. By the time I returned to the room with the three female waxes, my eyes had fully adjusted and I could see the silhouette of their forms very well.

I slightly opened two window coverings, to admit two narrow beams of natural day light. These shone at a right angle across the room and directly through the cabinets holding the female figures. For the first time, I was able to see both the true qualities of the wax and the imaginative possibilities of the glass. When brightly lit by electricity, the glass had behaved as if it were sometimes opaque. Once dimly lit with natural light, it changed to reveal infinite depth. The cabinets were suddenly covered with extraordinary distortions and reflections, which produced a terrifying oscillation between permanence and dissolution; a solid figure and the illusion of floating transparency. The glass produced ceilings and floors which could at once contain the weight of the figure and allow it to fall into space. As I knelt on the floor and put my face close to the side of a cabinet, the interior of its other surfaces and the body parts they reflected, seemed to shine brightly against the darkness of the room. The reflections multiplied like mirrors until they not only filled, but infinitely extended the room. The similarity of reflections appeared to change as I moved around each case and by altering the focus of my eyes between different sheets of glass I was able to imagine relationships between multiplied reflected figures who could be drawn in such a way as to remove the certainty of a distinction between reflection and reality. I began to see imaginative ways in which I could extend the perceived boundaries of the body and I decided to use the nature of reflection as the imaginative basis of my next studio drawing. This revelation proved a certain irony in my hope to escape the rectangular forms and distortions of the dissecting room and the confinement of figures laid out in rows within an oblong space.

It was as if I had arrived in Florence to find the very nature of La Specola immovably pre-determined. In trying to draw it, it had only proved the confines of its own artifice; that art could not be made from its art, and that having reached its interpretative height it would only deny further re-invention. Re-lighting the museum enabled me to witness extraordinary visual effects, the subtle qualities of which refused to be captured through drawing. I recognised a need to find a more urgent method of recording ideas and so I turned to making written notes on my observations. The text I wrote during my last week at La Specola became the key to my understanding and interpretation of the collection. What I returned with was not a portfolio of drawn studies, (as I had anticipated) but a written description of my experience, a mnemonic of my entire sensuous understanding of the museum, a memory theatre constructed in words which after it was brought back to the studio had to be translated into drawing. The following extract is taken from this text.

October 4. 1995. 4 p.m.

I have turned off all the electric lights in the museum placing the collection in complete darkness.
Opened a single set of tall wooden shutters and tied back one curtain that I am able to reach.
Two shafts of daylight cut the darkness at a right angle - one high and immediately above the three female bodies and the other low, spilling across the floor from the adjoining room.
Much of the room, the high ceiling and the long glass walls of separated parts, remains in darkness.
Their fractured corridors absorbing luminous reflections from those who lie directly under the window.
Sunlight falls onto the head, shoulders and arms of the woman in the centre.
Figures beside her glow in a more diffuse light.
Their oily skins having completely changed; suddenly dry, cracked and turned to powder.
Their colour's lowered, they are pale, chilled, shimmering and iridescent.
Light absorbed in wax glows from beneath the dust and the dust shines like beads of water.
Everything lies thick with dust.
Their smooth skins, now drawn tight about aged bodies; apparent youth, fractured and peeled to reveal subsequent layers of soapish flesh.
Hair, now heavier than flesh exchanges light for sodden density.
Loaded with dust it appears both more brittle and more abundant.
Loose strands caught in the light throw complex webs against the glass.
The silk bed, split, now reveals decay in its compound of animal hair and grass.

I am kneeling on the floor at the centre of the room, my head between two of the cases.
Looking up at the underside of the glass forming the lids of the cabinets, their surfaces glow grey white against the blind darkness of the ceiling.
Streaks of dust and finger grease look like watermarks and trail strange perspectives across each case.
Putty grease forms a bright opaque rim, hovering parallel to the edge of the black wood case; its vertical seals running in reflection like suspending threads to the ceiling.
Dust silvers the lid like a mirror and further lowering my head, to the level of the bed, there appears above the shadowed body, her white and perfect replica.
Formed of millions of particles of dust, she floats there with greater solidity than the twin she reflects; the real body now fragmented, by limbs exchanged from the glass walls and disconnected glimpses of my own reflection.
Bright light striking the top of her head, shoulders and neck, cuts a cavernous blackness into the viscera.
Delicately pearled, her throat peels open to offer a lowering heart, which then rises sharply to the black hollow of absent lungs.
Visceral organs built of denser pigment appear dull, heavy and wet in a vapourless fluid.
Luminous painted veins trail in extension of the hair.

The women's raised and casual hands almost touch in an exchange of braids as shifts in perspective now move reflected forms to deny their similitude and produce a conversation of opposing parts.
Deep visceral caverns cupped each to form an ovoid half extend above and below to my furthest points of vision.
They exchange disquieting proximity and the circular space between them rings exactly the measure of my reflected head.
Everything the room contains is held in a box of glass.
Nothing can be seen except through glass.
Glass segregates hundreds of perfectly formed parts of the human body.
Sheer faced boxes hold me without, and yet enclose the whole of my visual field.
They deny me my sense of touch and become a distorted lens to my perception.
Heads and limbs are pressed to dull weight so that my eye strains to find inflection in their surfaces.

Now pitch black, and daylight through the shuttered glass, finds each body at once gaining in shadow but losing to reflection its absolute solidity.
Forms infuse. I cannot separate the reflected light of glass from the reflected light of wax, since the substance of each is apparently the same.
The eye strains.
Nothing is singularly visible.
No one visual plane or level contains the body in its entirety.
Reflections duplicate, eliminate, fracture and superimpose separated elements upon one another.
Objects and illusions interchange, exchange and eliminate one another.
Bodies reframe themselves in each others cases.
Reflected feet embedded in arms attached to legs extend through open viscera.
Casual hands draw braids of hair through their neighbors heart.
Rows of wax eyes watch from rows of backs of heads.
Ears listen from within a lung.

Infinite dissolution feigns the science of truth as the eye becomes lost in the multiplication of intersected parts, and the impossible distinction between extending and receding plains.
The containment of the glass walls grows with watching.
Multiplied forms dilate like an eye.
I appear in front of and behind everything.
My hands pass through every limb.
My face worn like a mask, frames every head I watch in the glass.
The eye cannot rest, the mind over occupied with deconstructing and reconstructing everything that it cannot absorb.
Mental fatigue eats the space that is imagination and creative interpretation is anaesthetized until its removal to the outside of the museum.

Each Specola model is given to be a true scientific replica of dissection, made with impeccable precision. Many bodies would have been required to produce one model and so, to some extent, one model remains imbued with many bodies. In relation to true life, too much is given, both physically and psychologically. No single human cadaver would ever be expected to provide as much concentrated information as is embodied in each comparable piece of La Specola. In spite of every modern method of absolute preservation, including plastinating parts of the body, La Specola continues to present a collection of unrivalled perfection. Whether modern or historical, preserved or in the process of decay, it has never been possible for the anatomical subject to be fully separated from its residues of fat or fascia which obscure and conjoin every structure. (Before the development of plastination.) The distortion and solid form of the cadaver, the degree of skill required to produce a clear dissection, the methods of subtraction as opposed to addition, the inevitability of human error, and the simple messiness of the process, all mean that in reality, no cadaver at any stage could ever reveal as much as one Specola model. The Specola figures represent a specifically calculated ideal. This after all was one aim of the museum. Many hundreds of bodies were used in its creation, each invested in the promise of bringing an end to the contemporary need of handling, dismantling, and disposing of putrid flesh. Even much of the museums funding was provided by the Grand Duke Peter Leopold of Lorraine upon the persuasion that its completion would secure an end to the social, political, moral and religious problems of legalised dissection in Florence. Leaving aside the issue of surgical practice which dissection provides, the models were created as an investment in the ideal future of anatomical teaching. They not only rid academia of the obnoxious corpse with its disease and infection: they also released the science of the subject from its pressure of social objection and the superstitious fears evoked by a body in its period of suspension between death and burial. Ultimately, La Specola promised to lift the obstructive necessity of imposing clinical, or psychological detachment. It promised to re-write the morbid responsibility of secret knowledge and leave only fertile ground for scientific learning and investigation.

In order to achieve this, the artists who built the collection necessarily would have had to operate within a void of psychological detachment and to try to create purely objective interpretations of the anatomised corpse. This being impossible, the artists instead filled and sealed every form with infinite levels of their imagination. Boxed rows of severed, dismantled heads and upper thorax turn and posture within their cabinet. They each observe their viewer, as they politely tilt their heads to expose the sinuous undercarriage of their throat. Separated limbs rest for observation, but retain the slightest anticipation of continued movement. The most subtle and astonishing overtones are undoubtedly found in the work of Clemente Susini; particularly his models of reclining females.

Imbued with the aesthetic of delicate taste, smooth sexuality, social poise and grandeur; naked in their eternal recline; pearled upon their embroidered silk, with hands wistfully moved to touch the lace of a bridal veil or else smooth their hair, they smile and conceal the wisdom of their pretence. They invite our recognition of their identity. They celebrate their perfection and demand our respect. Decorated in recognised cultural convention, they deny the possibility of dissociation. And an ironic ideal in their fusion of life and death, they only pretend in their disposal of our fear, in their lifting of the burden of necessary detachment and in the presentation of a perfected humanity. We are warmed by their seduction; invited to lean closer and enjoy them - until quietly, the disparity between the conditions they reveal and the attitude of their limbs, smacks the unforeseen fragility of our relation to such an intellectually engendered ideal - to the inescapable truth of mortality. They reveal the pursuit of knowledge, lying in ordered silence, preserved and inert. Yet undead, a mocking portrait of vanity, rich in honeyed oil, which, though never tasting blood still smiles proud of its mutilation and of being born to leach the horror of revulsion. La Specola needs to be more than a medical teaching collection. It stands in arrogant defiance of human mortality; its visual invention, a powerful servant to the declaration of mans sublime heroism. The gardens which surround the museum breathe a strange voice in its arrogant shadow, as we are taken to be it's accomplice and it whispers its relation to the terror of being exposed to something outside of understanding and beyond a defined emotional boundary. The museum smiles too much in its brutality. It becomes a barrage of suffocation which in silence demands the vital construction of imaginary escape. Lines maintained to the exit must press out through the walls to find air.

The dissecting room stands in paradoxical contrast to the waxes and as such is the catalyst to my understanding of them. The dissecting room permits its visitors to construct and exercise their own escape; to perform a high level of controlled emotional detachment. The reality of the medical environment is known, definitive, predictable, or if not then at least calculable and stable. It is the exposure of truth without even the possibility of interference from any other mind or imagination. The details are there to be uncovered, related, understood and stored for recollection. It is the blunt presentation of science only - hard fact. It is clear and it is real. Whereas La Specola transcends this, it reveals a weightless extension to the interior space of the body, and shows the body in that crucial state which is between life and death.

Section 8. Discussion of *Interior cabinet* made in response to La Specola

La Specola greatly challenged my purpose in studying human dissection and it defeated my usual methods of gathering information, i.e. the making of observed drawings. This was the first point in the project where I found I could not draw my way out of a problem. The collection forced me to find another solution, in the form of a written response. The whole experience of studying La Specola brought me to a crossroads in my research and the collection showed me that I needed to return to actual dissection to gain a more direct and rigorous knowledge of anatomy. After my return from Florence in October 1995 my studio drawings would not hold the qualities I sought and so I turned to studying dissection, first using jar specimens in the Wellcome Museum of the Royal College of Surgeons of England. Then, after February 1996, I studied with Mr. George Bridgeman at Guys Hospital.

In February 96, I began the drawing *Interior Cabinet* (figs 60 - 63), using compressed charcoal on white Fabriano paper. This measures 109 x 147" and its construction spanned nine months. It was made in response to La Specola and it shows a culmination of my developing drawing skills, my anatomical knowledge and my studies of historical theatres, museums, drawings and wax displays. *Interior Cabinet* was made parallel to an intensive period of study at Guys Hospital and my time was divided between the dissecting room and my drawing studio.

The initial intention of *Interior Cabinet* was to explore relationships between multiplied reflections, such as I had encountered at La Specola. I undertook to set the (actual) spectator, together with a number of imaginary drawn human figures, or part figures, within the confines of a glass museum cabinet. The rectilinear structure of this cabinet was to be repeated on all sides and therefore multiply upward, outward and back into space, as an infinite grid. Glass was to have entirely surrounded the viewer; a sheer plate passing over their head, two panels either side of them and one placed at an uncertain distance below their feet. I decided to experiment with apparently mounting one case on top of another producing the possible effect of a mirror within a mirror within a mirror. It was my intention to multiply the imaginary drawn figures, through their own reflection in the glass panels, which surrounded both them and the spectator. As I had seen at La Specola, when I turned the lights off, and as I described in my written response. However, I also wanted to experiment with sufficiently changing the attitude and position of each figure so as to remove the certainty of who is reflecting whom, who is solid, who is transparent, who is real or unreal. I decided to experiment with using the concept of multiplied reflection to undermine notions of reality or solidity throughout the whole drawing. This was to be achieved by altering relationships between figures and removing the solidity of

load bearing surfaces such as glass panels. I wanted the figures to converse with each other in such a way as to undo the notion of their simply being reflections and I wished to support the figures on a fragmented plinth or tableau of scattered books, underpinning the suggested metaphor of human understanding and chaos. Later in the project, I was presented with a false-colour scanning electron micrograph of compact bone lamellae taken by Prof. Pietro Motta in 1987 (fig 40). This looks almost indistinguishable from stacks of paper and it seems to verify my determination to use anatomical structures found within the interior of the body, to describe environmental structures placed outside the body.

I began *Interior cabinet* with a vertical piece of white Fabriano paper measuring 6' x 4'. At the centre of this I envisaged a standing woman with her hands clasped against her chest, holding up a thick mass of cloth in front of her body. This cloth was influenced by a 19th century French farmers apron (or smock) I saw in the Museum of Traditional and Popular Arts in Paris, just before I began the drawing. The white apron would have been worn by a woman and used for sowing seed. In the museum it was suspended by its shoulders, using invisible thread and the front of the apron was gathered up and filled with grain. The whole object was delicately illuminated against a very dark place. I found this to be a particularly moving image and so I brought it into my drawn response to La Specola. The fullness of the apron front and its containment of seed, made it a very strong image of fertility. The implied presence of an invisible wearer also related to the issue interior and exterior which is central to my research and also the enclosed, concealed, fullness of the apron, offered a sensitive counterbalance to the exposed (and to some extent emptied) interiors of the Specola females. Also several of the Specola waxes are shown to be pregnant (66). I drew the hands of the woman first and then her arms. However, I could not bring her arms together to form her shoulders. This was because I could not easily envisage them and I therefore divided her body to create two women, each sharing in the weight of the cloth. Their clasped hands now appear to hold together the centre of the drawing, suggesting that if they released their grip the image might become undone (fig 62, a). As the two drawn women developed, I leaned them back away from each other, to face the top of the drawing. At this point I added more paper and changed the orientation of the drawing from vertical to horizontal. As I placed a sheet of glass above them, they began to form their relationship to Susini's female models at La Specola and to my written account of their reflections in glass. The woman leaning toward the right, holds up a thin piece of cloth across her neck (fig 62, b). This gesture copies the wax model in fig 25 who holds up her hair. The drawn woman appears to be removing the display fabric which has been put around her as an anatomized subject, confirming that she is both alive and conscious. Most of the women in the drawing are of a similar build to those in La Specola, although they are not as idealised.

Interior cabinet is the first studio drawing of the project to use reflection to suggest aspects of its own composition which cannot be directly seen. All of the figures turn away from us, suggesting that what we witness is not as interesting or important as the scene which is revealed to them. They mimic our interest as their spectator, and their mass across the centre of the drawing prevents us from joining their view. The glass overhead offers us a glimpse of their view, but then it funnels our attention back into the interior of the central reclining woman (fig 62, c). The whole drawing presents us with an occulted vision of a scene that we can only imagine

The women who lie across the centre of the picture, draw a line between two reflections of their own interior. Above them we see a physical reflection in glass of their anatomised viscera and the interior of their cabinet. Below them we see books of knowledge and reams of cloth reflective of the traditions of anatomical teaching (from Galen) and the processes involved in anatomisation. The figures at the centre are compressed between these two reflections. Those who begin to sit or stand either side and below (and who were developed one after the other, working away from the centre of the paper) form a circular movement linking the reflections above to the empty space below. This is bridged by lengths of wood, sheaves of paper and museum trays. The reference to a museum's contents without its supporting structure retains the notion of flux. There are tall glass jars which act as spindles or pins holding in place sections of the drawing and turning other elements around them. These are also a compositional device, adding vertical lines to the drawing between the side panels of the cabinet. To the left of the composition, two thin vessels are occupied by impossible miniature adult skeletons, which appear to be alive and gazing out of the drawing (figs 61, 62). These respond to the tradition of an exploded skull and also the large number of skeletons who stand in glass containers in the Hunterian museum. The compacted pressure of their containment seems to reflect the intense grip of the two hands at the centre of the drawing. They also reflect the compact nature of certain museums, particularly the Hunterian before it was destroyed in the Second World War and certain natural history and anthropology collections such as the Natural History Museum at the University of Bergen and the Pitt Rivers Museum at Oxford.

Interior Cabinet has several points of focus. Consider the hands at the centre of the drawing (fig 62 a), the standing figure to the far left who reaches back to touch the arm of the figure behind them (fig 61), the group of women to the right of the drawing together with their reflections above and the view between their heads of a reflective glass dome (fig 63), the figures beneath to the right of the drawing (fig 63) and the glass sides of the cabinet which also funnel the viewers attention toward a central vanishing point behind the tableau of books. Several figures refuse to be held

by the sheets of glass and they begin to climb out, transferring themselves into other cases, or into the extended landscape of the museum (See the top of fig 61). The circular movement of the drawing presses beyond the confines of the glass and the base of the cabinet has been removed to create a precipice. These qualities of circularity and falling echo those established in *Circular Theatre*.

The complexities of the drawing's composition greatly exceeded my expectations. The simultaneous development of several focal points moved its emphasis away from the problem of reflection and consequently it's strength is not in the simulation of reflection and counter reflection but rather in the unity of its many focal points. Unlike *Circular Theatre* and *Table with five figures, Interior Cabinet* can only be fully seen if standing at a distance from it. Throughout the development of the drawing I used the dressing mirror in my studio to double my visual distance from the paper. The confining width of the studio prevented me from seeing the full effect of the drawing until after it was complete. I then made an opportunity to stand on a table outside the window and look in to see it. This showed me that through constructing relationships between individual figures and elements I had succeeded in creating a unified composition and the illusion of deep recession into space.

Section 9. Discussion of *Unraveled body* and *Three figures*, made in preparation for the conclusions of the project

Unravelled body (represented by figs 67 - 72) and *Three figures* (not illustrated) stand in direct contrast to my previous studio drawings and to one another. This is because they were made in recognition of the need to change the direction of my practice to answer directly the question of how line can describe relationships between the interior and the exterior of the human body. I saw that to answer this particular research question I had to leave aside my study of relationships between the anatomised body and its environment as examined in the first three studio drawings and focus upon the anatomised body in isolation.

Unravelled body was made in response to a description I obtained of the resin preparations made by Honoré Fragonard (1732 - 1799) which are kept at L'École Nationale Veterinaire d'Alfort in Paris, particularly his apocalyptic vision of a dissected woman charging on a dissected horse (fig 30). It was to be one year before I could travel to Paris to see this model and I could not obtain a photograph of it. However I knew of very small resin preparations in the Hunterian Museum and I was struck by the apparent strength of these. I also saw how resin preparations, which are desiccated and layered could show simultaneous views of the interior and exterior of a dissected form. I combined my observations of the effects of resin on human flesh with an imagined notion of anatomised movement evoked by Fragonard's work and this led me directly to the development of an *unravelled body*, the flesh of which has the capacity to support bone in a moving exploded view.

Unravelled body which measures 108" x 70", was made in January 1997, using compressed charcoal on a single piece of white Fabriano paper. The image describes a twice life-size human body which has completely unravelled through its own circular movement in space. The body may have become twice life size because of my close focus upon its interior structure. The skeleton is disarticulated and lifted outward by a mass of disassembled muscle fibres, fine threads of blood vessels and nerves. From a distance the drawing seems to describe a plant which is at the end of its flowering, partly collapsed and partly dried in the air. A closer view reveals each branch or flower head to be a recognizable part of the interior of the body. The tangled qualities of withered vegetation describe the nature of advanced dissection and the desiccation which would take place if a cadaver were left unwrapped. The body itself has become a landscape and it has unfolded to draw the boundaries of its own theatre. The interior is the exterior and nothing else is described. There is no architectural contrivance or mechanistic suggestion of study such as open books or pieces of glass. This is an important simplification of the subject so as to address directly the research questions.

At the centre of the drawing (fig 70) the pelvis is undone and the haunch bones face each other. The spine has fallen backwards and it is divided, to allow the ribs to open on either side of the drawing. Above these rise the intestines and the stomach (fig 69), the abdominal fascia (fig 68) and the occiput (figs 67, 68). The muscles of the torso fade toward the ground. The legs are folded, turning in a heavy circle from the right to the left of the drawing (fig 72). The left ear touches the left heel (fig 71). The orbital muscles of the eyes rest among the tendons of the calf and these are overlaid by the left clavicle and the pectoral muscles (fig 71).

Fig 67 shows the upper right arm of *Unravelled body.* The humerus is loosely covered by the remains of brachial muscles, together with fat, fascia and threads which may be blood vessels or nerves. The deltoid and pectoral muscles float either side of the bone and turn backward like the wings of a moth. The whole structure is then held up by a transparent membrane, which describes the shape of latissimus dorsi, as if it were separated from the ribs and shoulder blade. Ligaments tie the head of the humerus to the clavicle (67), and the clavicle in turn, is joined to the two sterno-cleido-mastoid muscles, which describing the absent form of the neck, rise to hold the cup of a floating occipital bone (68).

In spring 1998, I visited L'Ecole d'Alfort, to study the anatomical preparations of Honoré Fragonard and compare them with the wax works by Fontana, Susini, Towne and Ruych. I gathered a number of images, including those reproduced in figs 30 - 34. Unexpectedly, my visit showed me how close my imagined notions of Fragonard's work had come to their actual structure and texture. For example, fig 68 shows the raised sternum of *Unravelled body* attached to a descending half of the abdominal fascia. The brittle, billowing, paper qualities of this sheath could have been copied directly from the belly of the horse or the torso of the rider seen in fig 30, particularly the rider's own pectoral and abdominal muscles. The opened space described between muscle and bone, seen throughout *Unravelled body* also resembles the space within the work of Fragonard. The lower left leg of *Unravelled body* (fig 72) might be compared to the upper hind quarters of the horse (fig30).

Even more striking is a comparison between the right arm of *Unravelled body,* fig 67 and the left arm of Fragonard's standing figure wielding the jaw of an ass fig 31. Fragonard has peeled the pectoral and deltoid muscles away to either side of the bone and the brachial muscles cling together with several blood vessels. The brachial artery is tightened to lead directly into the chest wall (made possible by the absence of the first six ribs). Behind this artery and between the chest wall and the arm, the latissimus dorsi muscle drapes like a strip of coated paper. Within my own drawing it is possible to see the brachial artery drawn tightly from the elbow of the right arm to

behind the pectoral muscles, passing between the arm and what should be the chest wall (fig 67). Behind the artery curves latissimus dorsi which is drawn as a transparent membrane supporting the whole arm. Other similarities between the details of *Unravelled body* and the preparations by Fragonard include the treatment of the feet (compare the right foot in fig 31 to the left foot in fig 71) and the importance of swollen blood vessels in weaving together the interior of each whole form. These similarities of structure and texture between *Unravelled body* and the works of Fragonard were achieved through being able to envisage the possible nature of his preparation, and then apply it to my knowledge of a cadaver in a state of advanced dissection. To this I also added my observations of resinated specimens in the Hunterian Museum.

Unravelled body unwinds in a circular movement that is more pronounced than in my previous work. *Circular Theatre, Table with five figures,* and *Interior cabinet* all look inward, and in their making, both the images, lines and perspectives were used to carry the viewer into the depths of the picture. By contrast, the pictorial space of *Unravelled body* advances from the drawing so that the actual picture plane presses out toward the viewer. The sense of containment is almost eliminated from the picture and is only reinstated by its actual framing. *Unravelled body* reveals an important change in the way that I use my drawing to view the body. This is because the museum case of curiosities which was so important to *Interior cabinet* has been dissolved and I have turned to confront the body as both the only interior and the only exterior of the drawing. *Unravelled body* tested my knowledge of anatomy through taking the notion of interior to the extreme of becoming entirely exterior. It begins to realise its very own concept of theatre by the way it articulates its visual language, i.e. its line, tone, movement, perspective and most importantly, its expression of interior and exterior. This was brought about by my increasing knowledge of anatomy and the processes involved in dissection. The drawing also underlined the need for me to focus my research directly upon the description and analysis of a complete human body, separated from a perspectival interior.

Three figures was made in March 1997, on white Fabriano paper using HB and 2H pencil. It is a study which measures 90" x 95" and in contrast to my previous work, it does not respond to a particular anatomical device or a historical collection such as La Specola. This is because I had been invited to learn to practice dissection at University College London and in preparation I wished to find a way to align my studio drawing and my dissecting practice through a focus upon the whole body in isolation. As a result *Three figures* contains five developments which are crucial to the concluding drawings of my research. (*Prone female 1, 2* and *3*) These developments relate to the size, posture and placement of each figure and the way in which they are described using pencil.

Three life size women stand in a line with their backs to us. (It has not been possible to provide an illustration because the drawing is too pale for a camera to read.) They raise their hands across their abdomen and press their elbows out toward each other. There is no contact between them and their individual gesture and identity is read through their stance and position on the paper. They present us with a wall and it appears they could either stand still or move forward but they could never move back toward us and there is no possibility of their turning round. Their focus is into their own world and unlike the figures of say *Interior Cabinet*, their gaze is into an undeclared space. They have stepped clear of metaphors for the body, such as theatre and opened books, which are so important to the earlier drawings, and their lack of architectural reference has lead them to become more statuesque and iconic. They may even suggest the Three Graces. However, the distinct difference is that they have no intention of offering themselves or their individual qualities for inspection or approval and they are not in competition. Their turned backs show a stoicism and indifference. They are intended to make a positive statement of confirmed isolation and the power they gain from this.

I have described each woman using a continuity of several close lines which interweave and run on from each other, to describe the outline of her body. This outline is composed of infinitely subtle changes in both tone and contour and it models the illusion of solid form. Lines are carried either side of the disappearing edge of the body to describe light on skin, passing over fat, muscle and bone. Lines are also brought in from the edge to describe the surface of the mass which is at the centre of the body. The women were found through visualising the positions of their bones, overlaying them with muscle and fat, and then adjusting individual tensions through my knowledge of which parts should be in flexion, extension or at rest.

Three figures stand straight on their paper. This is to simplify their posture and partly align them with the anatomical position. In previous works, such as *Interior cabinet* and *Circular Theatre,* the female subjects either sit or lie and their limbs may be twisted, foreshortened or partly concealed. Before the completion of *Three figures* I had never been entirely satisfied with any of my drawings of large scale standing figures. I previously struggled with maintaining the perspective of lower limbs as they travelled through a plane parallel to the picture surface. For example I could not establish the legs of the figure to the left of *Interior cabinet,* seen in fig 61. *Three figures* are between 5'7" and 6'7" tall and they stand at the entrance to their picture, seemingly within our arms reach. This contrasts with the figures of *Interior cabinet* who may be an average height of only 4' and who are also placed more deeply within their picture, surrounded by the elements of their containment. The removal of exterior references from *Three figures* seems to have brought them closer to us and

allowed them to achieve life size. Within previous drawings, the presence of either a cabinet, table or theatre has kept the human subjects to a smaller scale and therefore further away.

Three figures was completed as I began to learn how to dissect, with Dr. Landon at UCL. My anatomical studies at Guys had led me to recognise the importance of learning dissection and I saw the importance of confronting the act of cutting into and therefore drawing into the skin of the body. The powerful stance and simplicity of line presented by *Three figures* directed me toward using the notion of an isolated female body as the ground for resolving my research. I decided to continue my use of pencil because of its parallel to the scalpel as a tool for dissecting and describing the body. Its accuracy and impermanence seemed more appropriate than the more expressive texture of charcoal and it is also held in the same way as a scalpel.

Section 10. Discussion of *Prone female 1 Prone female 2 Prone female 3* The concluding drawings of the project

The chronological order of my studio drawing reveals how I have used line to focus inward upon the human body. *Circular Theatre* describes the place of anatomical study, the museum-theatre, the exterior landscape within which the body's disarray, openness and exposure is echoed by the structure of the room and its contained parts. The lines of *Table with five figures* dismantle and peel the body to glimpse beneath its skin. *Interior Cabinet* shows line proceeding deep into the pictorial plane, through three or more vanishing points. Then line is exploded outward by U*nravelled body,* before it freezes and returns to describe the skin of *Three figures*. The concluding drawings of the project are *Prone female 1, 2* and *3.* In direct response to *Three figures* these describe single, isolated women, composed of lines that move into and through the detailed interior of their transparent form. This is the ultimate part of my studio practice, because it is where the exterior anatomised landscape becomes the interior of the body.

As I began the first *Prone female* drawing, I briefly revised the history of anatomical prints and drawings, to refresh my knowledge of the different modes of drawn representation I had identified earlier in my research: the body as flayed (ecorche), dissected in layers, cross sected, opened into flaps, divided into systems et cetera. I hoped that by making a survey of what had already been achieved in terms of using line to describe simultaneous views of the interior and exterior of the body, I might be able to see what had not been attempted or achieved. My decision to focus upon one female body led me immediately to Leonardo's *Composite study of the respiratory and urino-genital systems of a female body* (fig 9), which is his most significant drawing of a partially transparent human figure. I quickly realized that while this particular drawing relates directly to the medieval tradition, in terms of its drawn representation of a life-like transparent body, it is unique in the history of anatomical art (69). I examined every anatomical drawing I could find in print belonging to the history of medicine and I could not find any evidence of a medical drawing tradition which describes the body through transparency. There is a Fine-Art-Anatomy tradition of describing transparent musculature or flesh overlaying bone, though it is important to note that this does not examine and describe the anatomized body as a whole. I decided to take Leonardo's drawing (fig 9) - and therefore the notion of transparency - as the root of the test I would set myself through the development of my concluding drawings.

Prone female 1, 2 and *3* were made consecutively between April 1997 and August 1998, using HB pencil on lengths of white Fabriano paper, measuring approximately 94" x 34". Each drawing presents a horizontal view of a transparent, anatomised woman, floating in a defined empty space where she is the only subject. This space is contained by the actual frame of the drawing and emphasised by the 'floated' mount which suspends the drawing between the backboard and the perspex. The women are all life-size, measuring between 5' 7" and 6' 3", and they show how I have used knowledge gained directly from my practice of dissection (for example the role of fascia and processes involved in removing fat) to describe simultaneous views of the interior and exterior of a human body through the notion of transparency.

Prone female 1 (figs 73, 74) faces towards us, taking up the traditional anatomical position of a medical subject. This position was chosen for simplicity and because I began the drawing at the same time as I began to learn how to dissect at UCL in April 1997. This drawing was intended to be an experimental study and to parallel my lesson in dissection, therefore making a direct comparison between the processes of drawing and dissection, or between using a scalpel and a pencil. The face and anterior abdominal muscles of the torso have been cut away to reveal deeper structures. This shows my attempt literally to dissect an imagined transparent body from the front to the back, passing through and revealing selected layers on either side of the form. As the study developed, it became much more significant. This was because the figure took on her own identity and began to suggest an antithesis to the emotional condition of the Specola female models made by Clemente Susini. There is a pride in her stance, as if she has chosen to present her own interior, contrasting with the coy expression of the Specola models.

Prone female 1 was made in five stages. I began by taping a vertical sheet of paper to the wall of my studio. Standing in front of this, I focused upon the sensation of my own form and projected this onto the paper through my knowledge of anatomy. This enabled me to draw a pale outline-impression of a female body. It was important to begin with the paper upright so as to mirror my own standing position and the formal convention of the outline-impression allowed me to balance each side of the body, check its proportion and find the confines of the body as I built the relationship between its interior and exterior.

In the second stage I plotted the position of the bones, in order to mark the centre of the body and its maximum depth from the skin. I used collected parts of articulated skeletons as reference: one complete with a stand and the other in parts which I hung from a hook in my ceiling because it had no stand. I did not set the bones into specific positions and make direct observational drawings from them. Instead, I

studied each bone, or group of bones, turning them over in my hands, as I would a prosection, examining their structure and purpose. Then I transposed them into my drawing.

The third stage involved reworking the whole outline-impression, to ensure that the skin of the body fitted exactly with the underlying bones. I only drew the most prominent bones such as those of the cranium, pelvis, extremities and the overall shape of the thorax. The marrying of skin to bone was particularly important around joints such as the shoulders, elbows, wrists, hips, fingers and knees, where bones directly influence the appearance of skin. This process also established the most interior and exterior aspects of the body, between which I could find its other elements.

In the fourth stage of the drawing I attempted to visualise each superficial muscle group and its prominent tendons, together with the organs of the body and its depths of fat. I was guided by the positions of the bones and their measurement of space inside the body. Then I carefully marked the border of each structure, one over another, to a depth of perhaps three, four or five layers. For example the breast overlying the pectoral muscle, ribs, diaphragm and liver. At this stage in the drawing, the overlay of several border lines may have appeared flat or in places almost illegible, but they formed a very important map or coded body which I could then begin to dissect using a pencil.

At this point I began to rotate the drawing on the wall. The lines of a drawing nearly always reveal the way in which the paper was placed when they were made, and this suggests gravity. By turning a drawing around as it is made, it is possible to remove indications of gravity and make the drawn subject appear to float. I also realised that the process of rotating the drawing, was like walking around a dissecting room table to examine different aspects of a subject. The shape of the paper I chose to work on is also a similar dimension to a dissecting table.

The fifth stage involved selecting visual paths through the body and beginning to draw them. This was a difficult process because it involved translating the drawn map of border-lines into an illusion of solid yet transparent form. As I selected structures I rubbed away lines belonging to other parts that I did not wish to describe and as I developed the drawing I continually remodelled each element to fit the composition. *Prone female 1* was therefore worked out on the paper and found through a continual process of building up the body then dissecting it back again. I used a spray fixative to hold each layer as it was completed and this enabled me to draw and erase over the top of fixed lines without losing them.

In my study of dissection I had identified thirteen different elements or structures belonging to the body, which could be translated into drawing. These were bone, cartilage, ligaments, tendons, muscles, nerves, arteries, veins, viscera, fat, fascia, skin and hair. I excluded lymph glands and vessels because of the chaotic patterns they make in the body. In drawing the torso of *Prone female 1,* I selected elements to describe smooth movements which rise and fall through the interior of the body, such as a continual figure of eight drawn through her lower trunk (figs 73, 74) This involves the stomach (on the left of her body), which is echoed by the lower ribs on her right and again by her right kidney. The kidney also appears to cup the lower end of the stomach and direct the eye back across the body to the intestine. This falls along an arch of blood vessels and is in turn cupped by the pelvis. The intestine then rises up from the pelvis and disappears toward the back of the body, leaving the eye to return to the stomach. Another passage of movement may be followed up from her heart, separating to her right and left, through blood vessels which descend from her shoulders into her arms. The lines of these vessels are then picked up by the borders of the biceps muscles which carry them down into the front of her elbows. The lines then follow tendons into the wrists and palms.

In making the drawing I had to search through layers of the body, to identify the anatomical elements I had chosen to use in the composition. In doing so I was continually conscious of the relationship of these elements to each other and to the body as a whole. For example after I had drawn the stomach, the opposite kidney was especially chosen, because its curved outer border echoed and cupped the curve of the stomach. The kidney is also positioned toward the back of the body and the stomach is near the front. The eye travelling between them is therefore taken down into the depths of the body and this helps to create the illusion of a three dimensional interior.

Throughout the drawing I attempted to model the exterior of the form as if light were both shining on her skin and passing through it into her interior. The source of light appears to be from above her head. As at La Specola, when I turned off the electric lights and opened a curtain, and similarly to Leonardo's drawing seen in fig 9, I have used a combination of fine lines and tonal marks to suggest the reflection of light. For example, I have modelled the underside of her stomach (fig 74) through describing the blood vessels and strands of fascia which surround it and as they could be exposed in dissection. I attempted to model light onto the surface of the stomach by drawing lines which followed the contour of its surface, therefore describing contour, light and texture with the same mark. The constant process of adding and taking away enabled me to describe the form using both positive and negative lines and marks: i.e. by putting a groove in the paper with the pencil then carefully erasing

the graphite without flattening the groove, I could draw back across the groove in another direction, and reveal it as white, or paler than the surrounding paper. I also covered some areas of the stomach with dense marks, before gently putting masking tape over them, drawing on the reverse of the tape and then quickly tearing it off, lifting away fibres of paper to create fresh white marks over the darkened surface. The vitality and lifelike consciousness of *Prone female 1* showed me that in developing my next drawing I should move away from the notion of reductive dissection towards an impression of total transparency, and this is achieved in both *Prone female 2* and *3*.

Prone female 2 (figs 75 - 78) was made following the same process as *Prone female 1*. I began with a vertical sheet of paper onto which I projected the anthropomorphism of my own form, through my knowledge of anatomy, creating an outline-impression of an imaginary woman. I placed the skeleton inside, mapped selected aspects of her musculature and viscera, using an overlay of fine lines and subsequently focused upon selecting passages through her body. I rotated the paper throughout the development of the drawing to maintain the notion of her floating.

I also used this same process to begin *Prone female 3*.

Prone female 2 was made from September 1997 to February 1998 and it reveals a horizontal view of a woman floating with her back to us. In contrast to *Prone female 1* she does not take up a traditional anatomical position. Instead, her feet are lifted beneath her as if she is running (fig 75), and her hair, which is heavy and braided, falls down parallel to her shoulders (fig 76). These contradictory movements lend the drawing a subtle narrative that is not present in either *Prone female 1* or *3*. The weight and movement of her feet and hair shift her gravitational relationship to both her viewer and to the surface of the paper. They hold her balance either side of her own pelvis and it appears she could rotate herself in two directions, either along the axis of her spine or across the axis of her hips. Of the three *Prone female* figures, she appears to be closest to us, as if she may be resting on an imagined transparent surface. She is of heroic proportion. However, her vitality is not described through her musculature, as would be the tradition, seen (almost exclusively) in male anatomical subjects. See figs 10, 12. Her musculature is barely described and her vitality is expressed by her movement and by the intricacy and linear energy of her bones and nerves.

Prone female 2 is the most detailed of the three drawings. At a very early stage, the sacrum and lumbar vertebrae became a point of focus and their intricate structure and enclosure of the spinal cord led me to develop the body through a description of her bones and nervous system. Her spine draws a line through the centre of the drawing and the central focus of her body is between her third lumbar vertebrae and her sacrum (fig 78). The complexity of nerves emerging from her lower back is balanced by the weight of her hair and the nerves are displayed over a posterior view of her abdominal viscera. Nerves also rise into the transparent form of her gluteal muscles and they are seen in the flesh above the lower bones of her pelvis. The pelvis cups the mass of her abdomen which is seen through her back, and her lower ribs cover the upper borders of her kidneys. These with their ureters, are pressed tightly into the intestine, and together they describe the shape of her back. This particular point in the drawing shows how I used the deepest interior of the body to describe its most exterior contour. The kidneys, intestine and nerves passing over them, describe the absent form of the erector spinae muscles and the latissimus dorsi which would both flank and support the spine. From the tenth thoracic vertebrae I faded my description of the spine into a description of blood vessels leading to and surrounding the heart. This exchange carries the eye from the hard superficial bone of the back, to the soft interior of the thorax. To the right of the heart I have described the cavity of the rib cage as empty. This space, which is the absolute interior of the body extends from the spine to the sternum. The hollowness of her ribs also tilts the weight of her body toward her left side and from there toward the lower edge of the paper. This further reinforces the weight of her hair.

Throughout the development of the drawing, I concentrated on using line to differentiate between the textures of hair, nerves, bones, muscles et cetera. This was achieved by focusing on the textures and tensions of each surface, which I had learned from practising dissection and trying to emulate these through the movement of my hand - for example the elasticity of the skin; the smoothness of tendons and lengths of bone; the slippery knarled texture of exposed joints with strong ligaments rooted into them; the fibrous, cordlike texture of nerves in contrast to the softness of arteries and veins, and also the different consistencies and densities of fat and fascia. The bones of her body were drawn with reference to the plastic articulated skeletons in my studio. Her muscles, visceral organs and nerves were invented, using knowledge I gained directly from my practice of dissection and my study of anatomical collections, particularly the work of Clemente Susini and Felice Fontana at La Specola and the work of Joseph Towne at the Gordon Museum. I also referred to anatomical atlases and catalogues such as Gray's pp. 538, 1081, Marshall pp 304, 325 and the Korperwelten catalogue. These were used as an aide-memoire, helping me to recall the structure and order of very detailed parts. For example the nervous

system of *Prone female 2* was especially complicated to understand, because delicate nerves rarely survive the process of dissection. Beyond their main lines, such as at the centre of the limbs,they become so fine that they are nearly always cut away in dissection. To envisage aspects of the nervous system in *Prone female 2* I had to use atlases to construct a drawn interpretation from a number of diagrams. The most informative image was the photograph in fig 36 of the spinal cord of the 'Chess player' in the Korperwelten exhibition.

The hair of *Prone female 2*, is the only part of her body that I drew directly from observation (fig 76). I turned the drawing to a vertical position on the wall and rolled up the lower half of it. Then I lowered the whole drawing, so the head of the figure came level with my own head, as I sat on a chair in front of the wall. I braided my own hair, pulled it to the left of my head and held it as far in front of my face as it would reach. This enabled me to study the texture of my hair and how an individual strand winds through a braid. I then envisaged the appearance of the back of my head as I held my hair out to the side. I drew what I envisaged, by extending the information I gained from looking at the end of my hair and combining it with knowledge of the structure of the cranium, I had gained from my studies of anatomy.

The most important aspect of *Prone female 2* in relation to my research is that she is the first figure in all of my drawings to appear fully anatomised and yet un-dissected. Unlike the anatomized figures of *Circular Theatre, Table with five figures, Interior Cabinet* and *Unravelled body*, she is not cut and revealed in an impossible state which is between life and death. Throughout my research I have insisted that the figures of my drawings are not dead, in spite of their bearing conditions of mortal disrepair. However, *Prone female 2* actually achieves the position of being alive and anatomised while being completely whole.

As I completed *Prone female 2* in February 1998, I began to make *Prone female 3* on the same wall (fig 79 - 82). As one drawing was finished and the other began, they were rotated side by side. I had already recognised the important similarity between rotating the drawing and walking around a dissecting table and I knew the importance of the figure's isolation. Removing them from a described environment had taken the focus of each drawing into the interior of the body. However, it was not until I worked on the two drawings side by side that I saw the possibility of a relationship being built between two separate drawings. The head of *Prone female 2* is to the left of the drawing and the head of *Prone female 3* is to the right. Placed head to head a strong line of movement is drawn directly through both of their bodies. The movement of *Prone female 2's* kicking feet directs a median line though her pelvis, spine and head, across to the head of *Prone female 3*, through her thorax, pelvis and between the bones of her legs to her heels. This line is caught and stopped

by her toes, which move to touch each other at the first joint. When placed head to head, *Prone female 2* and *3* appear to become one and they revolve around the axis of their heads.

Prone female 3 faces towards us and the simple intimacy of her gesture suggests that she may be observing a reflection of herself (79). The focus of the drawing is upon her ribcage, pelvis and knees. She is the most skeletal of the three figures and the dynamism of her bone structure carries her personality as much as her weight. Her skeleton is very much alive to the extent that the bones of her extremities take on a bowlike tension. This tension has been created by the particular way in which I have used line to describe them. For instance, long clear lines move around the outer edge of each bone describing the passage of its invisible musculature (70). In addition, the curved lengths of bone in her limbs give a feeling of stretched pliancy and her body solidifies and gains interior detail and weight around her ankles, knees, pelvis and liver. These points have been chosen for their solidity and strength and because together they create an undulating movement throughout the length of her body. This movement rises from her ankles to her knees, then falls to her pelvis, before rising to her thorax and falling to her head. This movement is emphasised when the drawing is placed head to head with *Prone female 2*. It replies to the movement I described as passing from the kicking feet of *Prone female 2*, through the centre of each body to the closed feet of *Prone female 3*.

Some details of *Prone female 3* such as her arms are not fully described, but rather faded into the paper. This is to ensure that her body and lower limbs hold the focus of the drawing in a slender line. She is also without a described head, and this is because the features of her personality are carried by her torso and legs. Of all the *Prone female* figures she is the closest to a modern X-ray photograph in that her bones are clearly defined and appear solid, while her intestine is described as a soft transparent shadow. The stance she has adopted is for her own speculation and she appears to be looking through her own body. Therefore, of all my drawings, *Prone female 3* is the furthest from the female waxes made by Susini at La Specola and the coyness expressed by the traditional pudica figure seen in so many anatomical atlases. One example would be the work of Berrettini.

Prone females 1, 2 and *3* represent drawings of the interior of the human body which could not be produced actual dissection. This is because the process of dissecting a cadaver is reductive. Cut structures cannot be replaced and they are governed by gravity. A cadaver preserved in formalin, as all British medical school cadavers are, will collapse as it is dissected. This must be taken into account when incisions are being made. Also, from the moment of death, gravity pulls the body down into a flattened form, distorting it even before dissection begins. A drawn image is never subject to this kind of gravity and lines used to dissect an envisaged body may

therefore create almost any view. *Prone females 1, 2* and *3* are also drawn with greater clarity than could be achieved in actual dissection. In the reductive process of dissecting a wet specimen, it is never possible entirely to separate structures from a residue of fat and fascia.

Above all, the three drawings present original simultaneous views of the interior and exterior of the anatomized human body which have never been described in the history of anatomical art. This is because I have treated the body as a whole, rather than as a subject divided into isolated systems. All of the artists and anatomists I have studied in support of this research, have represented and displayed the body as a subject divided into isolated systems and functions, because their work was (is) made for medical or philosophical teaching. Even Fine-Art-Anatomical studies, such as those of Michelangelo (Ecorche of a Male Leg) or Theodore Gericault (studies for The Raft of the Medusa) isolate aspects of the body in terms of muscles and bones and therefore it appears that no known fine artist has undertaken the firsthand study and practice of human dissection, in such a way as to produce life-size and life-like drawings of an anatomised body which is living and functioning as a whole.

CONCLUSION

This practice-based research has sought to answer three questions.

1. What does it mean to bring the study of dissection into the practice of drawing?
2. What can be achieved by bringing the study of dissection into the practice of drawing?
3. How can line be used to describe simultaneous views of the interior and exterior of the human body?

The evolution of this project shows the development and continual increase of skill and interpretation of three areas of knowledge: The Western history of dissection and anatomical representation, and my developing practices of drawing and dissection. My starting point was my undergraduate study of anatomy, which introduced me to dissection at the Department of Human Anatomy, University of Oxford. My first challenge was to develop a parallel between my drawing practice, the elegant schematised historical drawings of human anatomy, and the reality of the dissecting room. The essential difficulty was in reading dissected flesh, because it was unfamiliar, collapsed and distorted and very different from its historical visual representations. Through drawing dissected flesh I learned to make sense of anatomical atlases and to see the subtleties which distinguish interior parts of the human body.

I began this research project at Cheltenham and Gloucester College of Higher Education in 1994, examining the Western history of human dissection and anatomical art practice. I quickly found the subject of anatomy to be broader and more complex than I had anticipated, not only in terms of its wealth of historic imagery, but also in terms of the medical profession's extraordinary determination to exemplify and display anatomical knowledge. Images of anatomical theatres such as those of the Universities of Leiden and Padua, together with my visits to the Old Operating Theatre of St. Thomas's, showed me the importance of the anatomical environment and the possible relationships which may be formed between anatomical subjects and their viewer. I examined the anatomical wax models by Joseph Towne at the Gordon Museum and these showed me I could not research relationships between drawing and dissection without also comparing the natures of real and artificial flesh. Subsequently, Towne's work led me to find La Specola.

At an early stage I recognised the categories into which anatomical representation can be divided, in terms of both Medicine and Fine Art practice. The human body is seen as either dead and decomposing or alive and engaged, whereas in anatomical terms, it can be either flayed (ecorche), deeply dissected into solid layers, set in exploded view, peeled into thin flaps, sliced thinly or animated in isolated systems et cetera. To begin my research practice I set up a parallel relationship between my studio drawing and my anatomical study through arranging to continue my studies of dissection at Oxford. At this point I observed piles of specimens leant draped or pressed across each other in such a way as to suggest intimacy. I related this to the tradition of depicting the dissected corpse as neither alive nor dead and brought this into my drawing practice.

My first studio drawing (*Circular Theatre*) was concerned with the notion of an anatomical theatre in relation to human dissection. The central figure anticipated my study of the female models at La Specola and the whole composition was directly informed by my drawings of prosections, collected anatomical drawings and photographs of La Specola, the theatres of Leiden and Padua, and my visits to the Hunterian, Gordon Museum and the Old Operating Theatre of St. Thomas's. The tension of line developed in my parallel studies of dissection was also translated directly into the tension of space seen in *Circular Theatre*, i.e. the precipice.

I anticipated visiting the models of La Specola and examining their clear structure which artificially demonstrated the exposure of an interior-exterior relationship that was of growing importance to my research. In my anatomical practice I began to reconstruct dissected human cadavers. The physical contact and process of unravelling and rearranging parts led me to take a closer and more intense view of the figures in my drawings and this is seen in *Table with five figures.*

The oxymoronic notion of a preserved (or artificial) anatomical specimen seeming to partake of life became greatly emphasised at La Specola, making the collection difficult for me to interpret. This was compounded by its presentation behind highly reflective glass. I resolved these problems by turning off the museum lights and examining the collection in a different way: I made a written response to the atmosphere and details of the museum. This took the place of the portfolio of drawings that I anticipated returning with and it became the key to my third studio drawing *Interior Cabinet.*

La Specola challenged my motivations and purpose in studying dissection and it momentarily defeated my methods of translating visual information through drawing. This was the first point in the project where I could not resolve what I wanted to do through drawing and I was forced to find another solution in the form of a written response. On my return from Florence, my studio drawings would not hold the qualities that I sought and the confrontation of La Specola caused me to return to study dissection. I needed to begin a more systematic approach to my anatomical studies and spend an intensive period of time gaining a more thorough knowledge of anatomy. I achieved this through drawing prosections and also investigating them with a scalpel. I received tutorials in anatomy from Mr. Bridgeman and we discussed shelves of specimens so as to identify their parts. I also learned first hand about the actual processes of preparation and dissection.

At the same time, in my studio in Cheltenham, I made *Interior Cabinet*, using my written notes from La Specola, in particular my response to issues of reflection and interior-exterior exchanges between figures and their environment. *Interior Cabinet* shows the coming together of my drawing skills, anatomical knowledge and studies of historical theatres, museums, drawings and wax displays. However, this drawing brought me to a crossroads in my research. I realised that the complexity of multiple viewpoints, and references to anatomical display, were extraneous to answering my research questions, and for the purposes of my research, I needed to change the direction of my drawing practice. I saw the need to close focus upon a single human body and further intensify my studies of dissection.

While examining the collection of resin preparations at the Hunterian Museum I learned about the work of Honoré Fragonard at Musee d 'Alfort. Resin specimens physically map the interior of the body and give simultaneous views of its interior and exterior. Subsequently, *Unravelled body* was influenced by a description of Fragonard's work. It shows an inventory of the elements and textures of the interior of the body that I had learned through my studies of dissection. The drawing tested my knowledge of anatomy; with in it, the body became its own landscape and the image brought me to the turning point of my research.

In March 1997, I made *Three figures,* and through this drawing I found a new way forward. This was because I recognised the crucial importance of isolating the body as a whole living and undissected subject. At this point I decided to review my knowledge of historical anatomical representation. I looked at what had been achieved in terms of using line to describe relationships between the interior and exterior of a life-like body and this led me to focus upon the qualities of partial transparency, found in Leonardo's *Composite study of the respiratory and*

urino-genital systems of a female body (fig 9). This drawing of an incomplete figure is the nearest example of an artist dealing with transparency in relation to the drawn dissected form. I decided to take Leonardo's study a stage further by drawing a full-size and complete female body, rendered transparent through line drawing.

In April 1997, I began to learn dissection with Dr. Landon. This enabled me to concentrate upon the importance of fascia in the body and I found its role to be more extensive than suggested by dissecting manuals. I realised that fascia could be envisioned as a perfect transparent integument which, isolated, could provide a map or drawing of every solid detail within the body's cavity. Passages through this could be mentally selected and imaged, to be re-invented in drawing.

As I began to learn dissection, I sought ways of comparing the scalpel and pencil as tools for dissecting and describing the body. I made *Prone female 1* as a study, placing the figure in the anatomical position and drawing passages from the front to the centre of the body. I sought a direct comparison between the practices of drawing and dissection and the rotation of the drawing as it was made, related strongly to the process of moving around a dissecting table. The drawing ceased to be a study as the figure assumed her own identity and she began to offer an antithesis to the female wax models by Clemente Susini. The vitality and life-like consciousness of *Prone female 1* showed me that in developing my next drawing I should move away from the notion of subtractive dissection towards an impression of whole transparency and this was achieved in both *Prone female 2* and *3.*

Prone female 2 focuses upon drawing passages from the sacrum to the pubis and from the spine to the sternum. I used deep structures such as kidneys, nerves and intestines to describe superficial forms such as the erector spinae muscles and most importantly, I stopped drawing the body as cut and dissected and moved to the notion of whole living transparency. The figure is therefore the first in my studio drawing to be fully alive rather than in an impossible state which is between death and life yet neither. *Prone female 3* was made in conjunction with *Prone female 2*, beginning in February 1998 and the two drawings showed me the possibility of their being made and installed in pairs so as to build compositional and psychological relationships between them. The focus of *Prone female 3* is upon her ribcage, pelvis and knees. She is the most skeletal of the three figures and the tension in her body is created by the way in which I have used line to describe her bones. Her simple and intimate gesture suggests she may be observing a reflection of herself. As the last drawn figure of my research, she is also the furthest from the Susini female waxes (which were the subjects of my first drawings) and the coy expression of the traditional pudica female figure.

Prone female 1, 2 and 3 are in suspension and their suspension contradicts gravity. They enabled me to use my own body in a more direct way than was previously possible and they are successful in terms of the formal relationships within themselves and between each other. They are contained by their frames. The 'floated mount' supporting each drawing, suspends them between the perspex and the back board. The frame therefore becomes a shallow cabinet similar to an opened sarcophagus. The figures are entirely original, enabling me to reach beyond the anticipated level of my research. The simultaneous interior-exterior views which they reveal could not be produced in actual dissection because of the subtractive nature of the process and the force of gravity upon the dead body. They also show completely original passages through the body which have not been described using drawing by any other artist in the history of anatomical representation. This is because they reveal the body as a whole rather than as a subject divided into isolated systems. Each figure is opaque and life-like, while at the same time rendered transparent. They show the culmination of my experiences with anatomy and dissection and they could not have been drawn without them.

Through the development of this research I have gained knowledge of gross anatomy and I have moved from being an observer to a practitioner of dissection. I have learned dissection not just as practical skill and key to visualising and drawing the interior of the body, but also to understand the works of other artist-anatomists. I have learned to envisage, open out, draw and make clear the internal structures of the body. Through this I have evolved my drawing skills and use of line. The evolution of my drawing has been consistently informed by my study of anatomy, and my practice of dissection was crucial to meeting the objective of my research; the simultaneous representation through drawing of the interior and exterior of the human body.

My researches during this Ph.D. have made the foundation for the continuation of my artistic practice. They have also demonstrated the process of exchange of knowledge between the factual and the envisaged, making this most important of creative activities a clear academic procedure. The development of perceptual and conceptual skills have come together to open a greater debate that I hope will be valuable to both anatomists and to artists .

End notes for section 1

1. It is thought that complex surgery was successfully carried out in China as early as 2500 B.C. (Bishop, 1960, p 46)

2. Throughout ancient history there were important exchanges of knowledge between Greece and the Near East. 'Ancient Egyptian medical books attribute prescriptions to Cretian physicians. Greeks in turn borrowed from their neighbours and built upon the knowledge of the near East.' (Bishop, 1960,p 46)

3. 'His accounts of actual cases are model clinical records and many of his descriptions of diseases could take their place in a modern text book.' (Bishop, 1960, p 48)

4. At this time 'The practice of medicine was beneath the dignity of a Roman Citizen...most medical and surgical practice of Rome was in the hands of the Greeks. Many practitioners were slaves in Roman families.' (Bishop, 1960, p 51)

5. Galen's work was accepted uncritically and as dogma until the Renaissance.

6. From conversations with Dr Willem Hackman, Deputy Curator of the History of Science Museum at the University of Oxford.

7. It is interesting to note that there were several female doctors at Salerno. (Bishop, 1960, p 61)

8. From conversations with Professor Martin Kemp, University of Oxford.

9. Bodies could not be used if they came from within thirty miles of the dissection site. (Sawday, 1996, p 59)

10. The theatre is now open to the public as a museum. I have frequently visited it when drawing at Guys Hospital.

11. The union was designed to ensure that barbers no longer practiced surgery other than tooth extraction, and by creating a monopoly on all surgeons and barbers practice, it became possible to fine unlicensed practitioners. The united guild also acted as a court to end disputes. Records of these settlements provide important and often humorous insight into contemporary life in London. *9. August 1647. 'Mr. Heydon complains to this court of his apprentice here present in the court for his evil and stubborn behaviour towards him and frequent absence in daytime and in late hours. The said apprentice being in court to answer to the same did rudely and most irreverently behave himself towards his said master and the whole court in saucy language and behaviour using several oaths protesting that he will not serve his master whatsoever shall come of it. The court did therefore cause the hair of the said apprentice (being undecently long) to be cut shorter'.* (Bishop, 1960, p 89) In 1745 the company of Barber-Surgeons was dissolved. The company of Surgeons continued supervision of surgical practice until 1800, when King George III formed the Royal College of Surgeons of London. In 1843, Queen Victoria granted a new

charter for the Royal College of Surgeons of England which remains situated in Lincolns Inn Field in London.

12. There are extensive records of riots and violent fights taking place at gallows, between anatomists and relatives of the dead. It was a dangerous means of obtaining anatomical subjects.

13. The chief anomaly of exhumation, was that it was not technically theft; a human corpse was not property, and yet 'to steal a sheep, pig, ox or foul was a capital felony, punishable by hanging.' William Cobbett, 1822.
(Richardson, 1989, p 58)

14. Examination of a resurrectionist by the select committee on Anatomy 1828:
'I like to get those of poor people buried from the work houses, because, instead of working for one subject, you may get three or four; I do not think during the time I have been in the habit of working for the schools, I got half a dozen of wealthier people.' (Richardson, 1989, p 60)

15. Modern teaching methods (first introduced in France) involve each student being allocated one body to dissect for themselves, rather than watching a demonstration.

16. St. Thomas's hospital manuscripts, 55, p 182, Royal College of Surgeons.

17. From conversations with Miss Allen, Quist Curator of the Hunterian Museum.

18. If a person dies under the age of 65, an autopsy is usually carried out to confirm the cause of death.

19. See 'Donor's attitudes towards body donation for dissection' Dr Ruth Richardson, Brian Hurwitz, The Lancet, Vol. 346. July 29, 1995.

20. Up until 1982 the hospital would arrange and pay for either a burial or cremation to take place after 'examination'. Now only cremation is offered.

End notes for section 2

21. In his introductory plan he writes 'Then I will discourse of the hands of each animal to show in what way they vary; as the bear, which has the ligatures of the toes joined above the instep'. (Popham, 1947, p 85)

22. Leonardo wrote: 'This work should commence with the conception of man, and should describe the nature of the womb, and how the child inhabits it, and in what stage it dwells there, and the manner of its quickening and feeding, and its growth, and what interval there is between one stage of growth and another, and what thing drives it forth from the body of the mother, and for what reason it sometimes emerges from the belly of its mother before the due time. Then you should describe which are the limbs which grow more than the others after the child is born; and give the measurements of a child of one year. Then describe the man fully grown and the woman and give their measurements, and

the nature of their complexions, colour and physiognomy. Afterwards describe how he is composed of veins, nerves, muscles and bones. This you should do at the end of the book. Then represent in four histories, four universal conditions of mankind namely, joy, with various modes of laughing, and represent the cause of laughter; weeping, the various ways with their cause; strife, with various movements expressive of slaughterings, flights, fear, acts of ferocity, daring, homicide, and all the things which connect with cases such as these. Then make a figure to represent labour, in the art of dragging, pushing, carrying, restraining, supporting and conditions such as these. Then describe the attitude and movement. Then perspective through the office of the sight or the hearing. You should make mention of music and describe the other senses. Afterwards describe the nature of the five senses.'
(Roberts and Tomlinson, 1992, p 105)

23. Leonardo writes: 'I am fully aware that the fact of my not being a man of letters may cause certain arrogant persons to think that they may with reason censure me, alleging that I am a man ignorant of book learning. Foolish folk! [...] Do they not know that my subjects require for their exposition experience rather than words of others?[...] And if they despise me who am an inventor (innovator) how much more blame should be given to themselves, who are not inventors but trumpeters and reciters of the words of others?' (Roberts and Tomlinson, 1992, p 104.)

24. Leonardo writes: 'This plan of mine of the uman body will be unfolded to you just as though you had the natural man before you. The reason is that if you wish to know thoroughly the parts of a man after he has been dissected you must either turn him or your eye so that you are examining from different aspects, from below, from above and from the sides, turning him over and studying the origin of each limb; and in such a way the natural anatomy has satisfied your desire for knowledge. But you must understand that such knowledge as this will not continue to satisfy you, on account of the very great confusion which must arise from the mixture of membranes with veins, arteries, muscles, tendons, bones, and the blood, which of itself tinges every part with the same colour, the veins through which this blood is discharged not being perceptible by reason of their minuteness. The completeness of the membranes is broken in the process of investigation of the parts which they enclose, and the fact that their transparent substance is stained with blood prevents the proper identification of the parts which these cover [...] Therefore it becomes necessary to have several dissections [... thus] by my plan you will become aquainted with every part and every whole by means of a demonstration of each part [...] And would that it might please our Creator that I were able to reveal the nature of man and his customs even as I describe his figure.'
(Roberts and Tomlinson, 1992, p 104)

25. Leonardo writes: 'Make two air holes in the horns of the great ventricles and insert melted wax by means of a syringe, making a hole in the ventricle of the memoria, and through this hole fill the three ventricles of the brain and you will see the shape of the three ventricles exactly. But first insert thin tubes in the air holes in order that the air which is in these may escape and so make room for the wax.' (Roberts and Tomlinson, p 107)

26. Transparent anatomies may be found in the history of comparative anatomy. The finest examples are pen and ink studies of a chick in embryo, made by William Bell in 1782 for John Hunter. In the collection of The Royal College of Surgeons of England.

27. For further information concerning the earlier history of this model see *The Medical Museum of Guy's Hospital'*, p 4. This is a booklet published by the United Medical and Dental schools, available at the Gordon museum.

28. 'I have examined the model of a skeleton made by Mr. Joseph Towne of which I most heartily approve" February 20th, 1826. He later noted "I have examined with great attention the models of the brain which have been executed by Mr. Towne and I feel that I have not the words to express my high sense of their merit." February 24th, 1827. From '*Joseph Towne, Wax modeller*', a short essay by Frederick Griffith, M.D., available on request from Mr. J.J. Daws, Gordon Museum. (No references to original sources are given.)

29. From a discussion with Mr. J. J. Daws, Curator of the Towne Waxes at the Gordon Museum, Guys hospital.

End notes for section 3

30. John Hunter FRS (1728-1793) is considered to be the founder of scientific surgery. His private collection was purchased by the Government for the nation in 1799. It was accepted by the Royal College of Surgeons in 1800 and opened as a museum in 1813. It was continually added to, so that later in the nineteenth century, the museum had to be demolished and rebuilt to accommodate its own expansion. By 1940 it held over 65,000 specimens distributed throughout several halls. Photographs of these can be seen in the Hunterian today. The collection also embraced artifacts which had belonged to other key figures in British surgical history, particularly Sir Astley Cooper, William Cheselden, Robert Liston, Lord Joseph Lister and Sir James Paget. In 1941 the College was hit directly by a bomb, and most of the collection was destroyed. Hunter had insisted upon only preserving his specimens in the very best solution, which is alcohol. Consequently, the fluid content of so many thousands of the jars caused such an explosion that German intelligence marked the site as a munitions factory. The present museum was rebuilt using surviving parts, including the iron rails which now skirt the balcony. About 3,500 specimens survived from Hunter's original collection and these were again added to, up until about 1950. Then it was decided that large scale collecting was no longer appropriate for the College and better left to institutions such as the British Museum. The collection is now divided between four museums on different floors of the building with all of the oldest specimens gathered in what is now called the Hunterian. Much of this information was kindly provided by Miss Allen, Quist Curator.

31. In the Hunterian it is possible to find beside modern prosections and photomicrographs, dried preparations similar to the work of Honore Fragonard, 19th century disassembled skulls arranged in exploded view, mercury preparations made by Sir Astley Cooper, resin corrosion cast of infant human arteries or tracheo-bronchial trees, particularly some horses lungs which are lit and gleam gold from the balcony. These were prepared by Dr D. H. Tompsett 1909-1991. Also to be seen are the skeleton of Charles Byrne the Irish Giant and of Caroline Crachami, the Sicilian dwarf, together with articles of their personal clothing such as folded silk socks. There are also jars full of humming birds, a cabinet full of eyes, a baby elephant, manuscripts, drawings, and cyclops horse.

32. Although when the models arrived, the political climate was such, that they were never unpacked and they were later sent south to the University of Montpellier.

33. From a conversation with Dr. Willem Hackman.

34. The museum fills a large single hall which is partitioned by cabinets. Each of these rise to perhaps twelve or fifteen feet and they are widely shelved with pathological specimens. The school is dedicated to equine surgery and the eccentric height of the display, seems to suggest that visitors would be better off on horse back. A person on foot may feel unusually diminished and too low down to take a proper view.

35. It is interesting to observe the enormous differences which appear between actual anatomical models and their photographs in catalogues. La Specola is shown to be more brightly coloured and Fragonards work has been photographed in highly theatrical blue and red light.

36. Some British medical departments, such as Guys hospital and the University of Oxford are beginning to plastinate small specimens and build permanent teaching collections of them. They are very time consuming to produce, but they are permanent and highly durable. In the next few years, plastinates will possibly replace wet specimens and also the necessity of pre-clinical dissecting practice. Anatomy will also be increasingly taught using CD ROM.

37. Dye seems to be used in the plastinating process. This converts the green-grey colours of the corpse into deep purples, browns and an array of pinks. Bones, tendons and nerves remain white but where they are tinged by dye, they become bright pink.

End notes for section 4

38. The dissecting room is a large open space used for teaching gross anatomy to preclinical students. It contains five rows of six parallel steel tables and on each table there is one preserved cadaver wrapped in wet muslin and a blue plastic sheet. There are fifteen or more articulated skeletons suspended on looped iron frames, which are placed around the room. The oldest skeletons are real and mostly come from India. The more modern ones are made of molded plastic and are usually from Germany. Around the edge of the room are vats full of prosections in water and shelves full of specimens in jars. The whole room is kept at the lowest possible temperature (about ten degrees centigrade. This helps to reduce the level of fumes.

39. The Ruskin Cadaver was prepared more than ten years ago by an unidentified researcher from the Ashmolean Museum, who was studying depictions of rectus abdomenis muscles on Greek Vases. They wished to establish why some figures show the muscle with eight sections whilst others have only six. They made a superficial dissection of a particularly muscular white male body, as part of their research. The body is complete except for the right forearm and left lower leg which have been removed. Unlike cadavers prepared by medical students, the torso is not open and deep muscles have not been revealed.

40. My research studies have not extended to comparative anatomy, though from September to October 1994, there was a cull on the number of pigeons and doves occupying Christ Church buildings. As the birds were being shot, and thrown away, I asked to be given a number of the doves. I brought these back to Cheltenham, to dissect carefully and make drawings of their anatomy. Some of these drawings form an appendix at the back of my portfolio, and there are also some sketches in my drawing books. To some extent this experience was a foundation for my later dissecting practice. Unfortunately, my uninformed decision to boil the birds (out of fear of maggots), led me to melt the fat and destroy the elasticity of the muscles, leaving nothing more to observe, than their structure and attachment to the bones. I had little experience, with which to distinguish between muscle fibres fascia or tendons, veins, arteries or nerves, and I had to develop these observational skills. To a novice, deeply dissected human cadavers can appear to be a very collapsed mass of much the same.

41. Although the issue of showing something as alive, when the source material is dead, has been addressed by most anatomical artists throughout history.

42. These had been dissected by first year medical students who do not usually have any previous experience of dissecting, beyond A level Biology. They have little time to dissect, and are not expected to complete each area in terms of fully revealing parts or removing waste. It is standard that when they have finished, the body is left in a very mixed up pile.

43. To an untrained eye these often appear exactly the same. They can be distinguished by squeezing them. A nerve is like the root of a shrub, and an artery feels like cooked macaroni, since it is hollow and a little elastic.

44. High quality dissections sealed into glass jars and kept indefinitely. These may be quite old. Some collections, such as the Hunterian, retain specimens from the eighteenth century.

45. Later in the project I experienced difficulties looking through glass at La Specola, which I overcame by altering the lighting of the museum, but as the containment of body parts in glass could not be avoided in this study, I later brought the issue into my work and this is especially seen in *Interior Cabinet.*

46. The two parietal bones (from paries - Latin for the walls of a house) are the two large plates of bone forming the top and upper sides of the skull. The occipital bone is the thick rough plate forming the back and under side of the skull onto which most of the posterior neck muscles attach. The foramen magnum is the hole through the occipital bone at the base of the skull through which the spinal cord passes. The foramen magnum sits on top of the first cervical vertebrae, known as Atlas. The trachea is the wind pipe and the oesophagus leads to the stomach.

47. This is to protect hands from the scalpel, not to avoid contact with the cadaver. The chemical process of embalming ensures that all the flesh is inert and incapable of transmitting infection.

48. Most dissecting rooms are built above ground level for added security and preparation rooms are usually in basements with doors leading out to an ambulance bay. Pre clinical students usually dissect in groups of six and are supervised by a team of prosectors, at a ratio of about one to thirty. Prosectors are normally graduate students preparing for surgery examinations and they perform weekly duties in the DR. These include teaching gross anatomy to undergraduates and making a minimum of six prosections per year.

49. These tables (which are really cabinets) are brilliantly polished steel and trapezium shaped with hinged sides. They are stacked in pairs, one over the other with a set of levers at one end to revolve them. The top cabinet contains a whole cadaver for medical students and the bottom cabinet contains heads and thorax for dentists. The tables are "rolled" for different teaching sessions.

50. The prosections at Guys are of notably superior quality to those I have seen in any other department. I do not know why this is, but it may be that, as it is a hospital department, a larger number of graduate members is training for surgery. Gross anatomy may be being studied to a higher level by a larger number of people, than would be normal in a university department which gives emphasis to laboratory based research, using vivisection rather than dissection.

51 . These are made using techniques developed by anatomists such as Freidrich Ruych and Paolo Mascagni. Most are made out of a single coloured resin and then painted according to a code which shows the different sections of the lung. More prized models are made by injecting different colours into the appropriate area of lung.

52. Aside from learning more easily and quickly if I explained things to myself aloud, I also gained valuable practice for working with students. Memorising information by repeatedly speaking it, has its roots in ancient mnemonic practice, but this may not have been appreciated by the technicians watching television monitors outside the room. - I didn't see the overhead security cameras for about two weeks.

53. The use of a different mix of chemicals is supposed to keep the body malleable as it is in life and permit tendons to be taken hold of and pulled to flex limbs.

54. In April 1997, an artist named Anthony-Noel Kelly, stole body parts from the Royal College of Surgeons. In April 1998, he was convicted and sentenced to nine months in prison. Since he would not name his source, the Government Anatomy Inspector suspended all departments from receiving donations. There was a full inquiry and this created a shortage of bodies for students to dissect during the summer term. As a result our cadaver was allocated for priority study.

55. When a body part is first taken out of storage, it gives off noxious chemical fumes, these subside after a few minutes.

56. For example Ron Meurck 's wax figure entitled 'Dead Dad' shown in the 'Sensations' exhibition at the Royal Academy in 1997. The artist has stated that this portrait was made from observing his dead father laid out. If this is true, it is surprising how many living attributes 'Dead Dad' managed to retain: his palms face forward and his abdomen is fully inflated.

57. Two pairs prevent the chemicals from staining the hands yellow and also keep them from smelling too bad for too many hours afterwards. However, two pairs also impede your circulation and hurt after a while, so often one is better.

58. If it dries out, it shrinks, distorts, and surface flesh becomes dark brown.

59. These are particularly abundant at the back of the knee and in all other tendonous areas of the body, which are mostly joints.

60. In *The birth of the clinic*, p 129, Foucault discusses Bichat's *Traite des membranes.* He writes that Bichat 'imposes a diagonal reading of the body carried out according to expanses of anatomical resemblance's that traverse the organs, envelop them, divide them, compose and decompose them, analyze them, and at the same time, bind them together...the uncovering of an elementary that is also a universal, and a methodical reading that, scanning the forms of disintegration, describes the laws of composition.' It seems that he is describing the nature of tissue fibres and in particular fascia. This description could also be applied to a drawing, if line were seen as a membrane.

61. As Dr. Landon and I dissected the femoral muscles of the leg, we found the long slender strap of sartorius to be further toward the inner thigh than expected. It is usually described as arising from the anterior superior iliac spine, passing obliquely across the front of the upper part of the thigh (between the quadriceps and adductor muscles), passing behind the prominent part of the internal condyle of the femur and inserting onto the head of the tibia

through a broad, flattened (fish tail) tendon. We found no mention in Cunningham's manual of the additional attachment of sartorius to rectus femoris, throughout the first third of its length. This additional strong attachment, which we could see so clearly in the body, was made of dense fascia. The discovery of this attachment changed my previous understanding of how the muscle works effectively and shapes the inner thigh.

62. This process was very absorbing and took many hours and I was reminded of the significance which is given to the hand in the history of Western dissection, in terms of representing Gods likeness. It was suggested to me by Dr. Willem Hackman, that if man is made in the likeness of God, to dissect the hand, is to reveal the hand of our maker. This notion is exemplified by Rembrandt in his painting of the anatomy of Dr Tulp, where Tulp and other black suited surgeons, stand around the pale corpse of a hanged man and direct the attention of our gaze to the blood red tendons of his opened hand. In developing my drawings, I find that hands together with the face are the most difficult part of the body to draw. Not only because of their physical complexity, but also because of the importance of their expression which can change with only the slightest movement.

63. Throughout February and March 1998 I was employed to take first year Fine Art students from the Ruskin School of Drawing to the Department of Human Anatomy for their lectures and observational drawing classes. The dissecting room was closed for renovation and so after each lecture the group was divided between three teaching rooms, each equipped with either a series of fully dissected cadavers, the Ruskin cadaver, or skeletons and a CD ROM. I moved between each room repeatedly talking through the anatomy of the specimens with small groups of fine art students. This was particularly helpful to my research because at this time I was beginning to make *Prone female 2.* The students stood around the table as I dismantled each cadaver, first explaining the line of incisions in the skin, its depth and texture and then the nature of fascia. I then discussed and compared the appearance and function of superficial muscles along the torso, neck and limbs, before removing the front of the rib cage and holding it to the light to show the translucent network of intercostal muscles. Together, we identified the viscera, removed the lungs to feel their lightness, lifted out the heart showing the extent of its massive presence between the lungs, opened its chambers and followed its connection to arteries and veins running down the interior border of the spine, we observed the strong muscular sheet of the diaphragm stretched over the hard dome of the liver. We then took out the skirt like folds of the intestine which cascade from a ring of lace blood vessels. This revealed the kidneys and deep bowl of the pelvis, together with the thick columns of muscle which support the spine and frame the bladder, bowel and in one body, a uterus. These sessions enabled me to revise and carefully examine some of the more complex aspects which I was trying to describe in my drawings, particularly the spine and nervous system seen in *Prone female 2*. I was also able to make notes and borrow bones from the department for use in my studio between the classes.

End notes for section 5

64. Text books show simplified views, level with a given plane in the body (i.e. the median plane.] Looking at a broad spectrum of dissecting manuals, there appear to be stock views of each part, seen from the front side or back. Explanations of how these views relate and what happens in between, are given in the text, but this information is not always accessible to a lay reader. There have been several occasions in the development of my research, when I have needed to gain knowledge of a particular detail, that I could not find illustrated and that I could not glean from the text. I resolved these questions by either returning to examine a cadaver or discussing the point with a medical colleague and continuing my drawing using their description of the part. For example in drawing *Prone Female 2*, I could not find an explanation of how nerves emerge from the back of the sacrum. I was able to draw these details after discussing them with Dr. Matthew Wood. (I now realise the nerves I have drawn are far thicker than in real life.)

End notes for section 6

65. My pencil study of three dissected arms (figs 44, 45) was included in the Geneva Exhibition.

(No end notes for section 7)

End notes for section 8

66. My drawings respond to a number of small details remembered from anthropology and natural history collections such as the Museum of Traditional and Popular Arts in Paris, The Natural History museum at the University of Bergen and The Pitt Rivers Museum at the University of Oxford. The most important detail from the Pitt Rivers which relates to *Interior cabinet* can be found on the ground floor of the museum, in the far left hand corner. There is a cabinet filled with small model boats. These are stacked in layers, one fleet apparently sailing above another. The highest boat in the cabinet, which is by itself, is only a few inches below the dusty glass lid of the case. It is an open canoe, filled with simple cloth dolls with rigid bodies. These dolls have all fallen slightly out of place and several of them lean backwards. They appear with frozen outstretched arms, to be shouting in horror at the ghost of a boat sailing upside down above them. This is also filled with little dolls exclaiming horror in return. This small piece of magic is a very simple reflection caused by dust settled on top of the cabinet and it was pointed out to me by the artist and curator Chris Dorsett.

End notes for section 9

67. This is anatomically incorrect. Throughout my studies I have endeavored to draw accurate anatomical details. This is therefore an example of how my subsequent studies of dissection revealed a misunderstanding in my previous drawing.

68. The action of flesh supporting bone is not possible in life, and until the recent development of Plastination by Professor Gunther von Hagens, it has never been used as a pictorial device in anatomical representation. 'Exploded views' were first recommended by Leonardo for describing the relative positions of bones and exploded skulls based upon his idea can be found in both the Hunterian Museum and many dissecting rooms. 'Flap' anatomies have been made since the medieval period. These are images where parts of the body such as the face or individual muscles are folded to the side of the main body. For example d'Agoty's image shown in fig 16 stems from this tradition. However, anatomized flesh is rarely, if ever, presented as stretched over or between a framework of exploded bones. (Fragonard's models are fully articulated) *Unravelled body* was completed one year before I visited the Korperwelten exhibition in Mannheim where I saw the first anatomical preparations to ever achieve the 'impossibility' of real flesh supporting real bone.

End notes for section 10

69. The medieval anatomized body was shown in a scheme of five or six figures: bone man, muscle man, nerve man, vein man, artery man and pregnant woman. These were simple outline drawings of squatting figures each of which contained a diagram of a particular system in the body. This graphic tradition relied upon copying previous texts rather than observing the real body. Leonardo's female figure (fig 9) is drawn in outline, with her visceral systems placed inside and these were not drawn from observation. The outline of the torso presents a convincingly solid form and it is possible to imagine light striking the surface of her skin. The sexuality of the woman is ambiguous. Her hips, thighs and genitals may be female, but her shoulders, breasts and particularly her nipples are unquestionably male. Within the thorax it is possible to see an overlay of up to three transparent layers. For example the solid form of the right breast is filled with blood vessels which overlap the superior border of the liver and the spaces either side of the liver and stomach suggest their containment by ribs. However, surrounding the uterus, Leonardo carries major blood vessels straight through the space which would be occupied by the pelvis, as if he is taking no account of it being there. This is particularly clear on the left of the drawing (her right hip). The lower right 'horn' of the uterus travels in a straight line and it appears to even pierce her thigh. At this point in the drawing, the solid form of the thigh appears to dissolve into a more diagrammatic outline and the wholeness of the body becomes less important than the study of its visceral parts.

70. The surfaces of the long bones in the body are shaped by muscles moving over them. Bone continues to be redefined by muscle throughout our life. This enables our frame to adjust and compensate for deformity caused by accident, disease or old age.

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LIST OF TERMS AND ABBREVIATIONS.

Acromion	The outer extremity of the shoulder blade.
Adductor	A muscle which draws any limb or part of the body towards the trunk or main axis, or which folds extended parts of the body.
Anatomical position:	The position in which the medical body is measured and described.
Anatomical subject	Usually a cadaver or part of a cadaver.
Aponeurosis	A white, shining, fibrous membrane, serving as the sheath of a muscle, or forming the connection of a muscle to a tendon.
Artery	A vessel which conveys blood from the heart.
Cadaver	A dead body.
Capillaries	The minute blood vessels in which the arterial circulation ends and the venous begins.
C.G.C.H.E:	Cheltenham and Gloucester College of Higher Education.
Clavicle :	The collar bone which extends from the breast bone to the shoulder blade.
Comparative anatomy :	The study and comparison of human and animal species.
Coracoid	Beaked like a crow. Applied to the process of bone, extending in man from the scapula toward the sternum.
Deep :	Extending far inward from the outer surface or backward from the front.
Deltoid	The large muscle which forms the prominence of the shoulder.
Depth :	Measurement from the outer part inwards or from front to back.
Display	Exposure to view.
Dissection	The action of separating the body into its elements for the purpose of critical examination.
DR :	Dissection room.
Fascia	An aponeurosis; a thin sheath of fibrous tissue investing a muscle or organ.
Femoral	Of or pertaining to the femur or thigh.
Fixative	That which serves to set or make stable a charcoal drawing. Also applied to chemical solutions used in the preservation of a cadaver for example formalin.
Foramen magnum	An orifice in the occipital bone of the skull, through which the spinal chord passes down from the brain.
Gastrocnemius	The most superficial muscle shaping the calf of the leg.
Gross anatomy	Those elements which are palpable, as opposed microscopic.
Humerus :	The bone of the upper arm, extending from the shoulder to the elbow.
Iliac crest :	The superior border of the ilium (or hip bone) of the pelvis.
Ilio tibial tract	A tendonous strip of fascia which runs from the hip to the knee giving the outside of the thigh its characteristic flattened appearance.
Intercostal :	Between the ribs.
Jar specimen	A dissected part of a body sealed into an elliptical, circular or square container, made of glass or perspex and filled with water or alcohol. Jar specimens are usually retained on open shelves for teaching.
Lamella :	A thin plate, scale, layer or film especially of bone or tissue.
Ligament :	Any short band of tough fibrous tissue which binds two bones of the body together.

Median plane :	The longitudinal anterior-posterior plane of the body.
Mercury preparations :	Usually a jar specimen showing lymph vessels which have been injected with mercury so as to make them visible.
Metacarpal :	Of or belonging to the metacarpus.
Metacarpus	That part of the hand which is situated between the wrist and the fingers.
Myology :	The branch of anatomy which relates to muscles.
Neurology :	The branch of anatomy which relates to nerves.
Obstetric model	A model of conditions or procedures pertaining to midwifery as a branch of medical practice.
Occipital bone	The posterior and posterior-inferior aspect of the skull.
Odontology :	The science which treats of the structure and development of the teeth.
Osteology :	The branch of anatomy which relates to bones.
Parietal bones	A pair of bones right and left, forming part of the sides and top of the skull, between the frontal and occiptial bones.
Pathology :	The science or study of disease.
Perfusion :	The anatomical process of removing blood from a cadaver and replacing it with a chemical solution or fixative.
Perspective:	The art of delineating solid objects on a plane surface so as to give the same impression of relative positions, magnitudes, et cetera as the actual objects do when viewed from a particular point.
Plastinate :	A specimen which has been treated by the process of plastination.
Plastination	Invented and developed by Prof. Dr. Gunther von Hagens. Plastination is a vacuum process which involves replacing the water and lipids in biological tissues with a reactive polymer such as silicone rubber, epoxy or polyester resin.
Preparation :	A whole or part of a dead body which has been prepared for anatomical study.
Preparation room	The room of an anatomy department to which cadavers are delivered from the hospital and in which they are prepared for the dissecting room. Also where cadavers are perfused.
Prosection	A whole or part of a cadaver which has been dissected in preparation for anatomical research or demonstration.
Prosector:	One whose business it is to dissect dead bodies and produce prosections.
Quadriceps	The largest anterior muscle of the thigh, which has four heads.
RCS	The Royal College of Surgeons of England.
Rectus femoris	The most anterior head or part of quadriceps.
Resin corrosion casts	Anatomical preparations usually of fine structures such as blood vessels, tracheo-bronchial trees, urinary tracts and the ventricles of the brain. Acid resistant resin is injected into the chosen structure of the body and when this has become hard, the surrounding flesh is dissolved in acid.
Sartorius	A long narrow muscle which crosses the thigh obliquely in front. So called because it draws the leg up to the cross-legged position in which a tailor sits at work.
Scagliola :	An Italian craft, which uses gypsum and glue to imitate ornamental stone.
Scapula :	The shoulder blade.
Soleus :	A broad, twin headed, muscle of the calf of the leg, situated between gastrocnemius and the bone.

Superficial	Situated just beneath the skin: subcutaneous. As superficial musculature; that which shapes the exterior of the body.
Tableau :	A picture composed of graphic elements.
Tendons	A band or chord of dense fibrous tissue forming the termination of a muscle, by which it is attached to bone or another part.
Thorax	That part of the body which is between the neck and the abdomen.
UCL	University College London.
Vascular	Having the form of tubular vessels, consisting of continuous tubes of simple membrane. The vascular system of a mammal comprises the heart, arteries, veins and capillaries; the lymphatic glands and vessels, together with certain ductless glands and the blood with its tributary fluids.
Veins	Vessels which carry blood back to the heart.
Wet specimens	Prosections which are normally stored in large numbers, together in deep tanks of water rather than individual jars.

All anatomical definitions have been taken from the Shorter Oxford English Dictionary, third edition, 1950.

DRAWING AS A METHOD OF ANALYSIS AND TRANSFORMATION IN RELATION TO THE HUMAN FORM

How the study of human dissection and the practice of drawing
can be brought together to describe simultaneous views
of the interior and exterior of the body

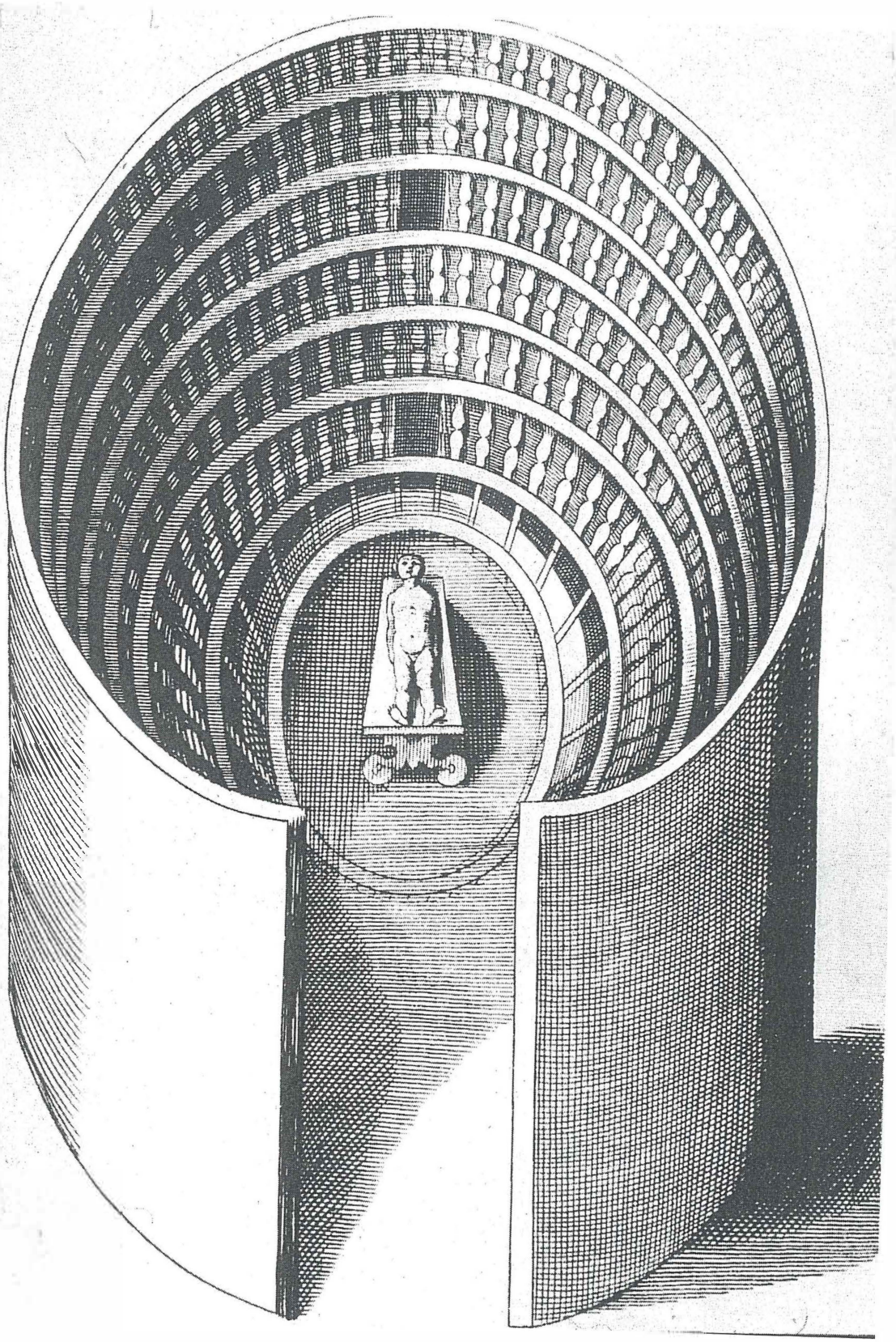
Volume 2. Images.

SARAH SIMBLET

A thesis submitted through Cheltenham and Gloucester College of Higher Education
To the University of Bristol in accordance with the requirements
Of the degree of Doctor of Philosophy in the faculty of Art and Design

December 1998

38,847 words



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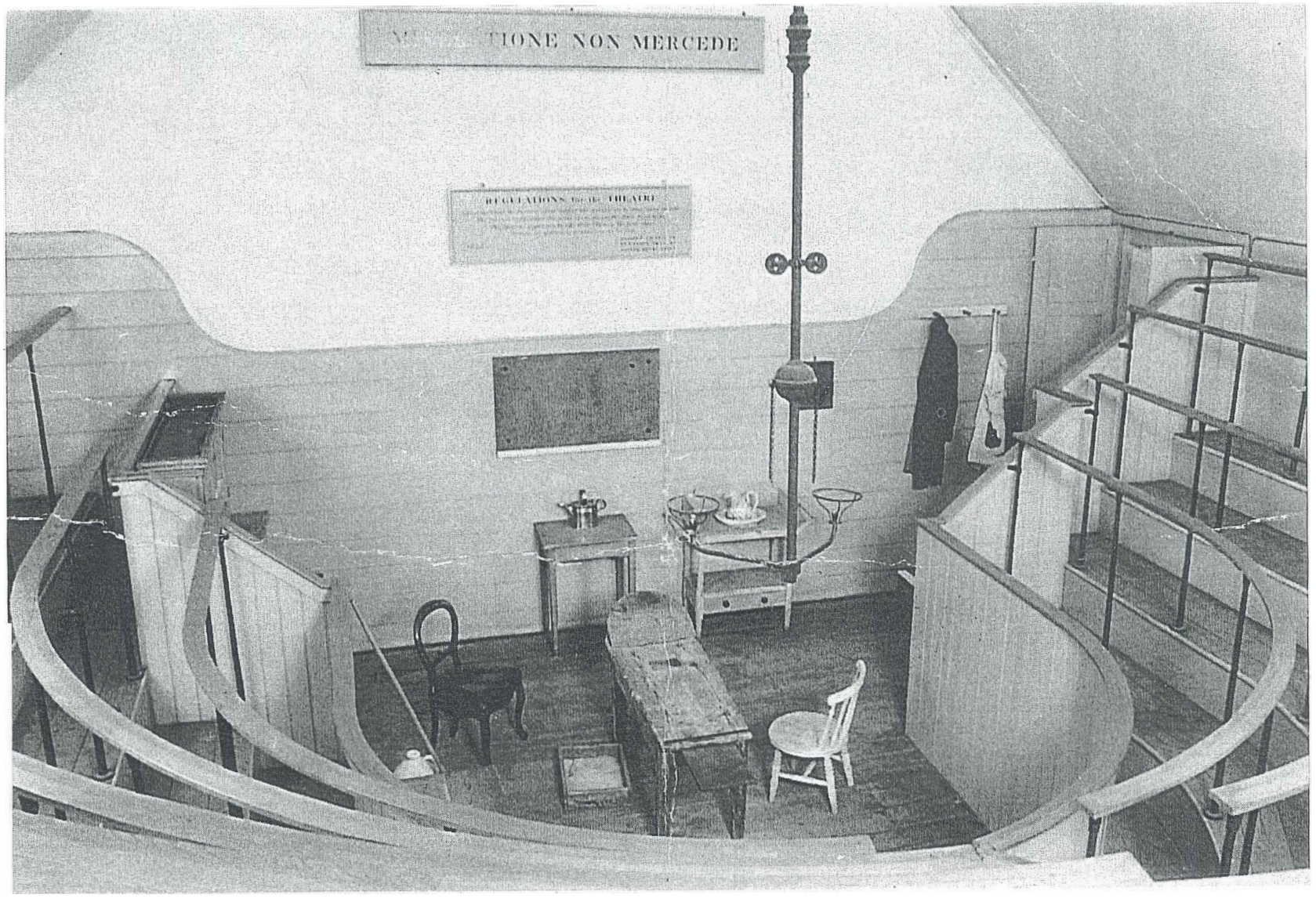
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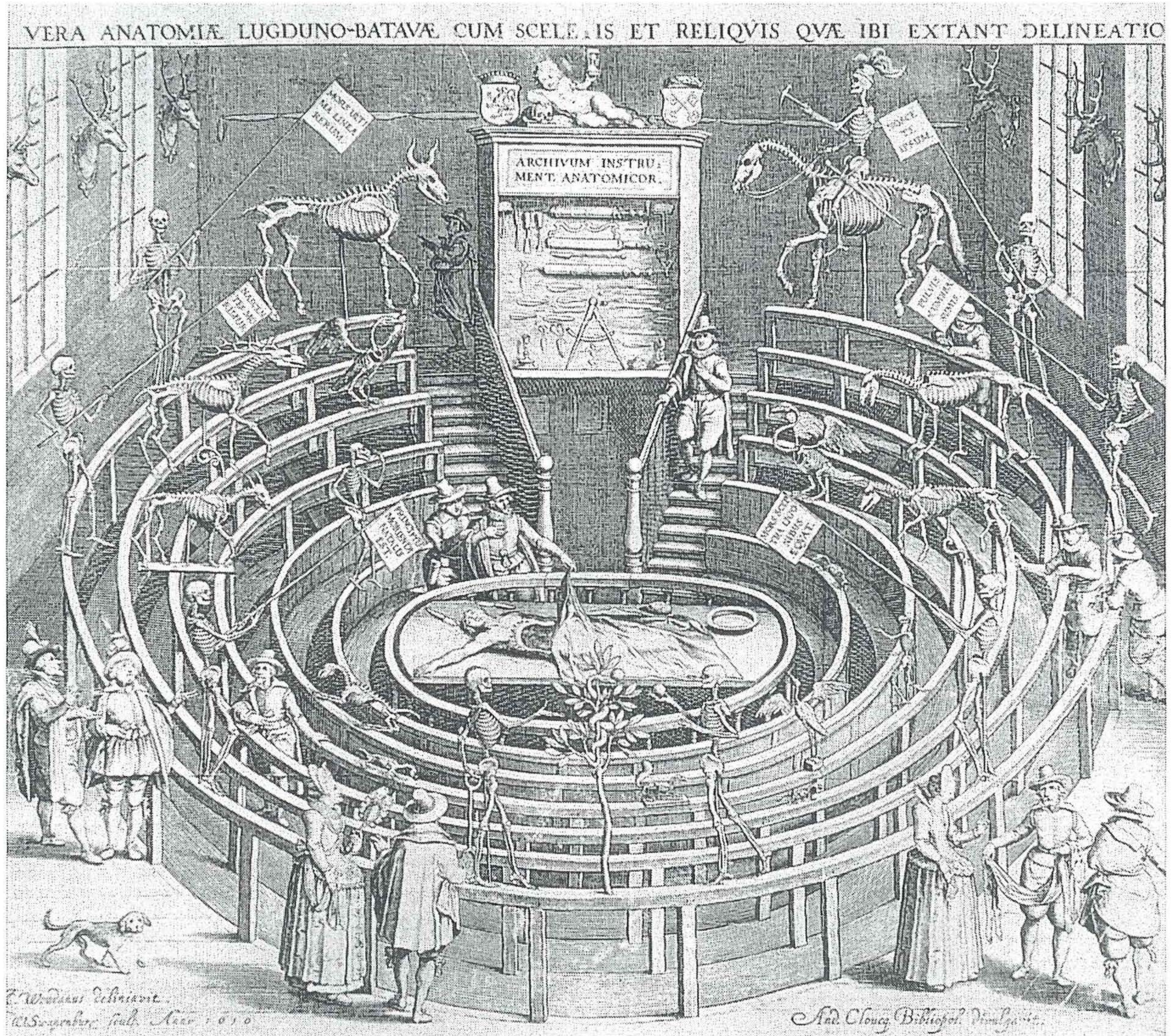
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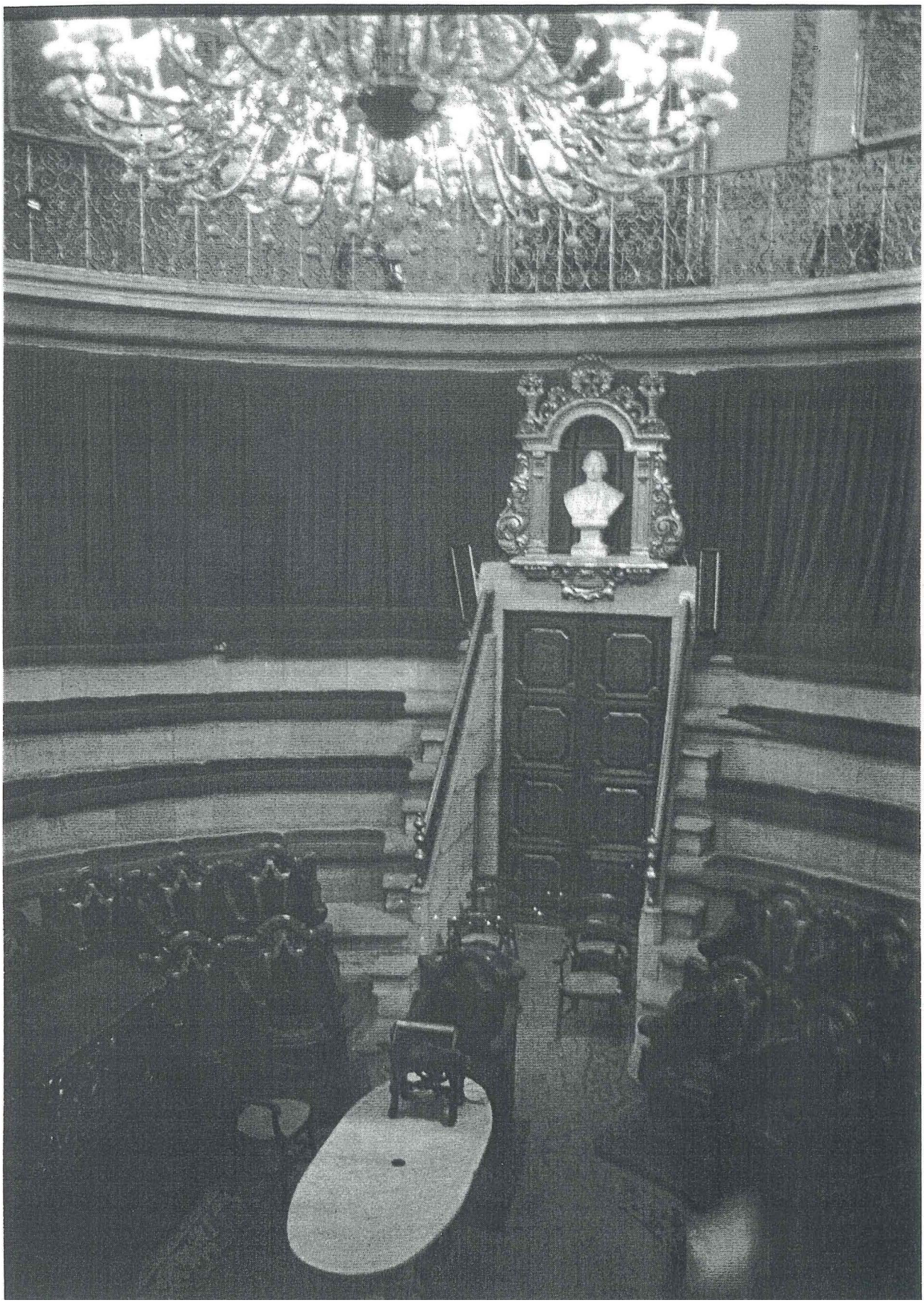
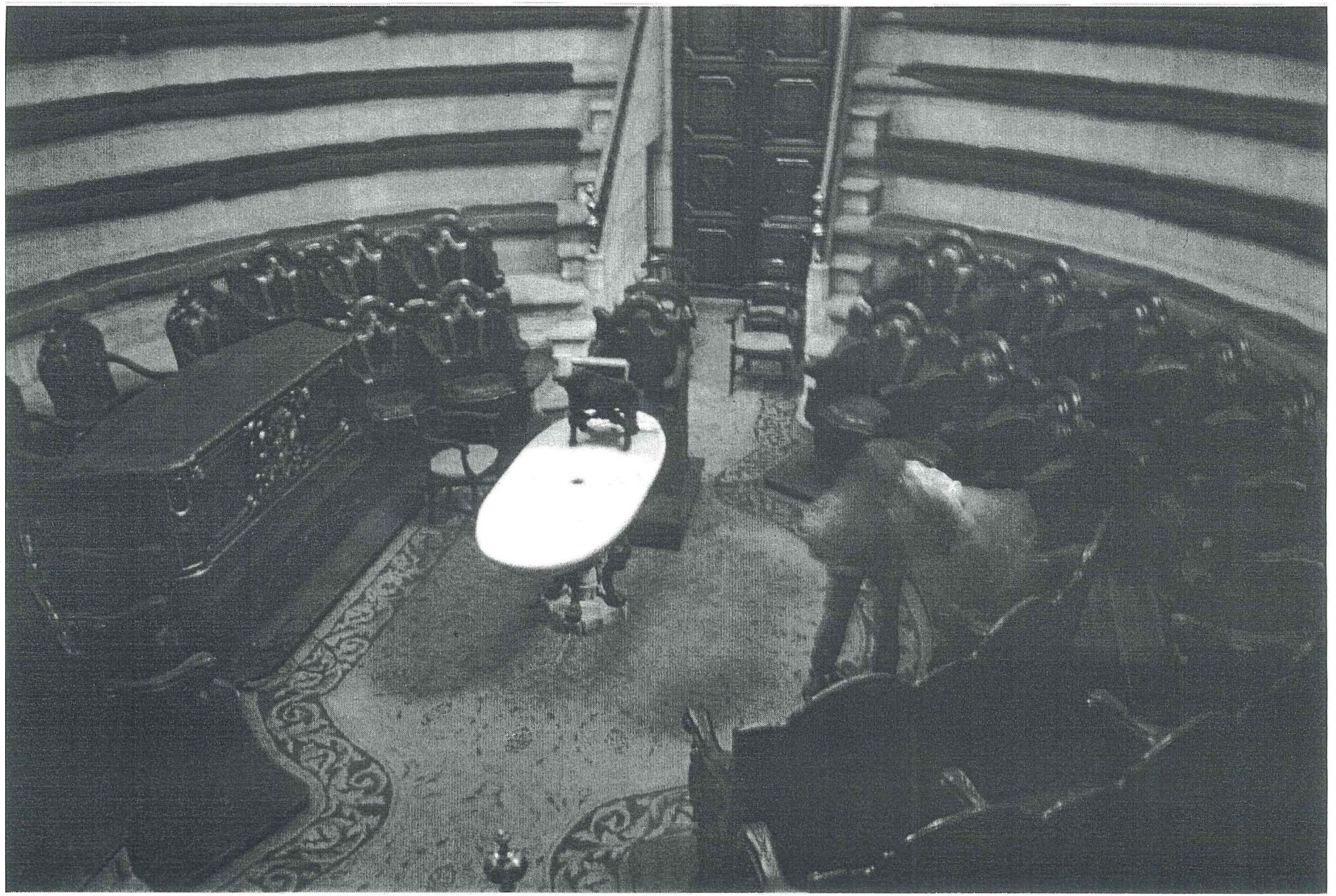
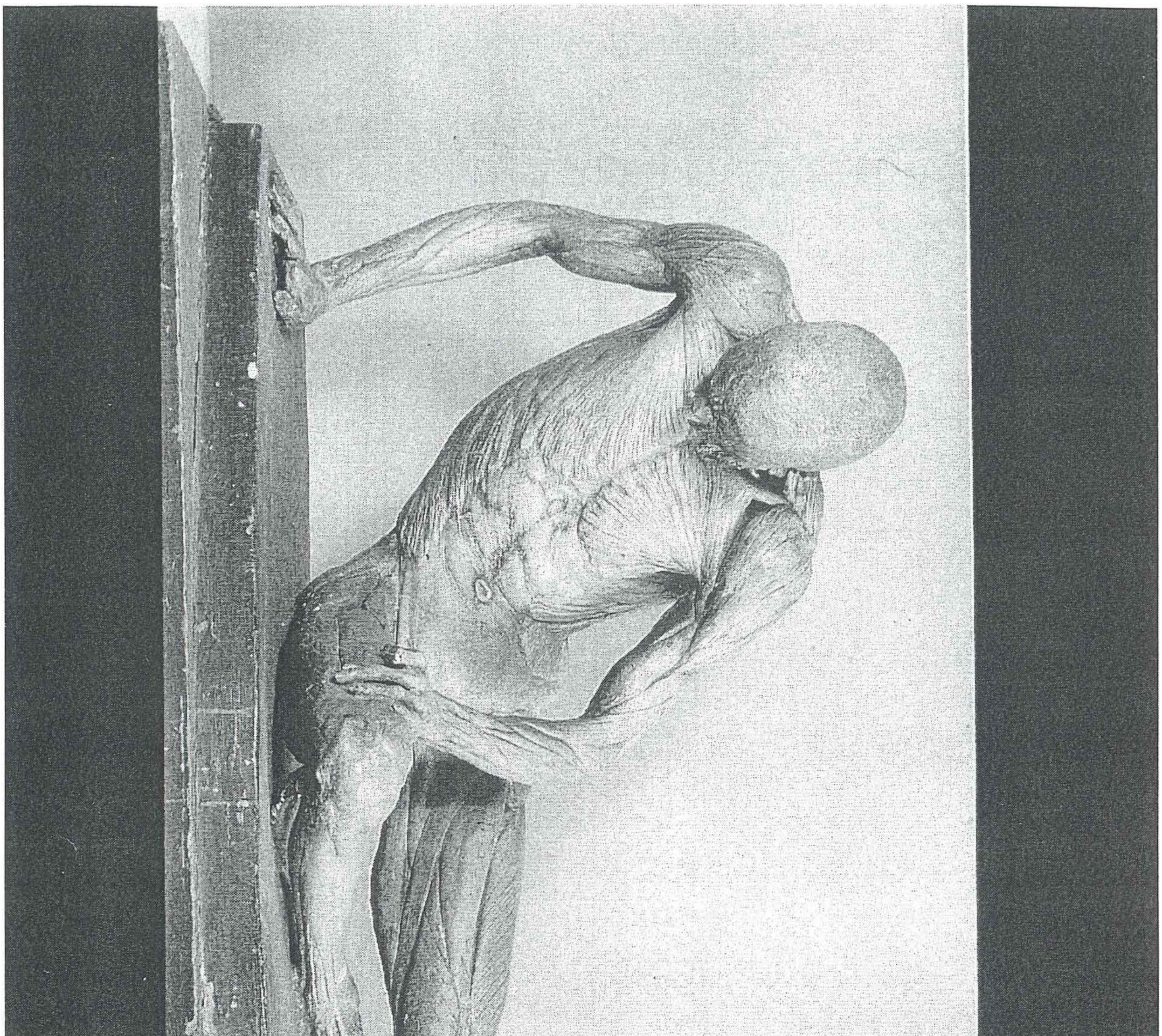
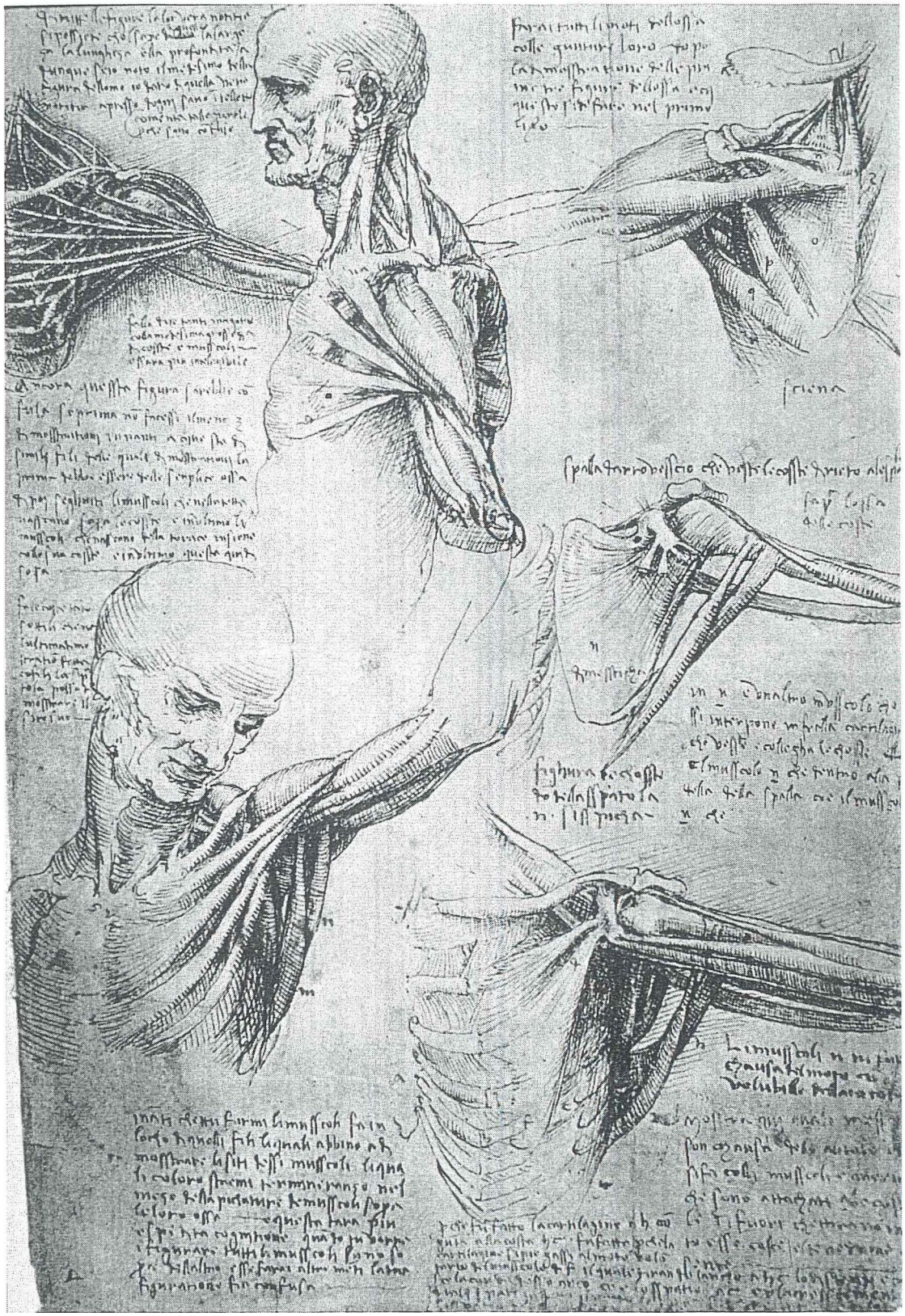
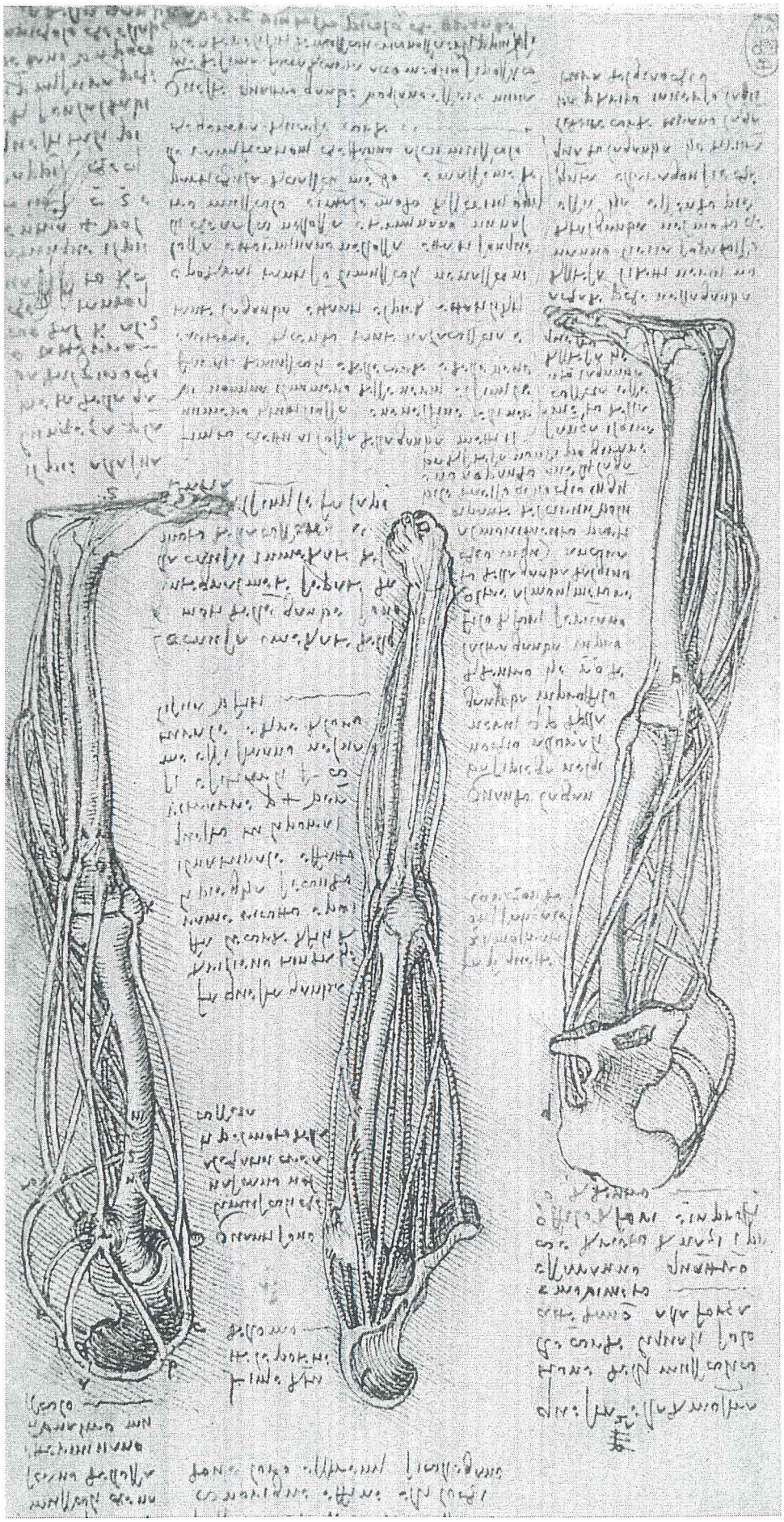
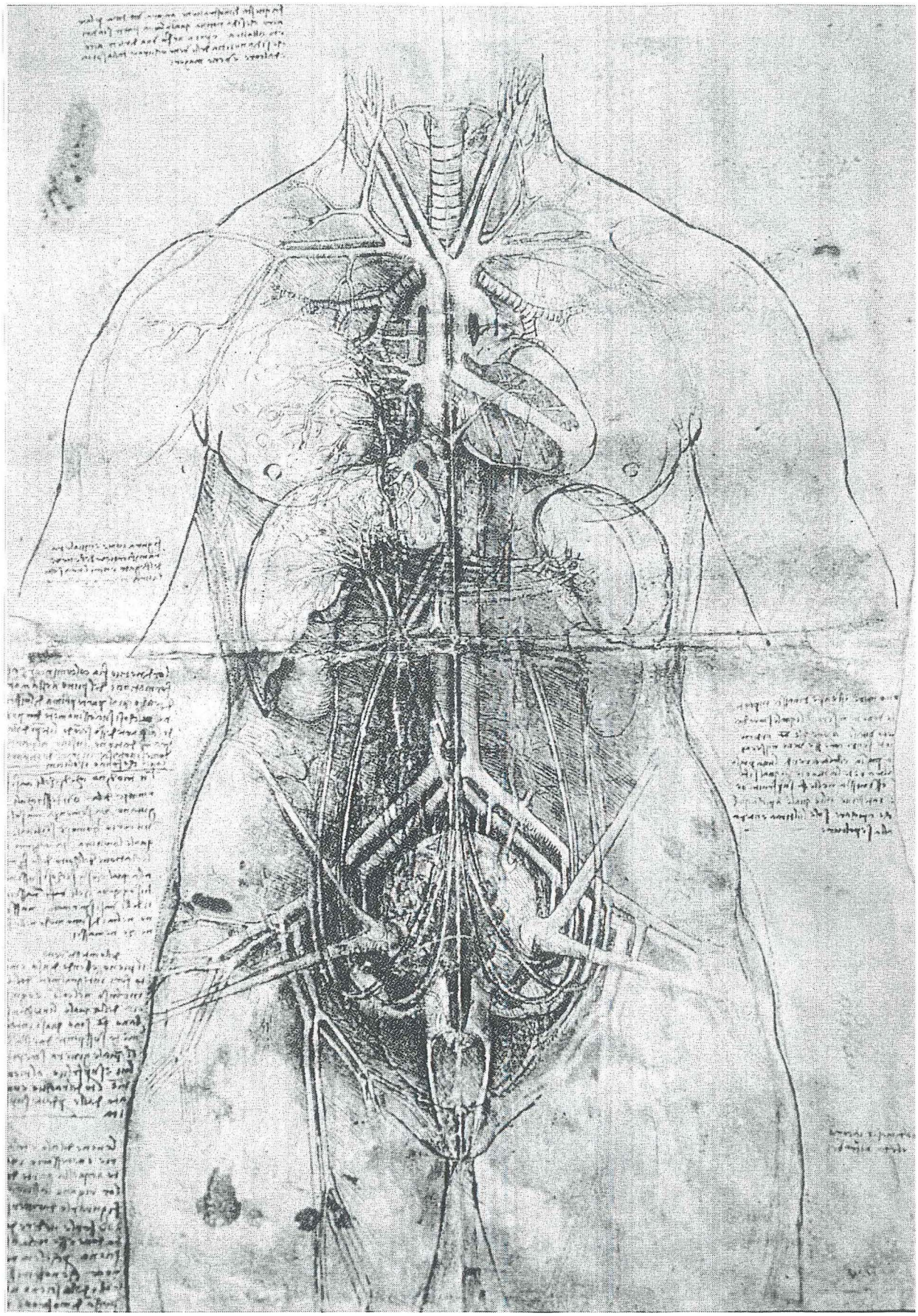


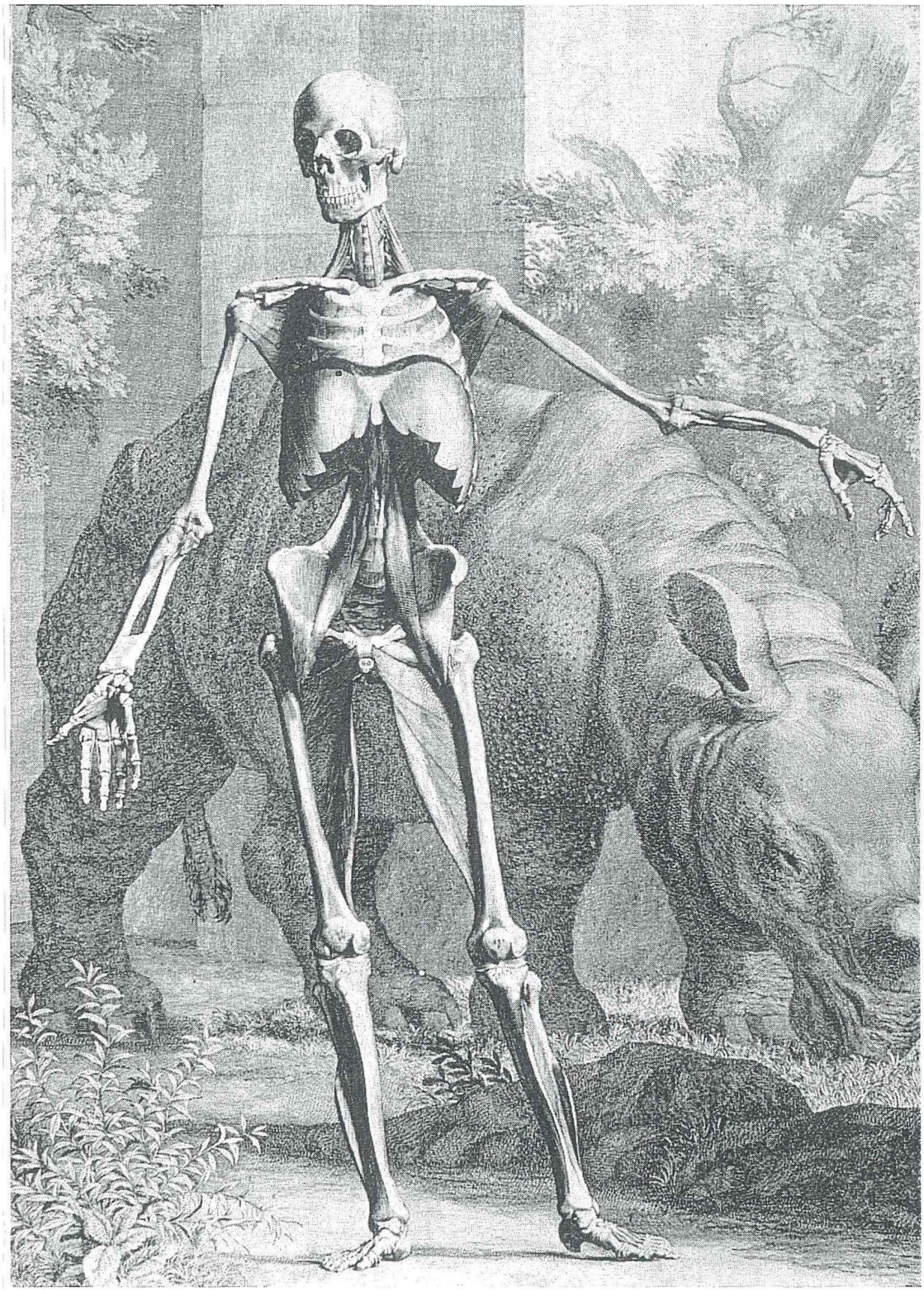


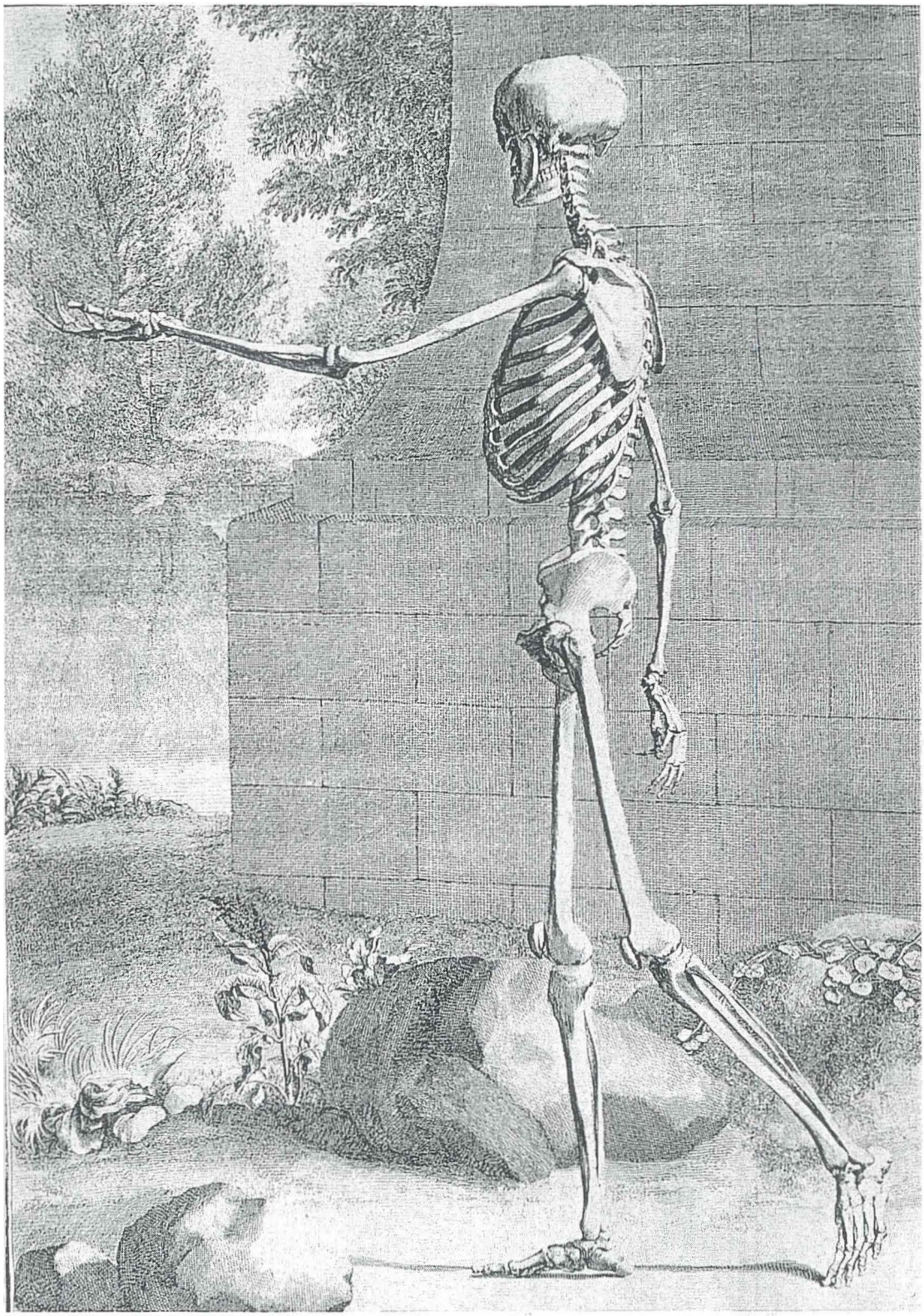


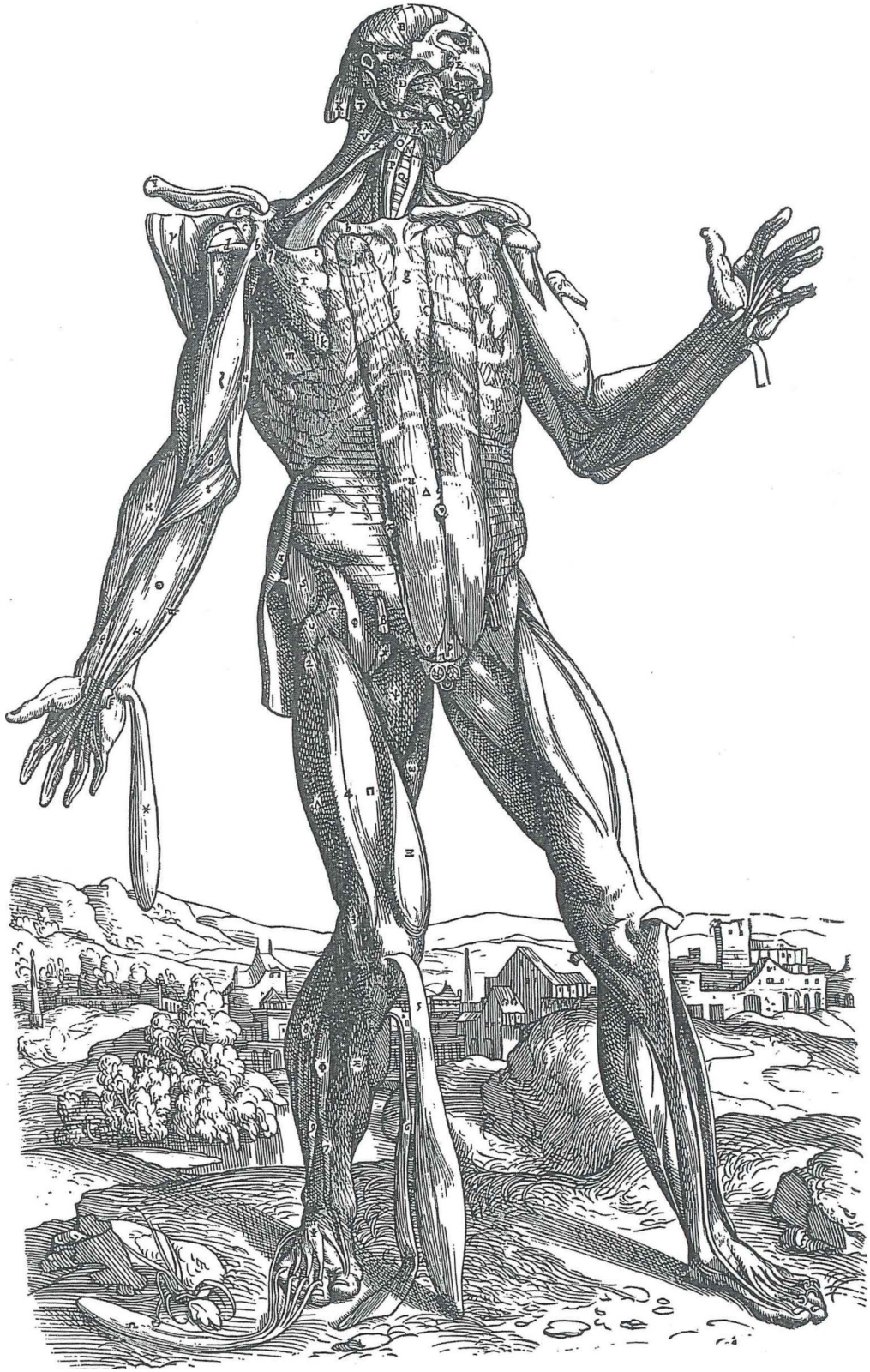


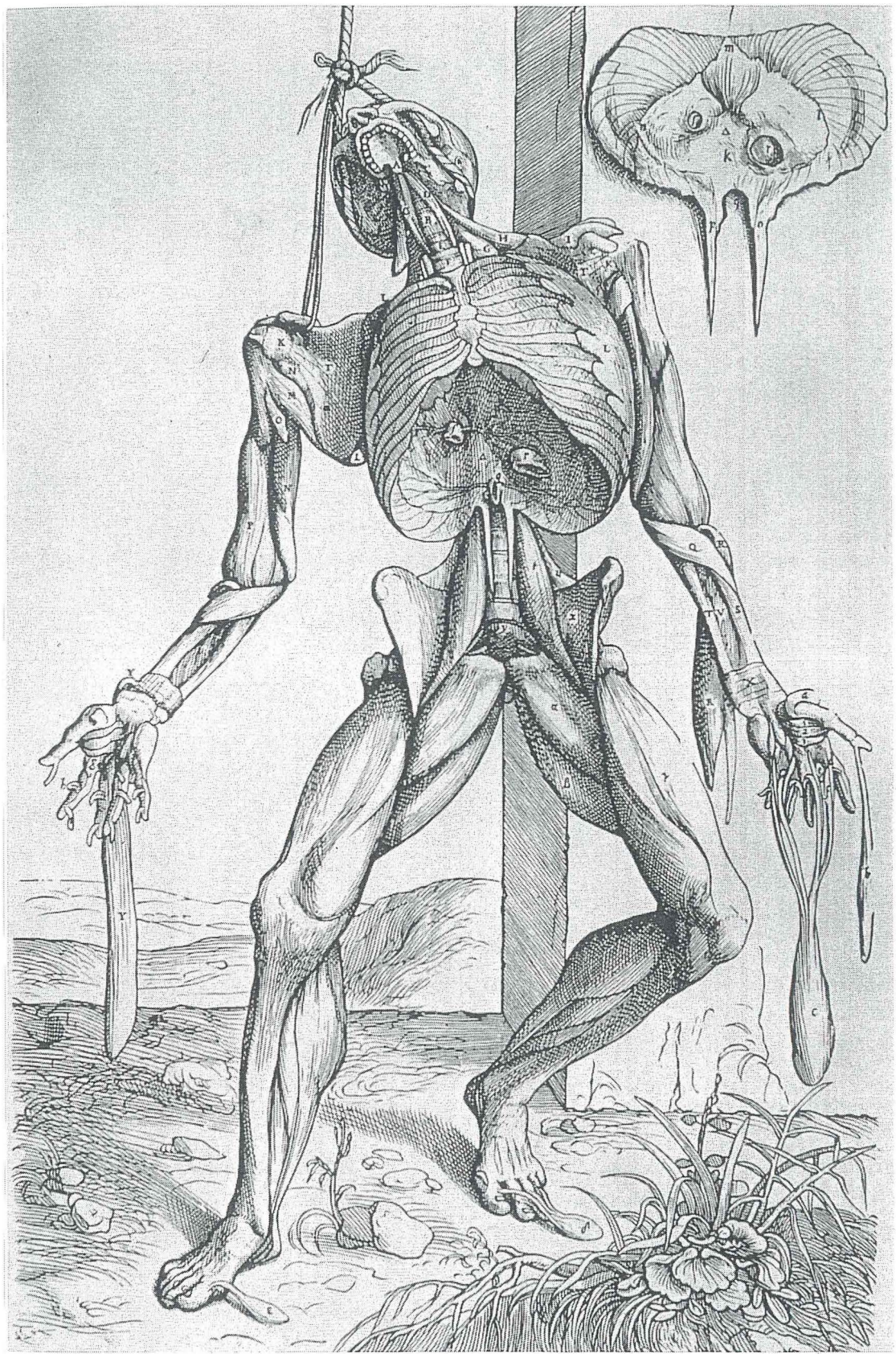


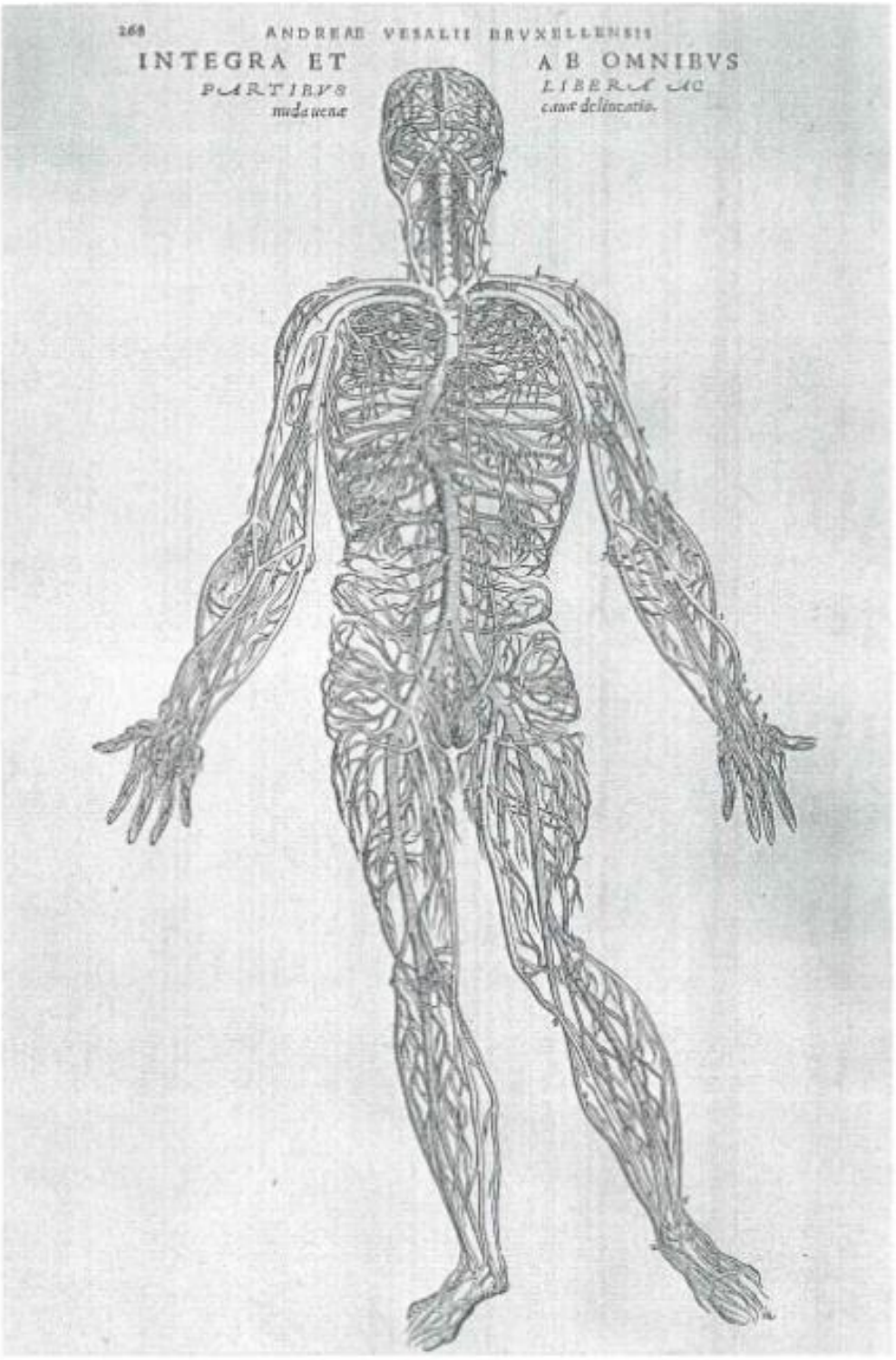


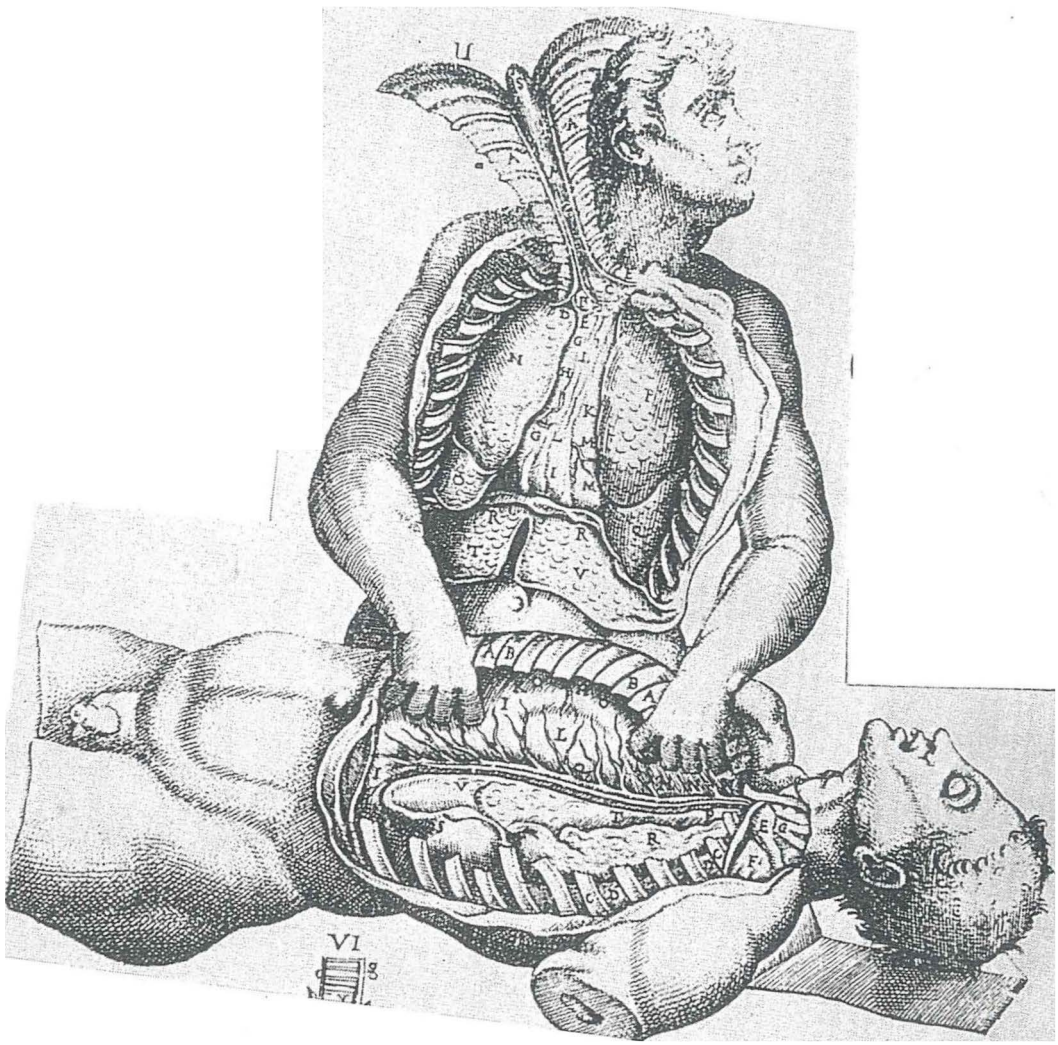




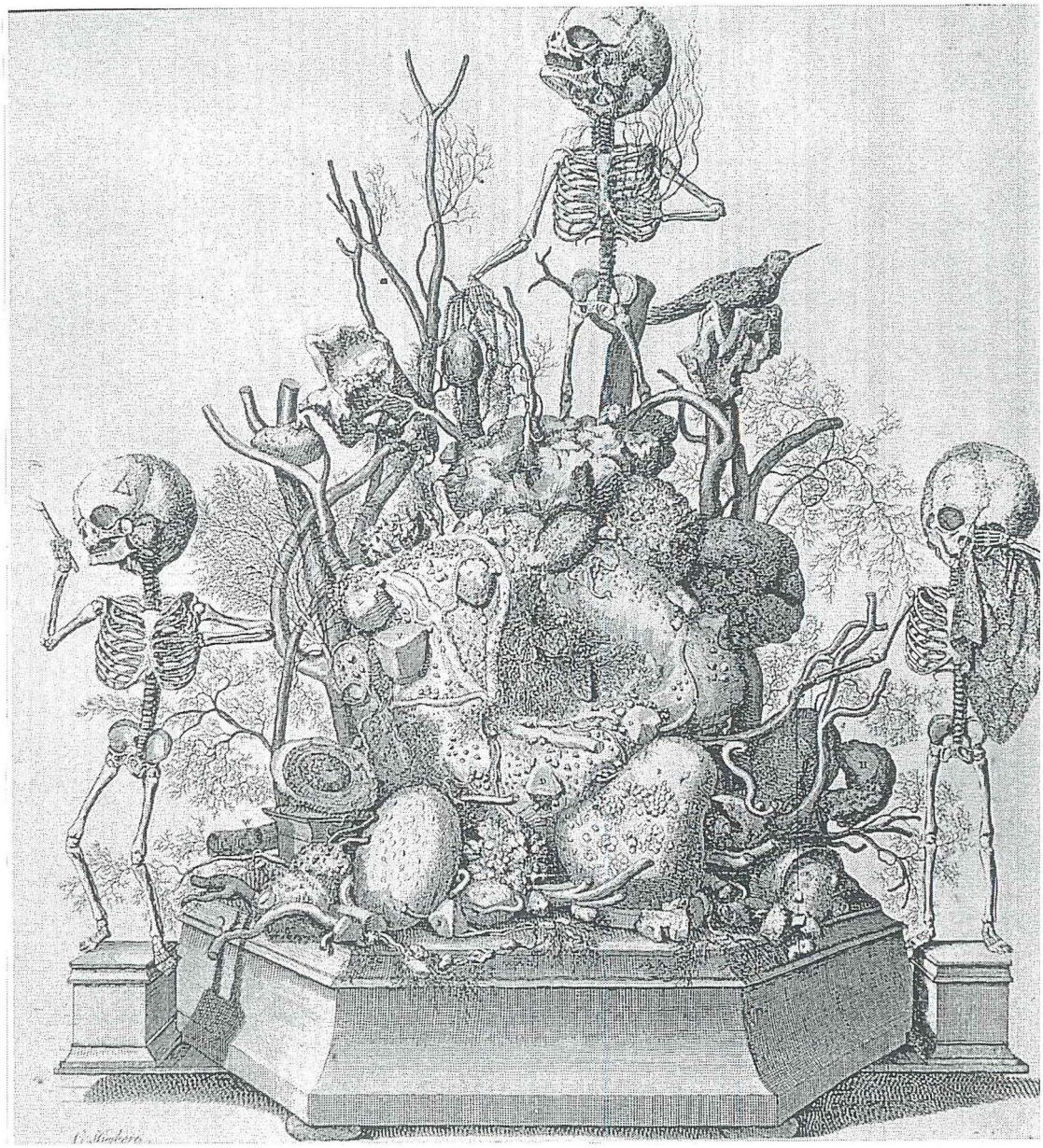


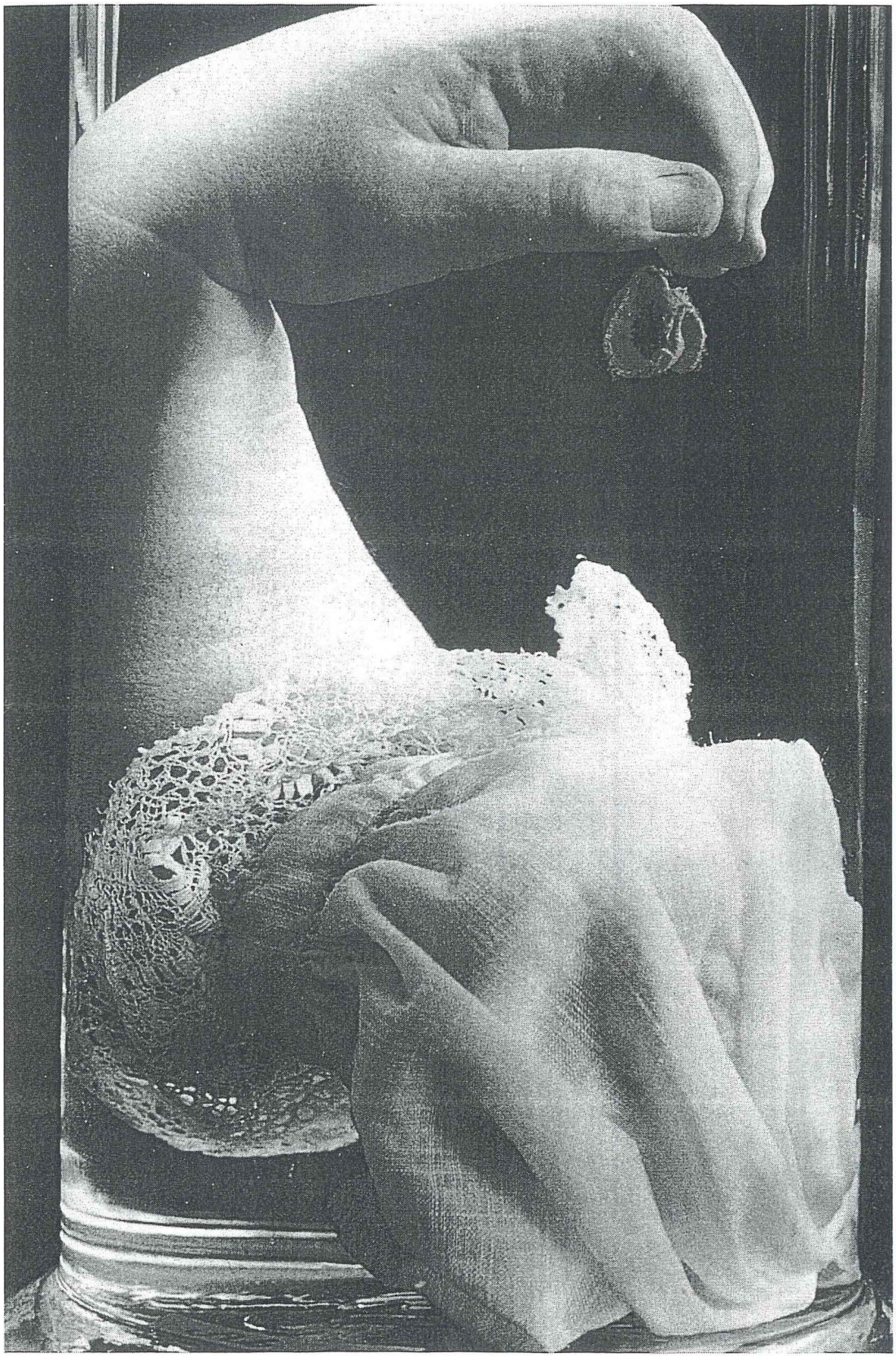


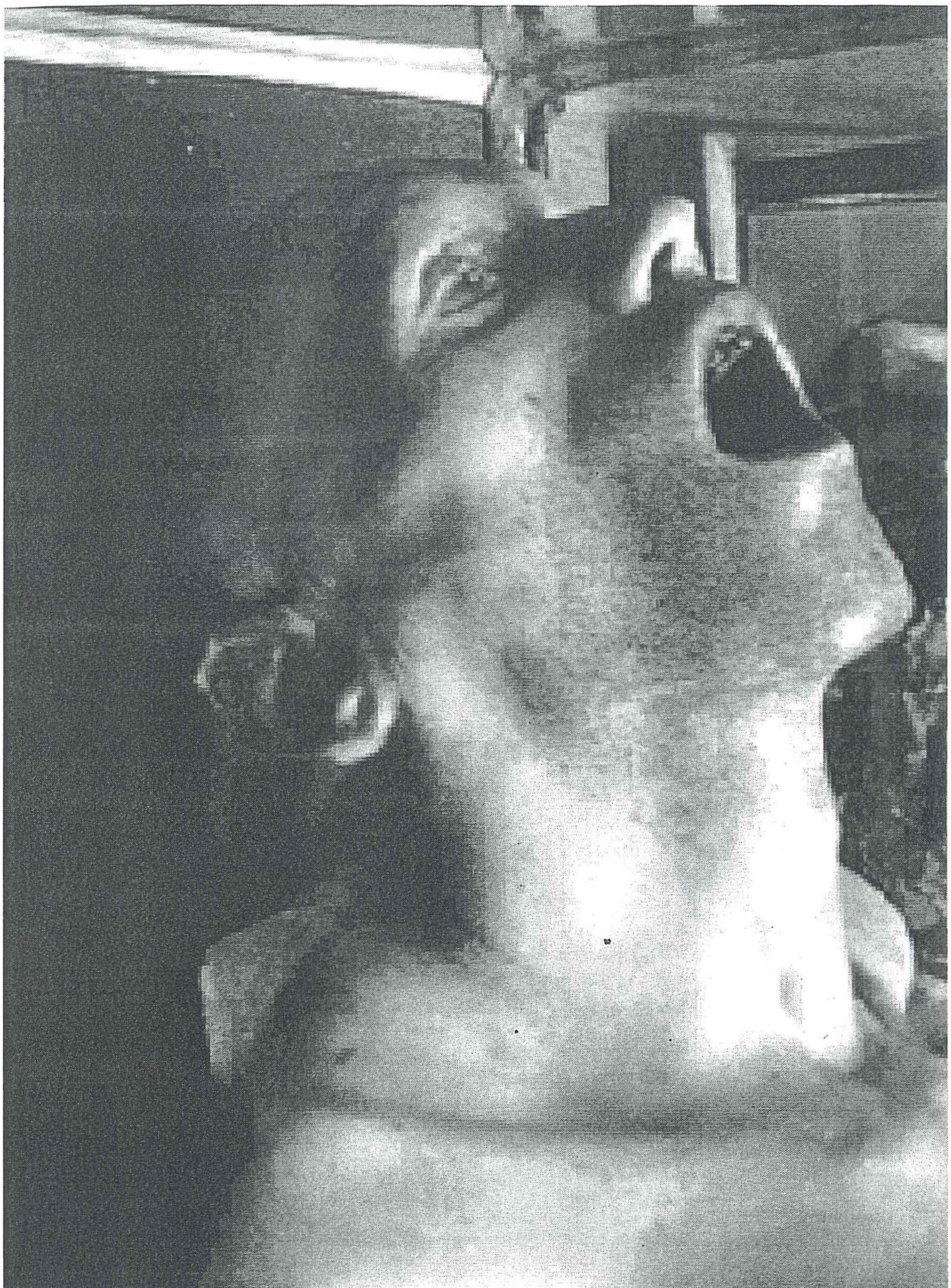

268
ANDREAE VESALII BRVXELLENSIS
INTEGRA ET
PARTIBVS
nuda uenæ
AB OMNIBVS
LIBERA AC
cauæ delineatio.

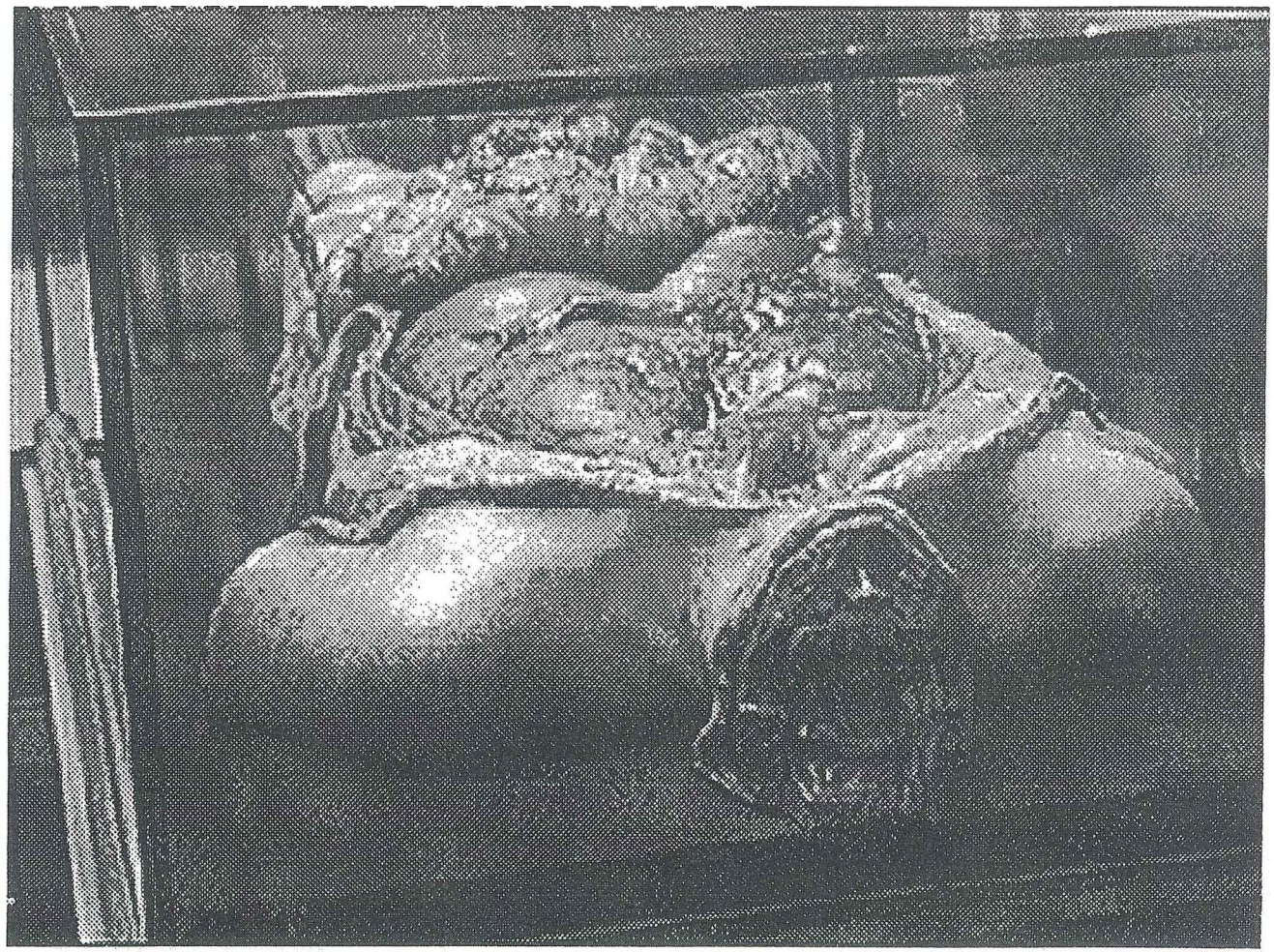


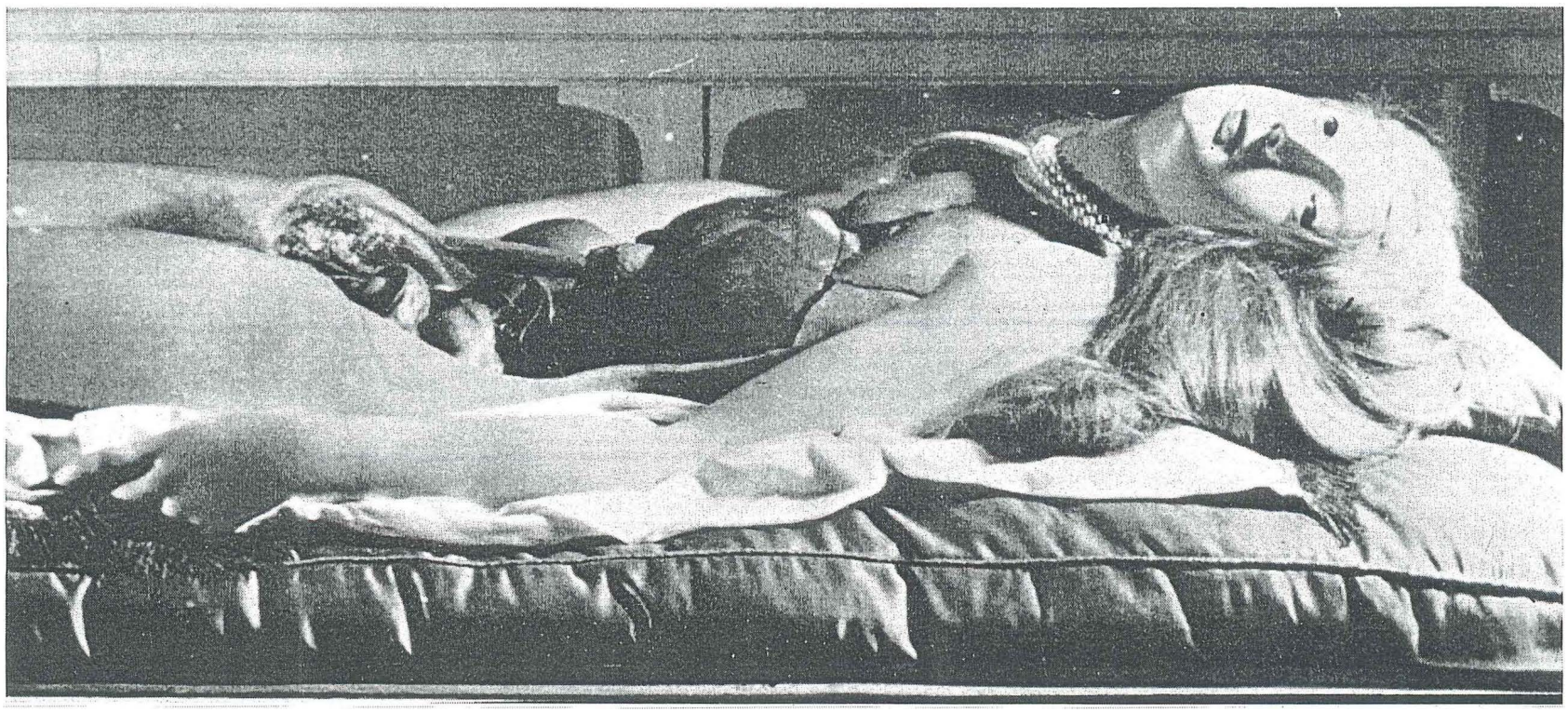
Jaques-Fabien Gautier D'Agoty: Seated woman with an opened back, Myologie complete en couleur et grandeur naturelle, Paris, 1746.

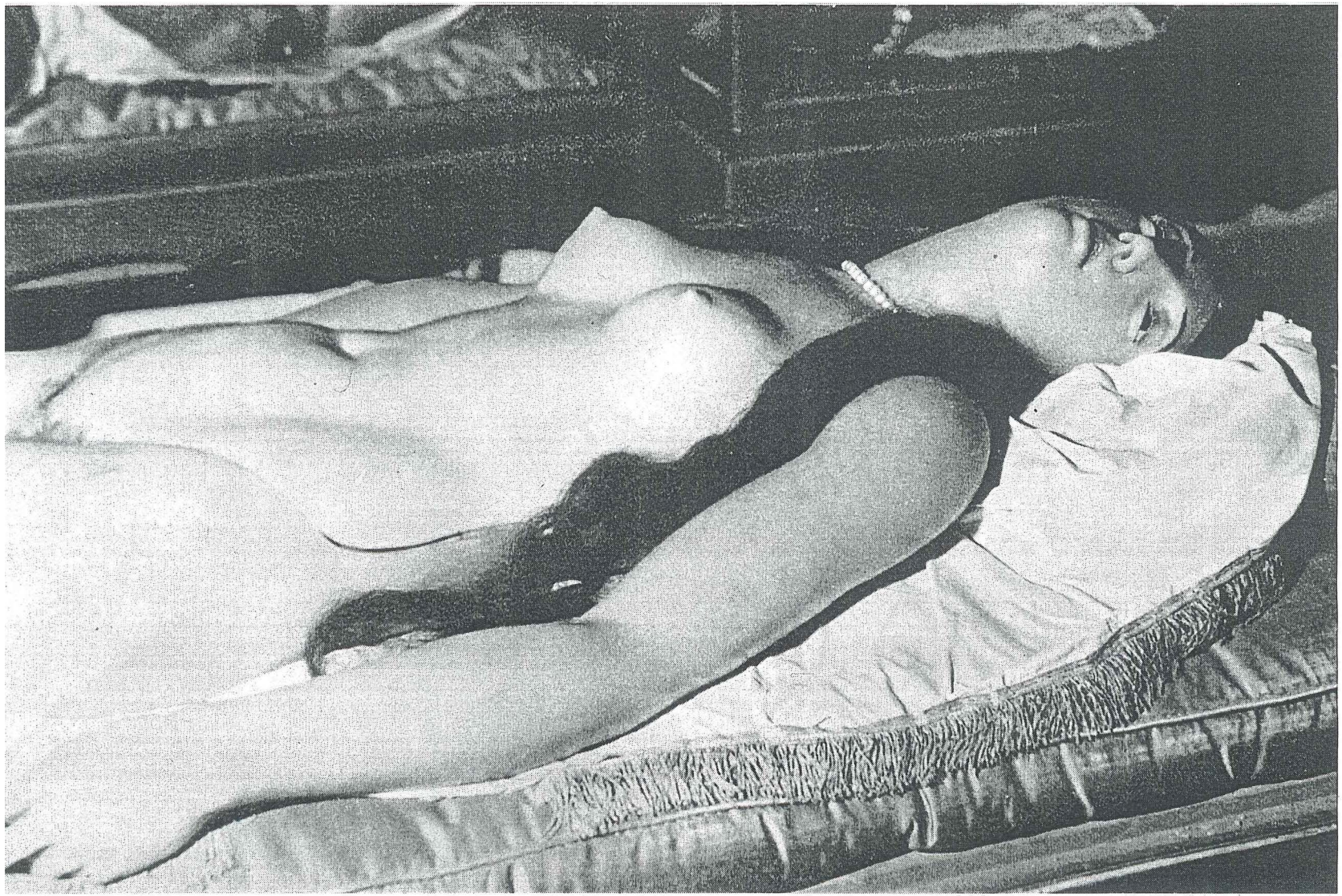


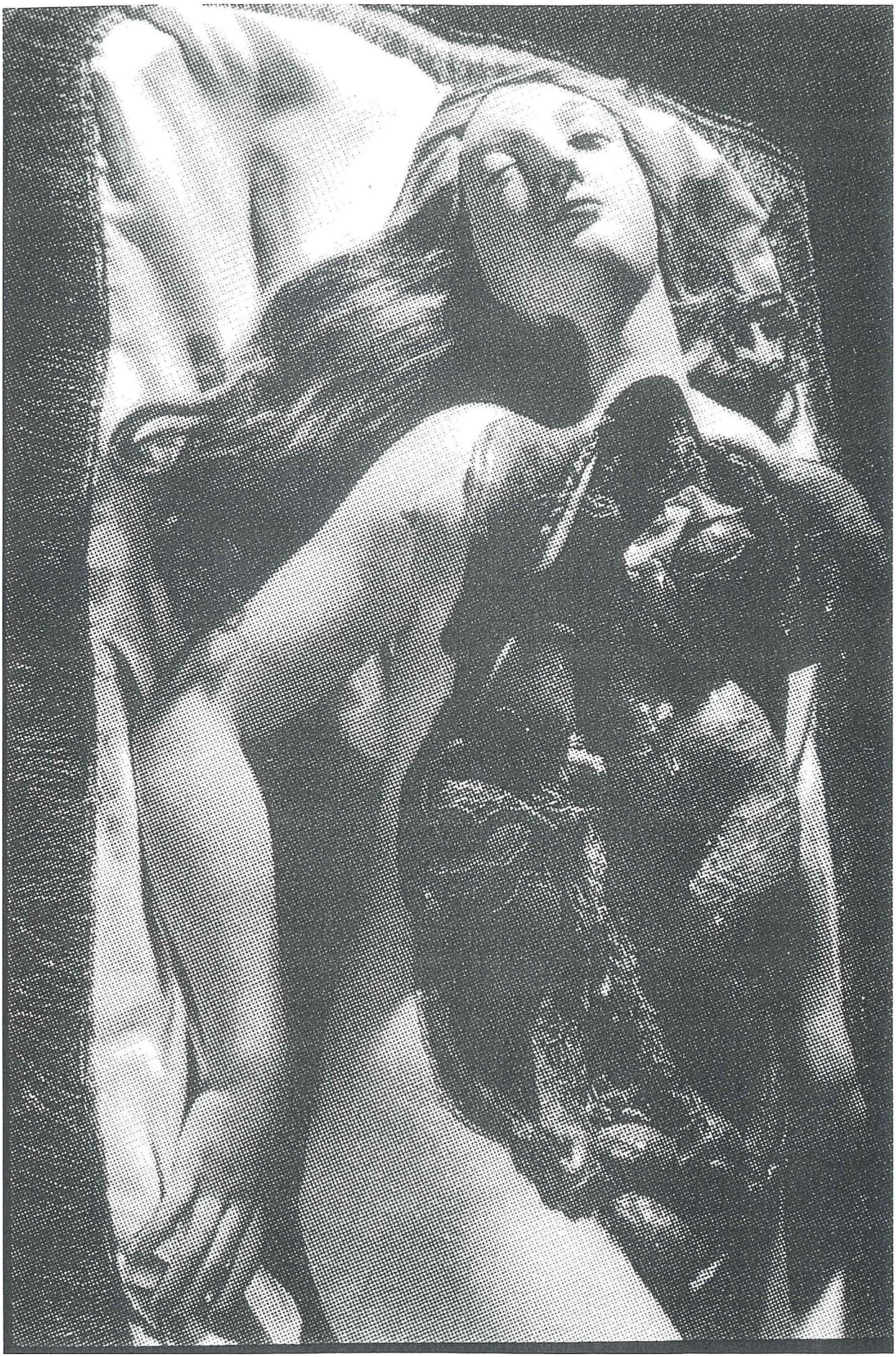


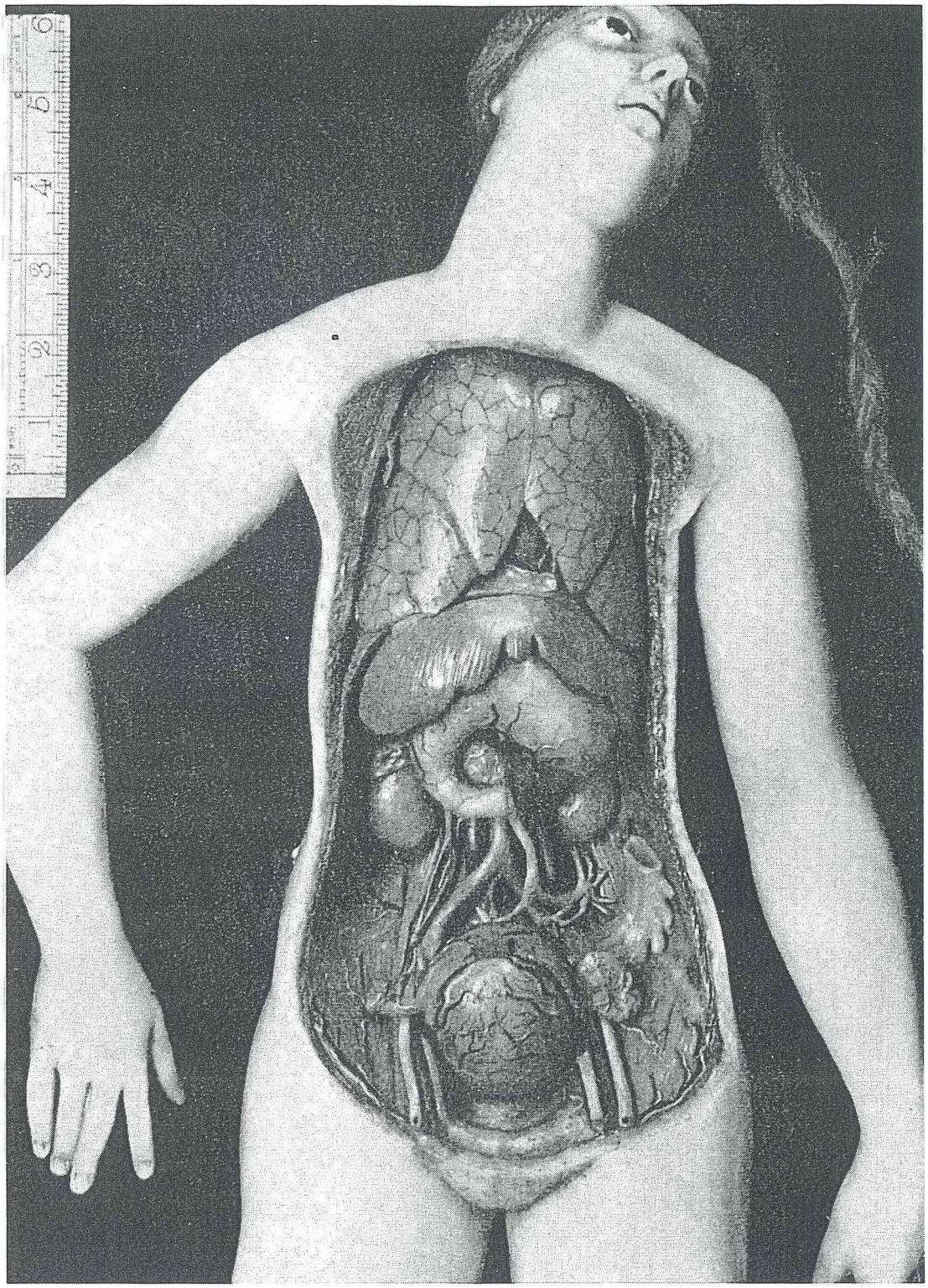


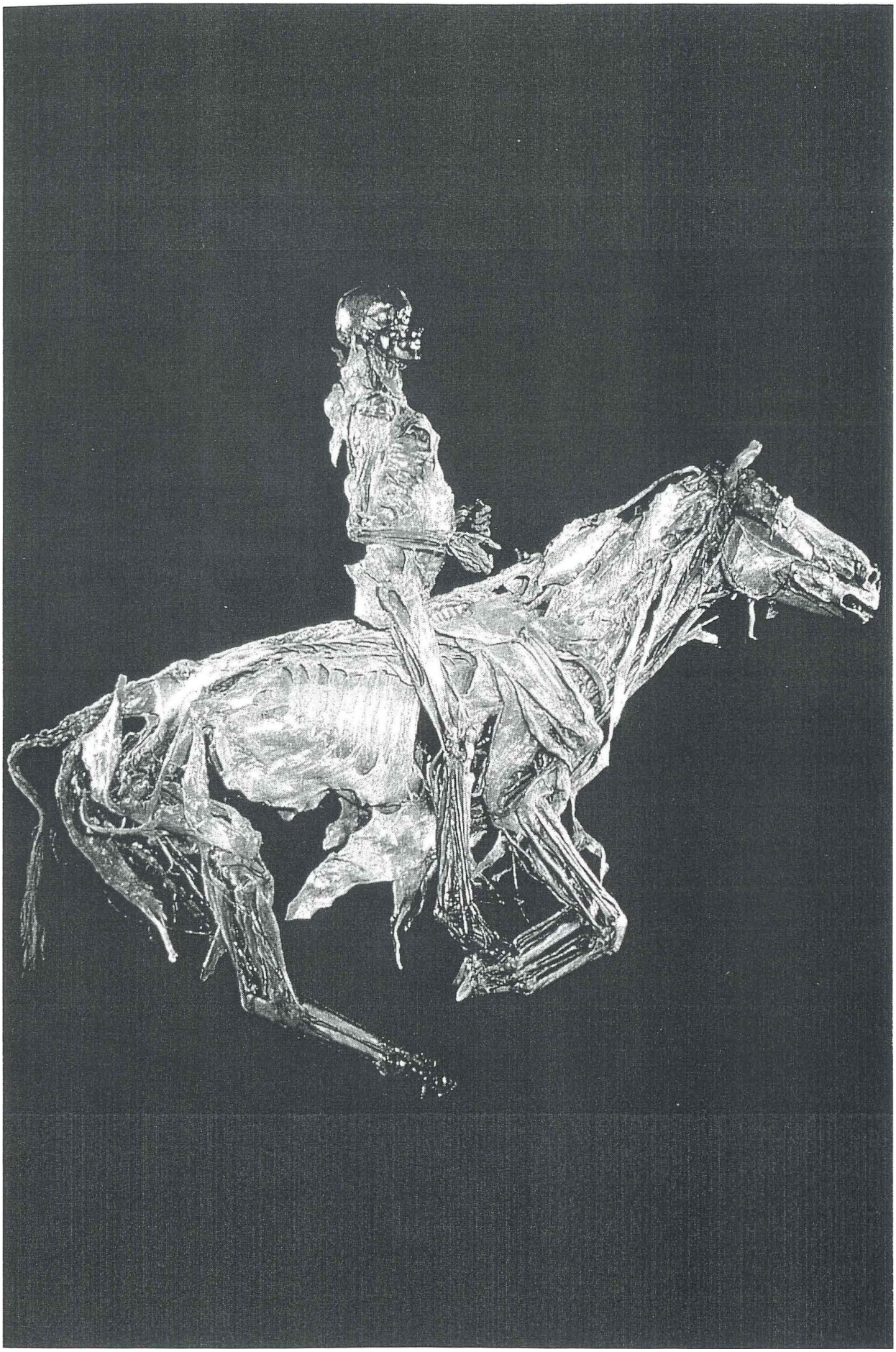


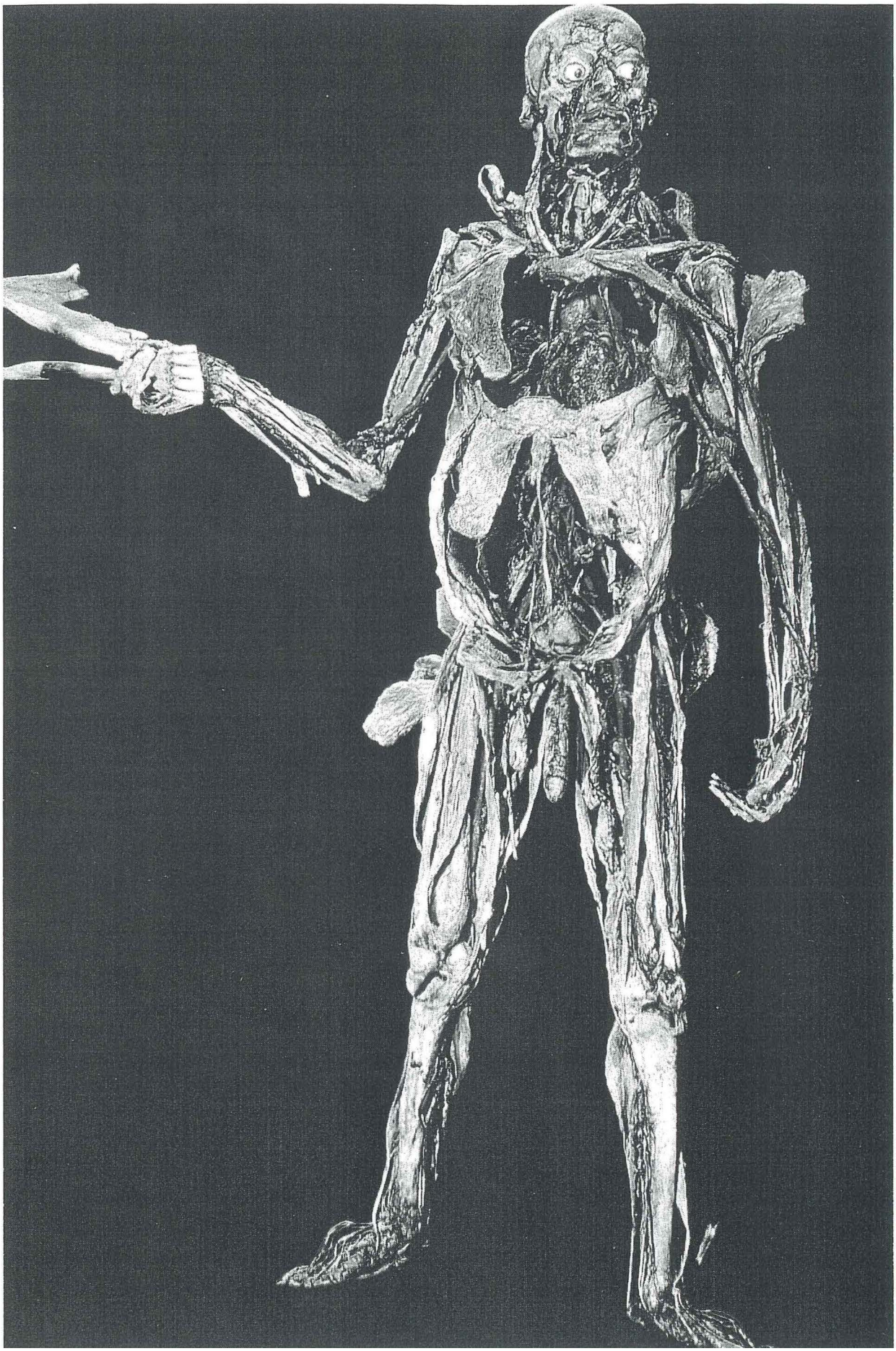


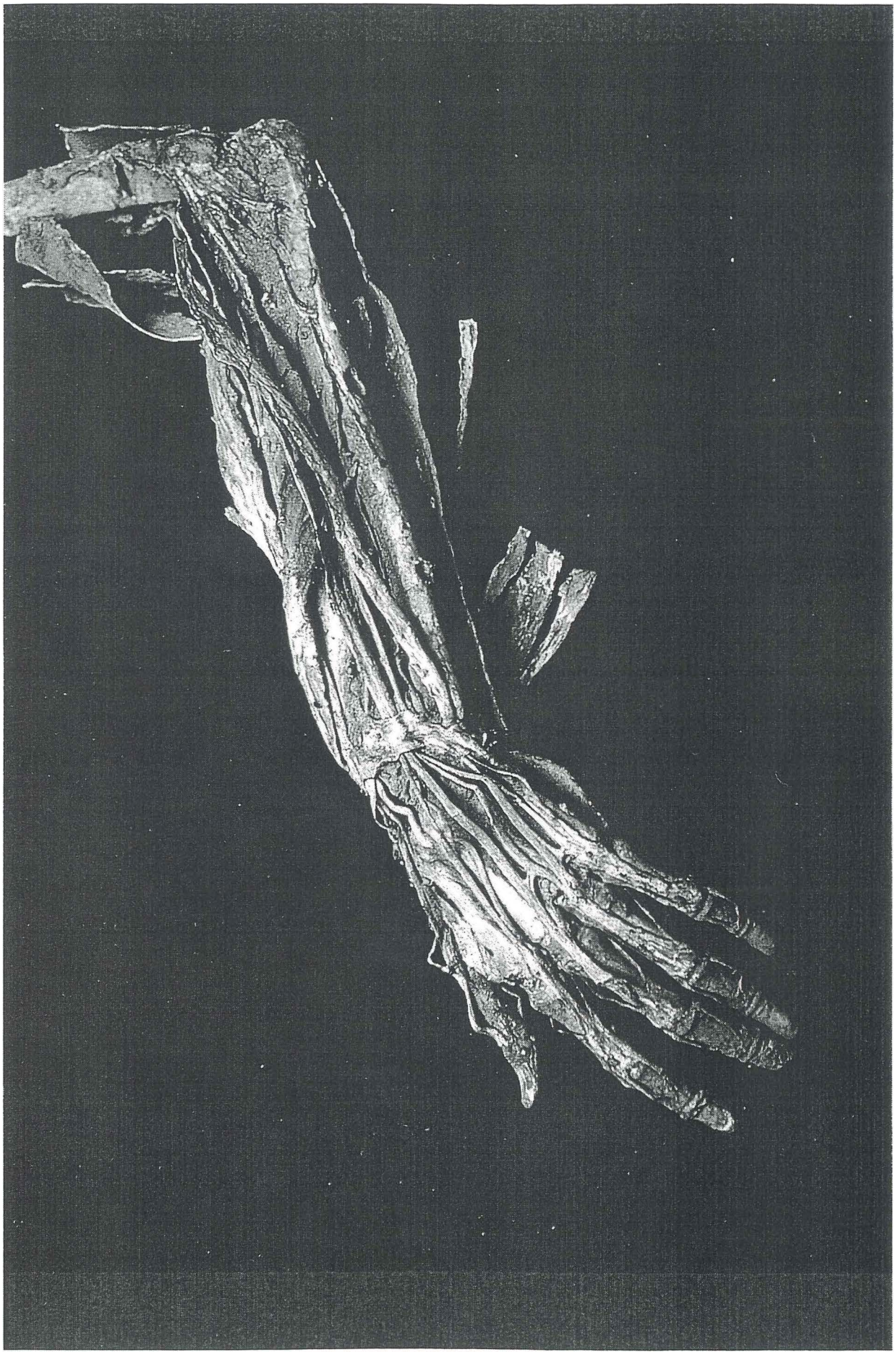


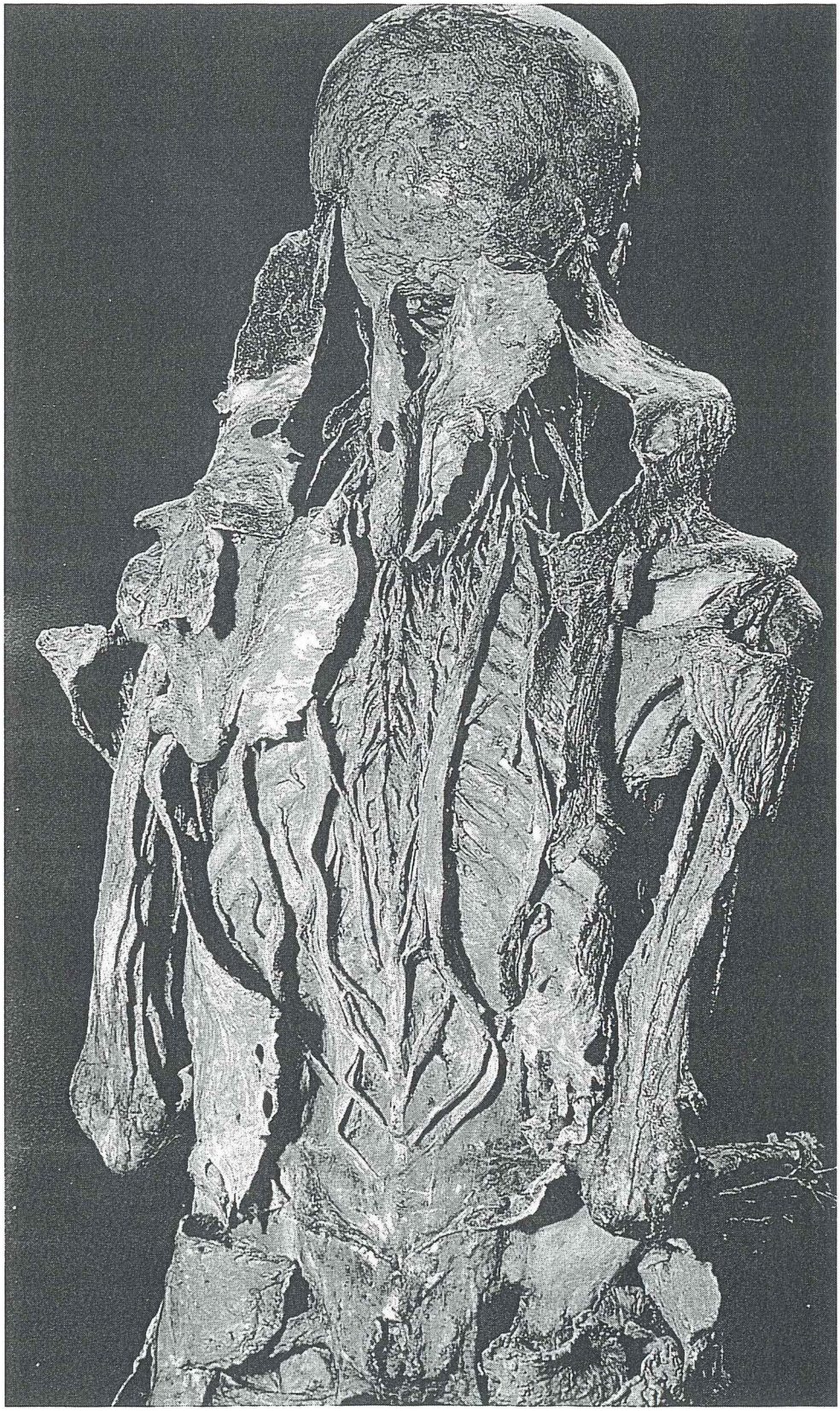


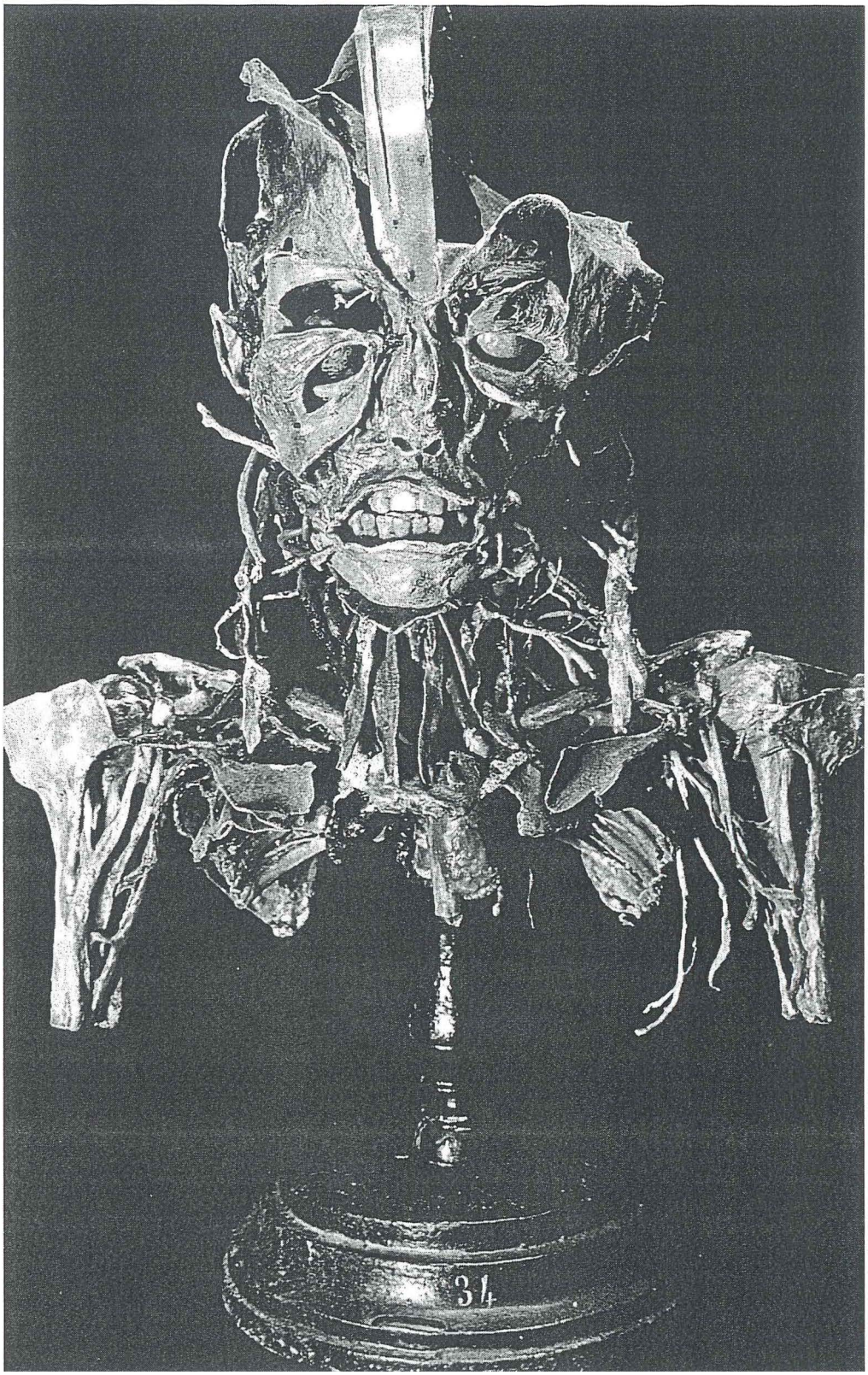








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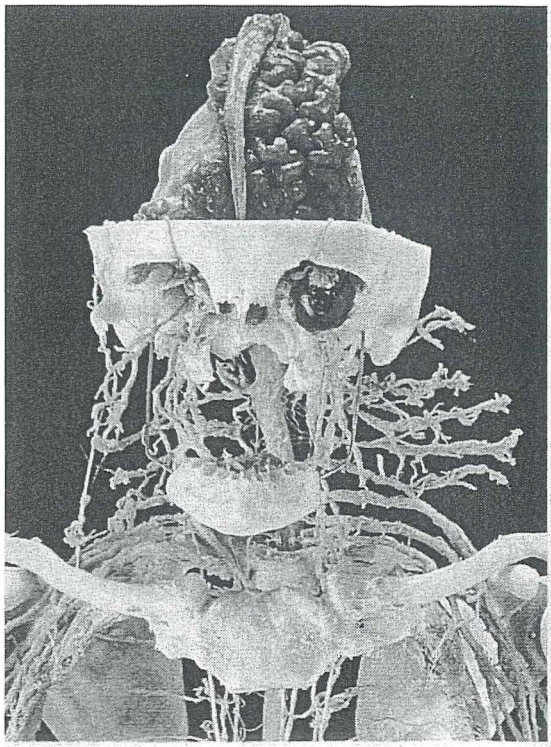


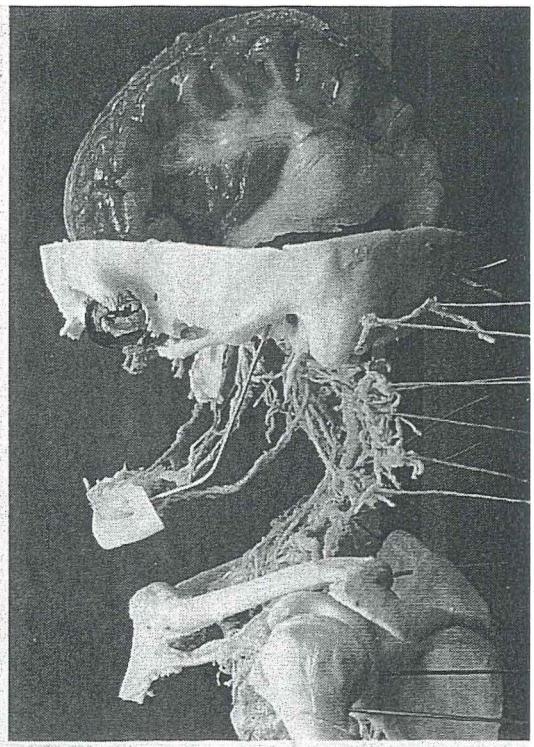
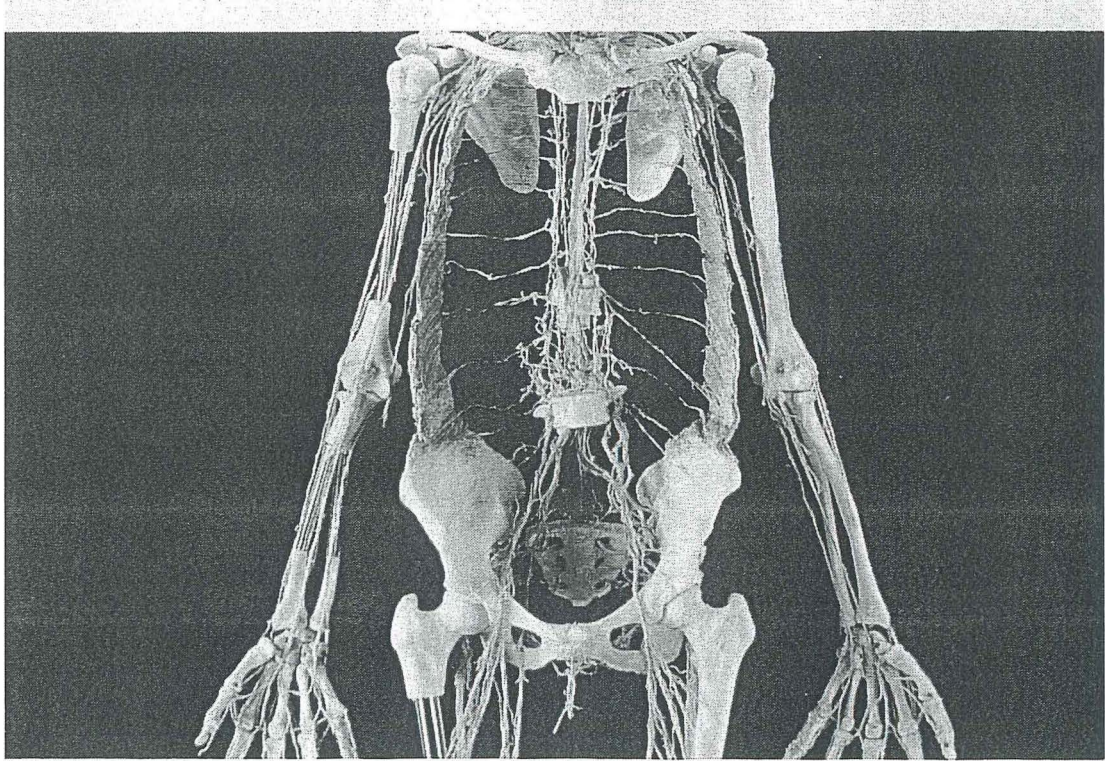
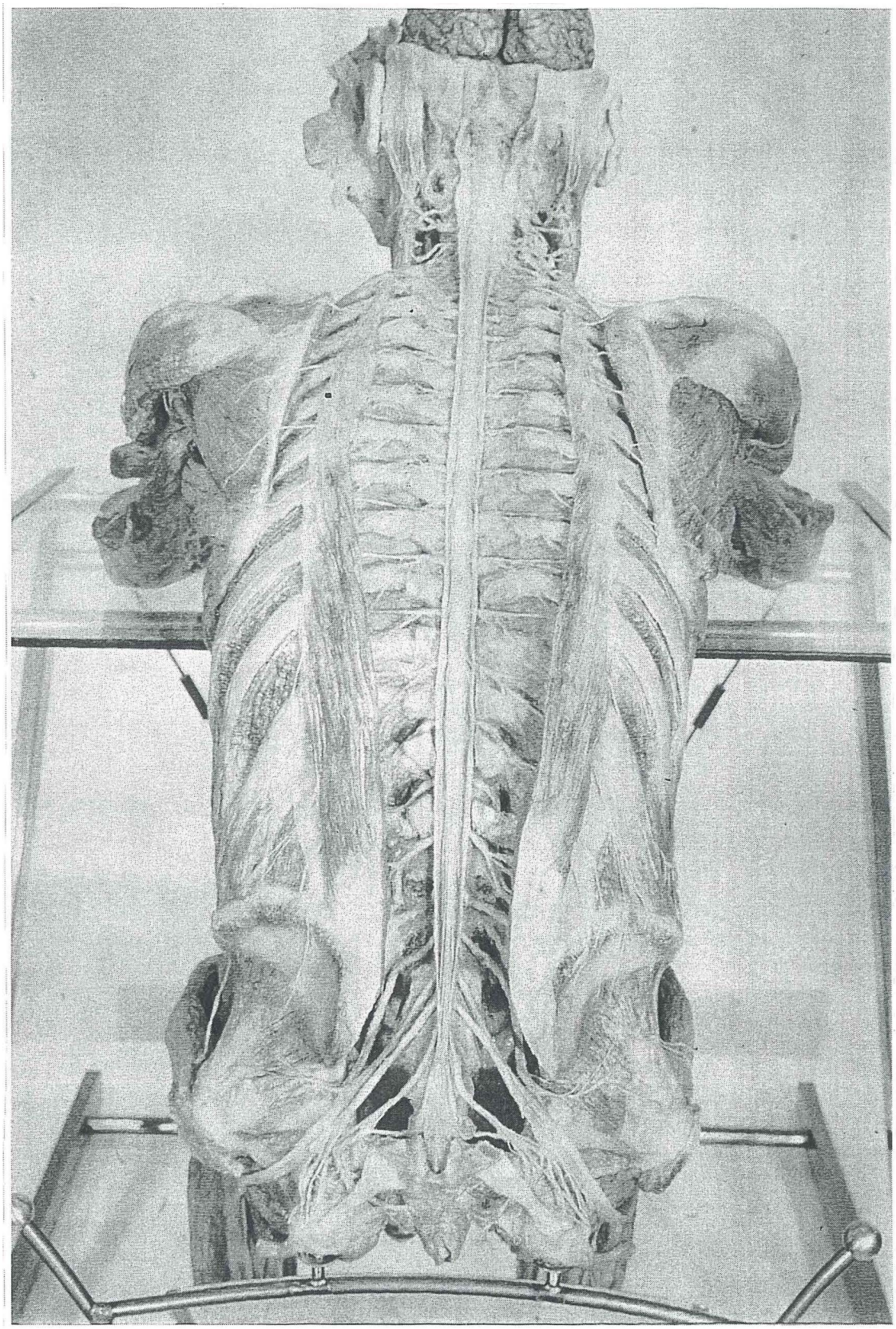
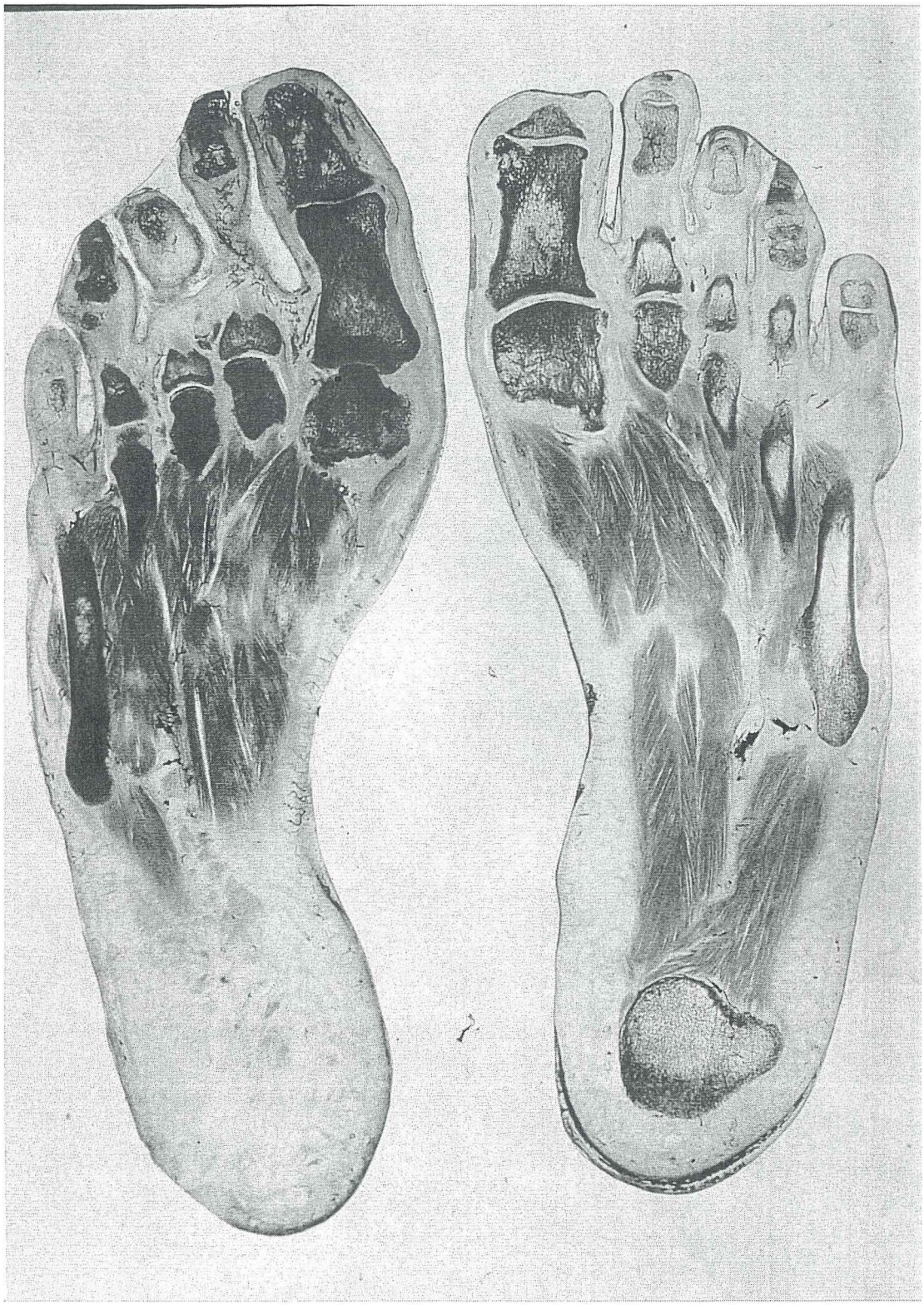
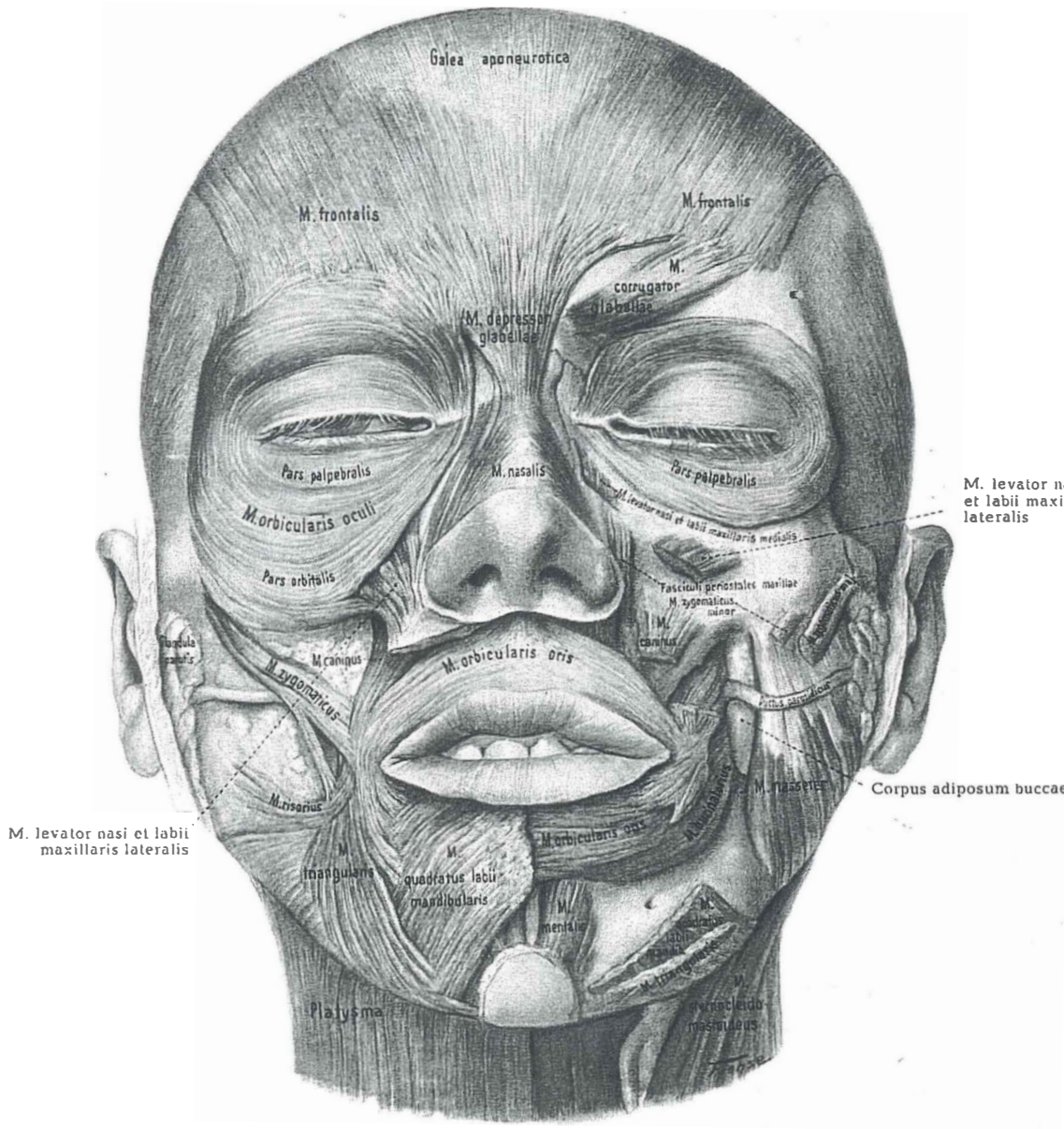


Abb. 2.3

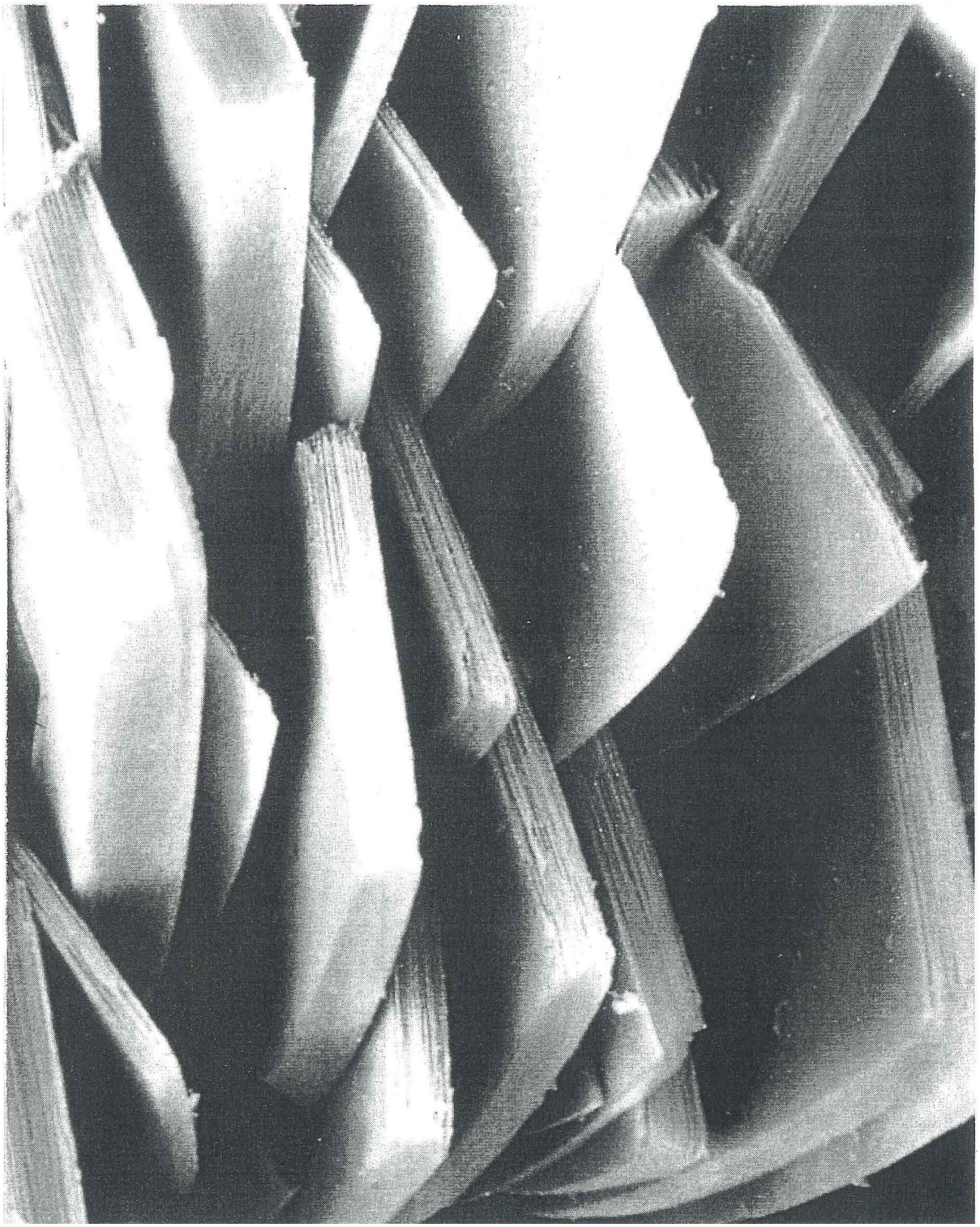








Kopfmuskeln (III) von vorn.



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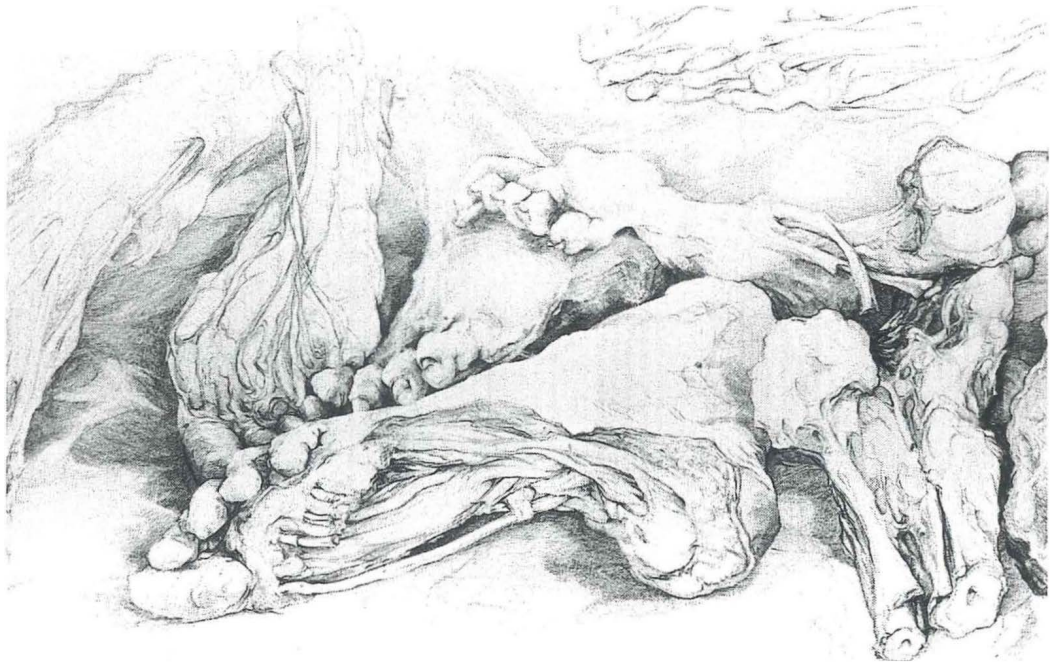

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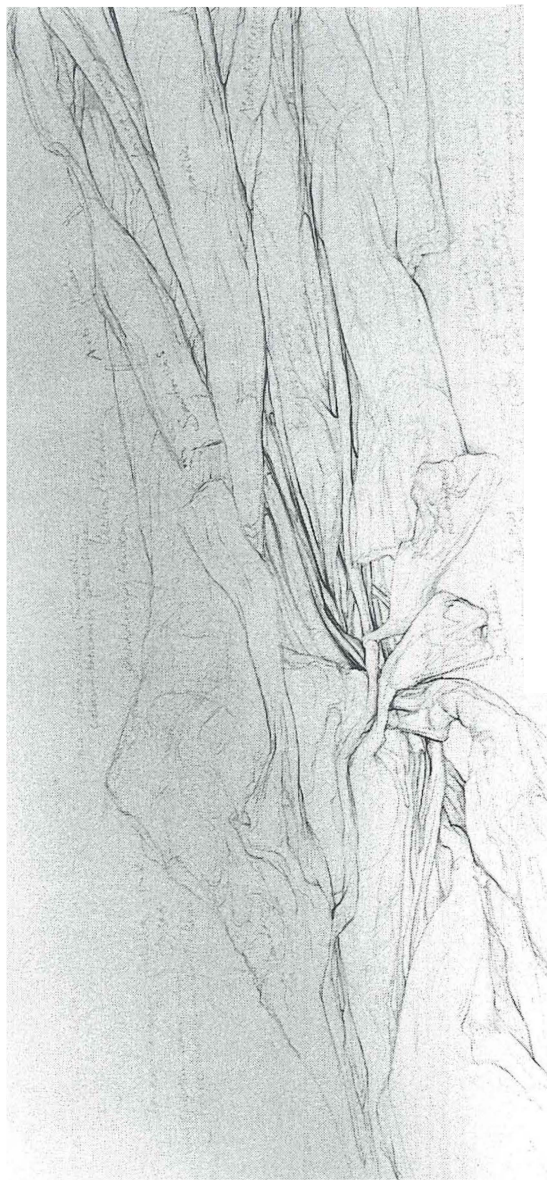

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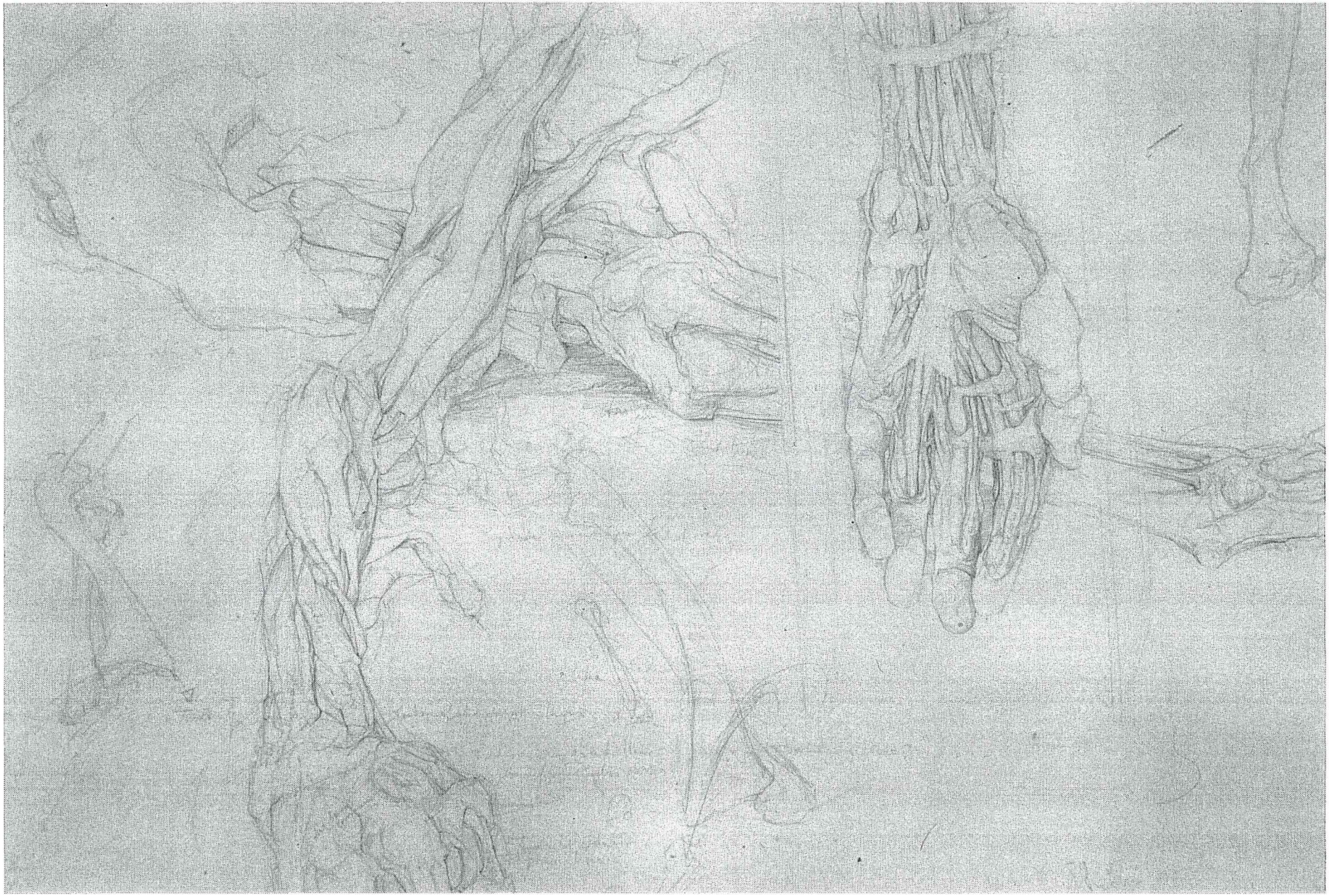
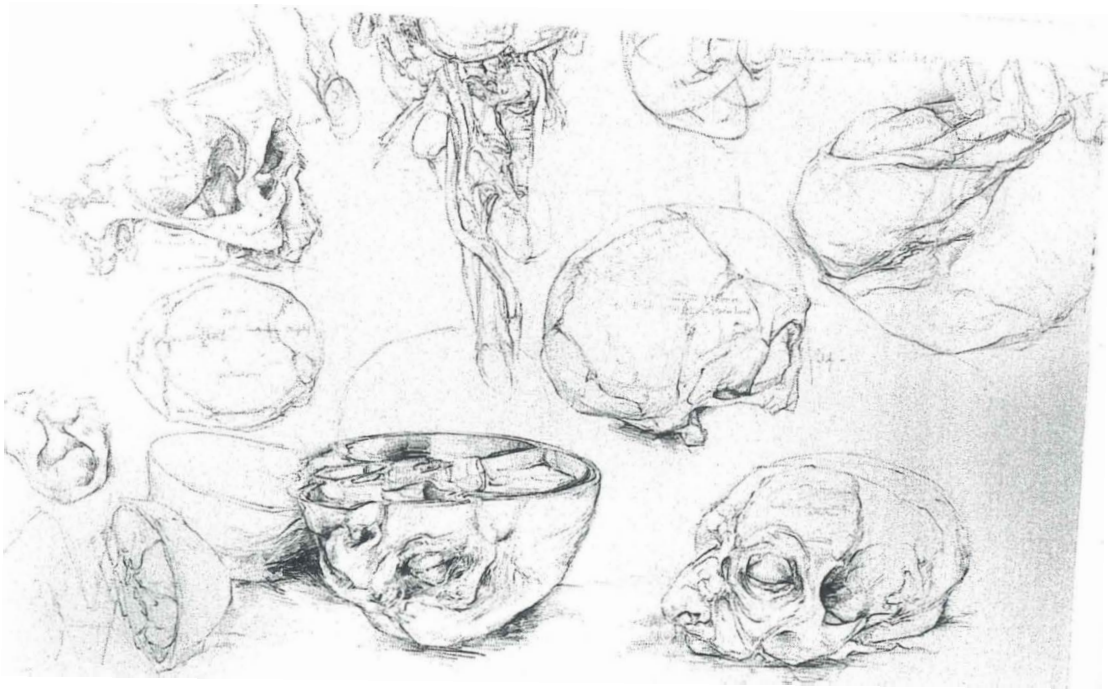


Sarah Simblet Three dissected arms, detail, 1995.

46



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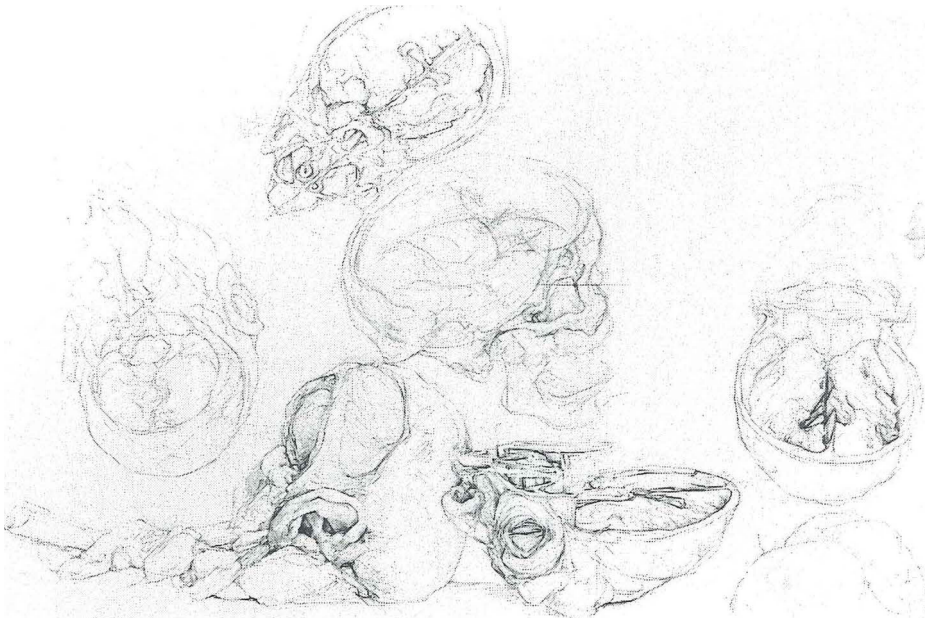

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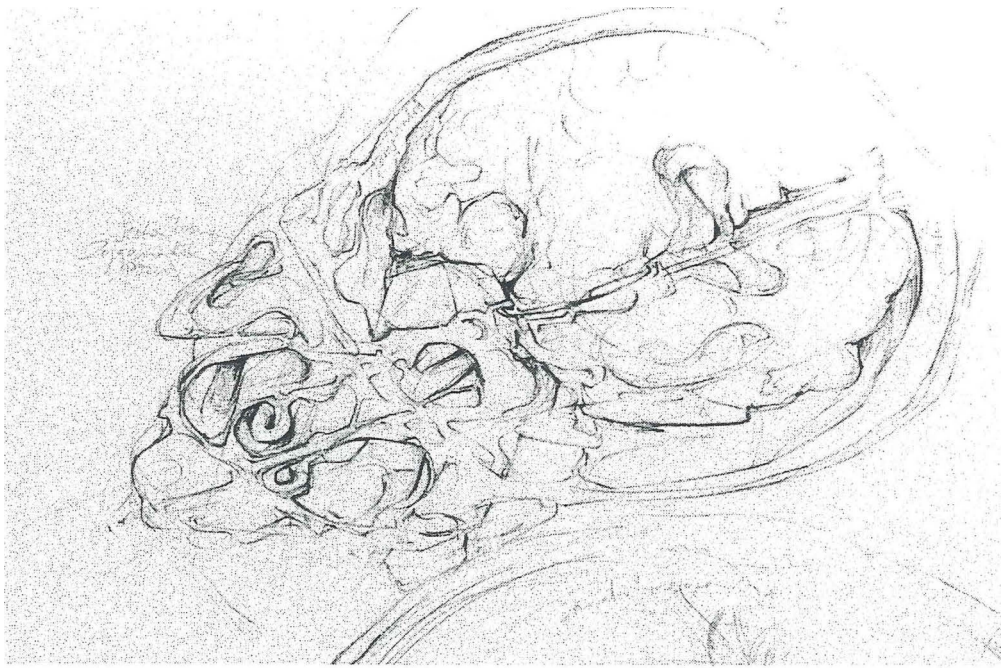
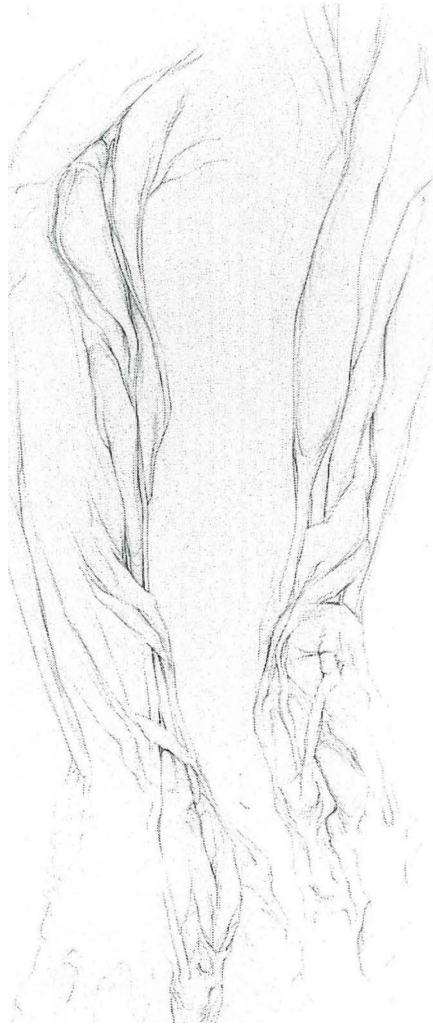
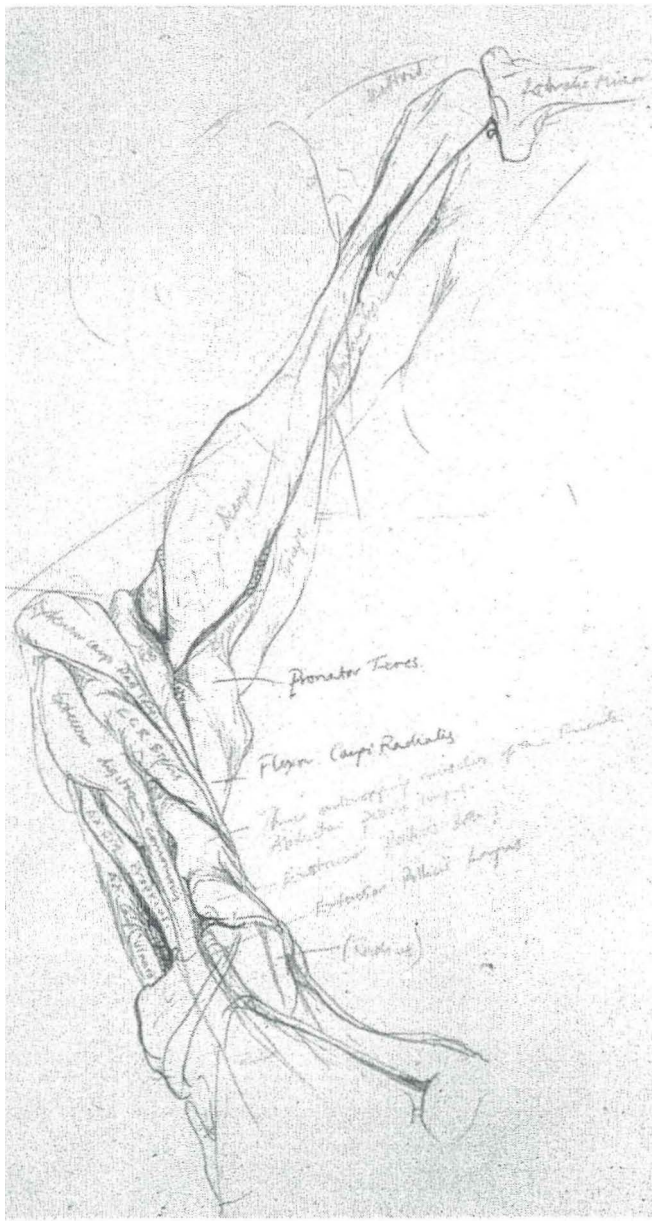
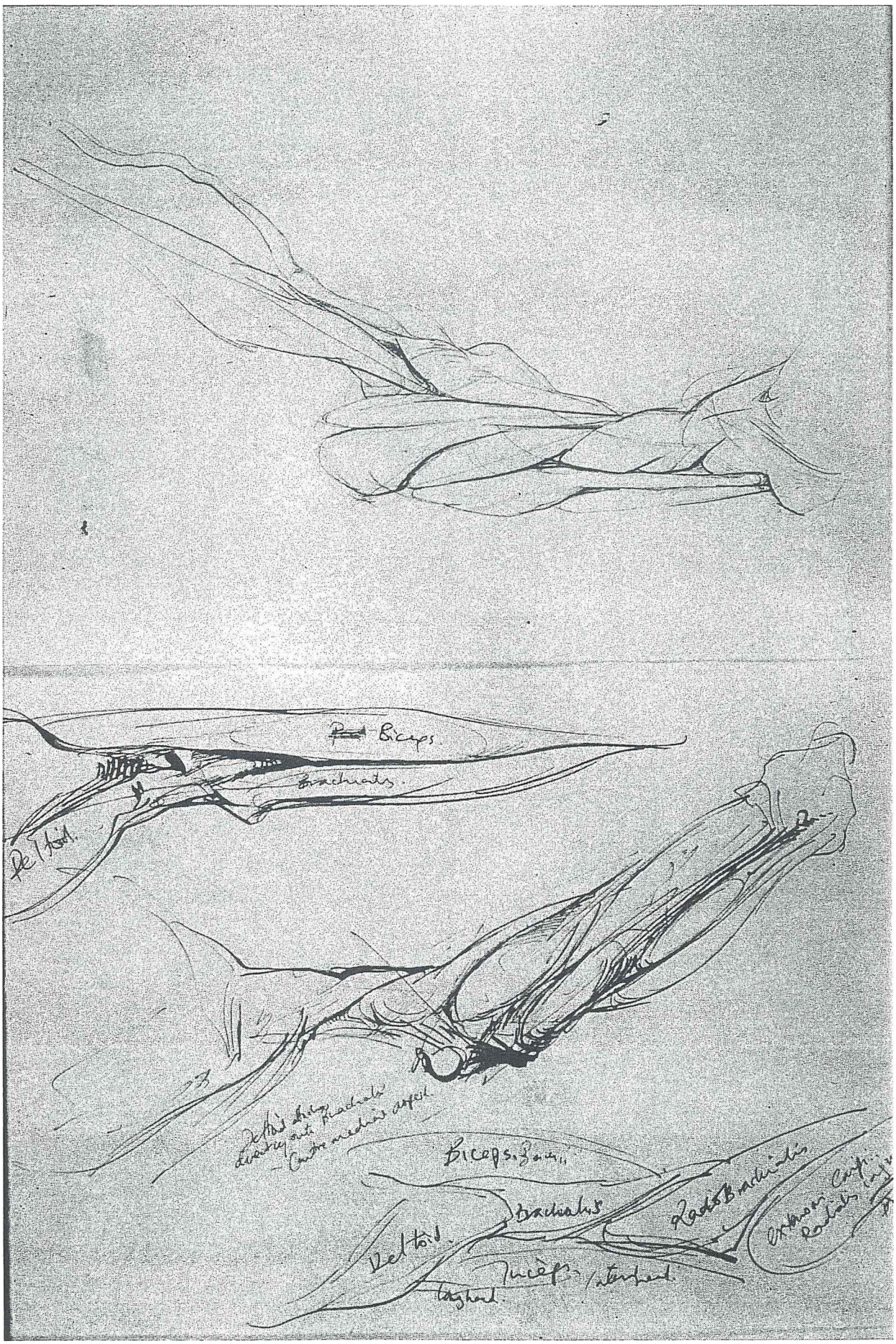


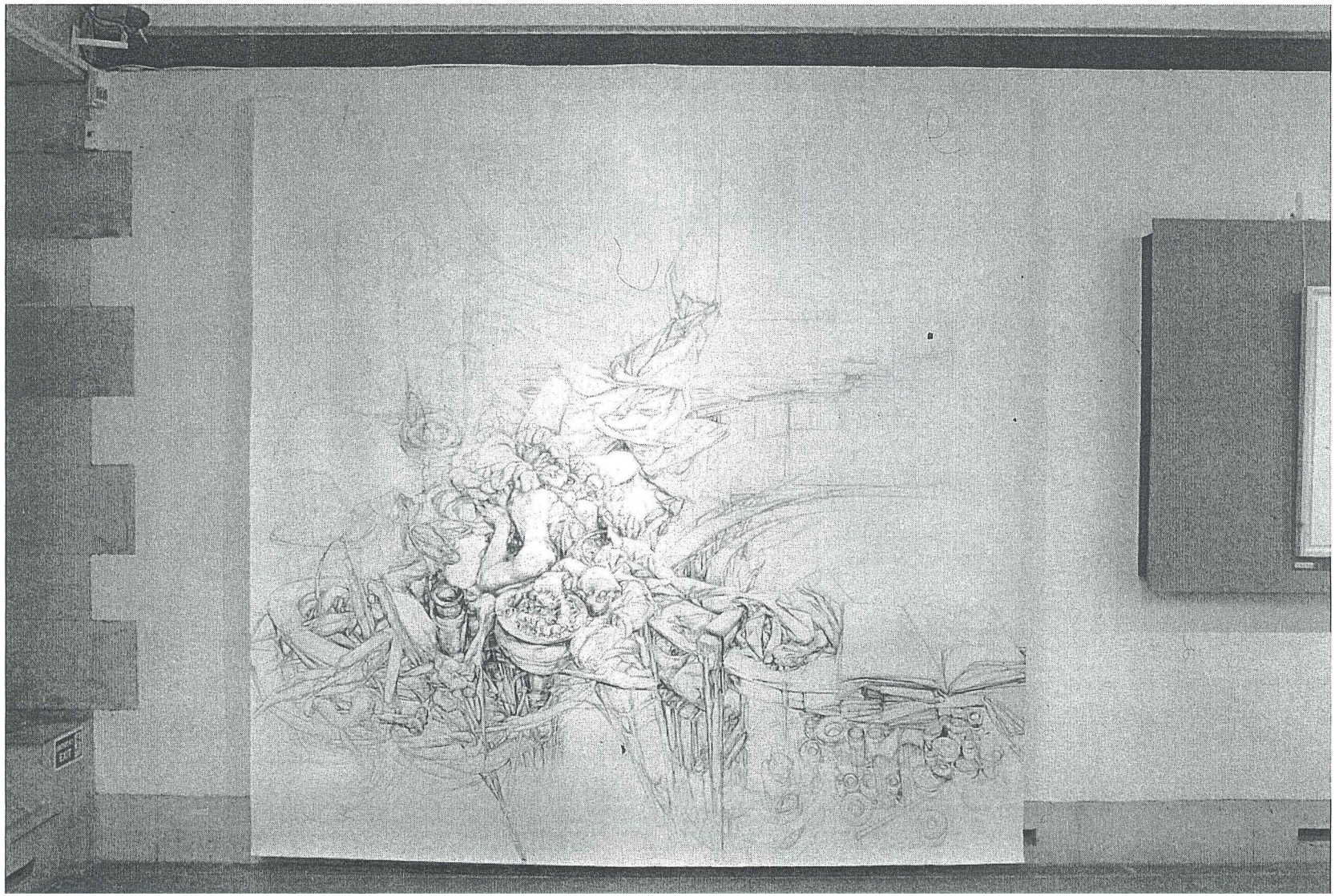
49




Pronator Teres
Flexor Carpi Radialis


Pectoralis M.

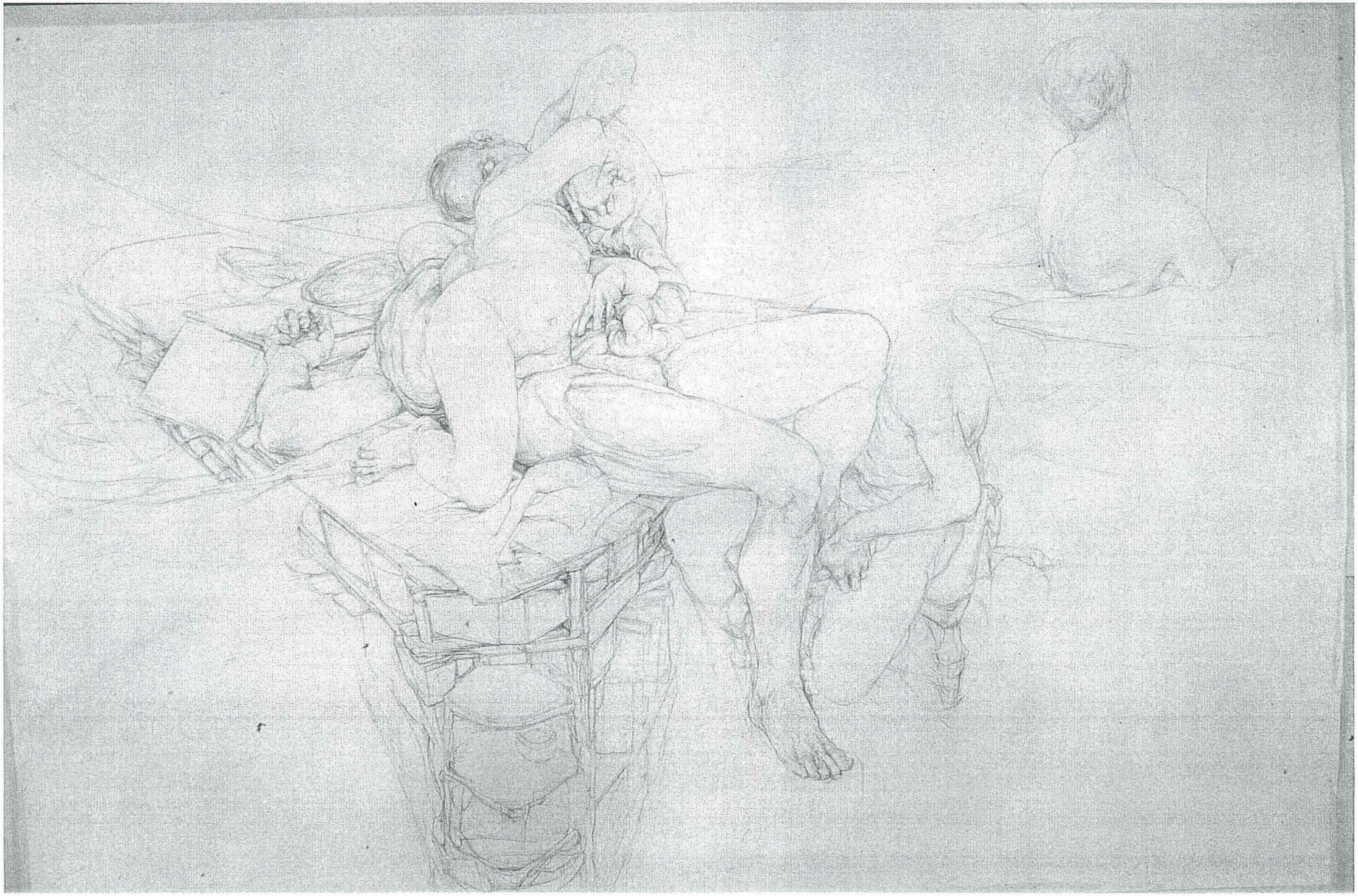

Biceps.
Brachialis.
Deltoid.
Biceps. Brachialis.
Brachialis
Deltoid.
Triceps. Lateral head.
Long head.

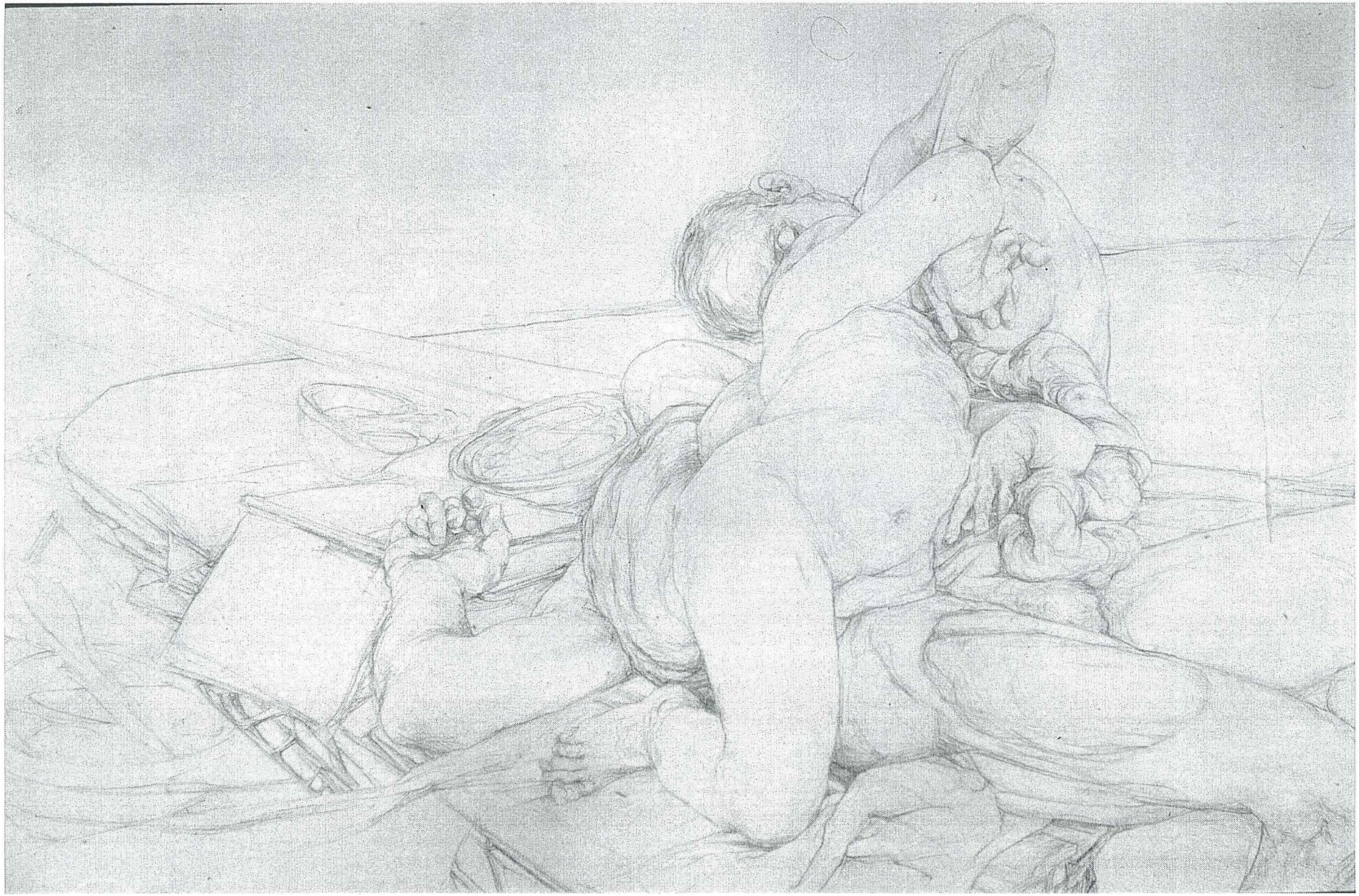


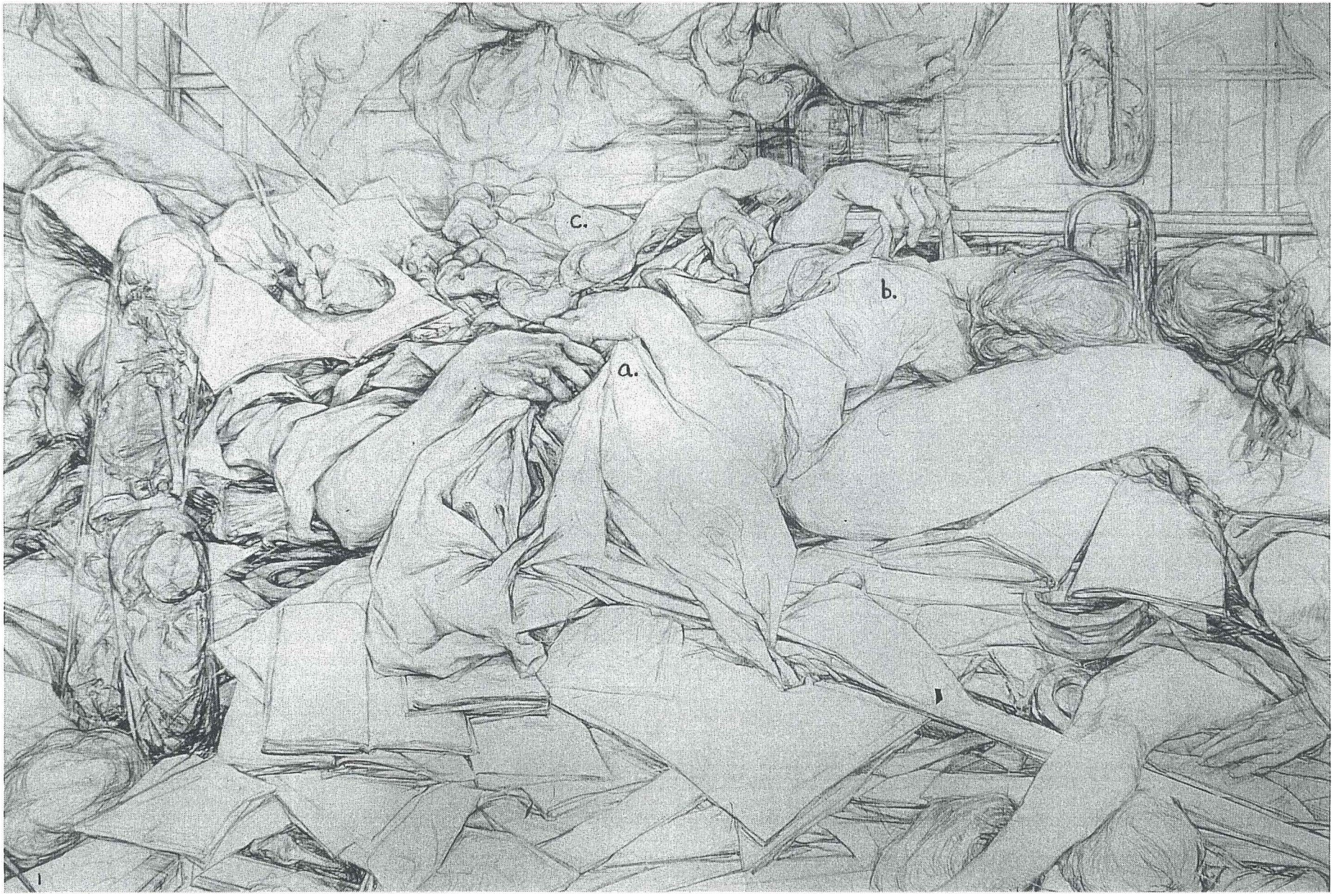

h
f.
a.
b.
e.
g.
c.
d.

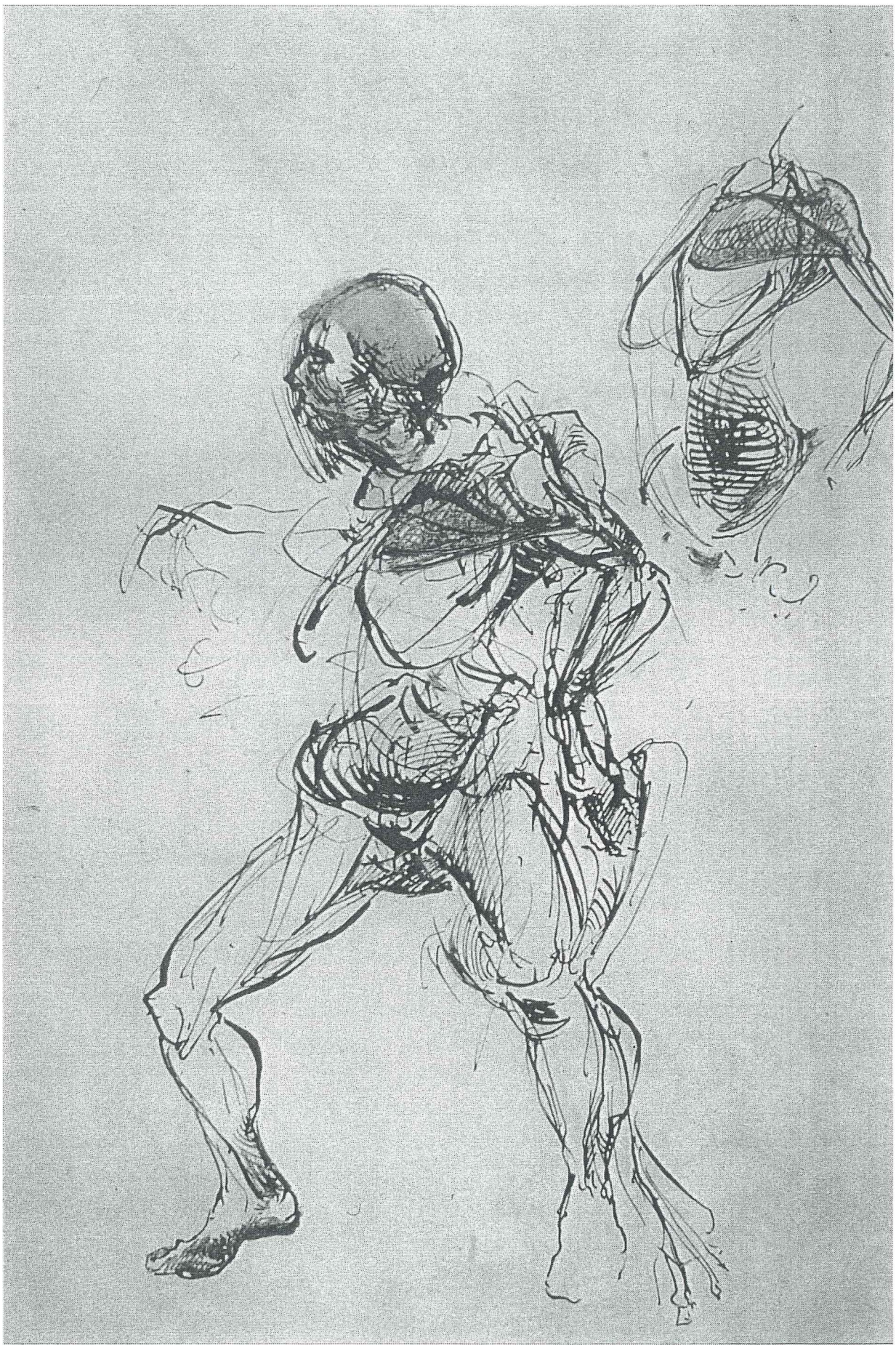
55

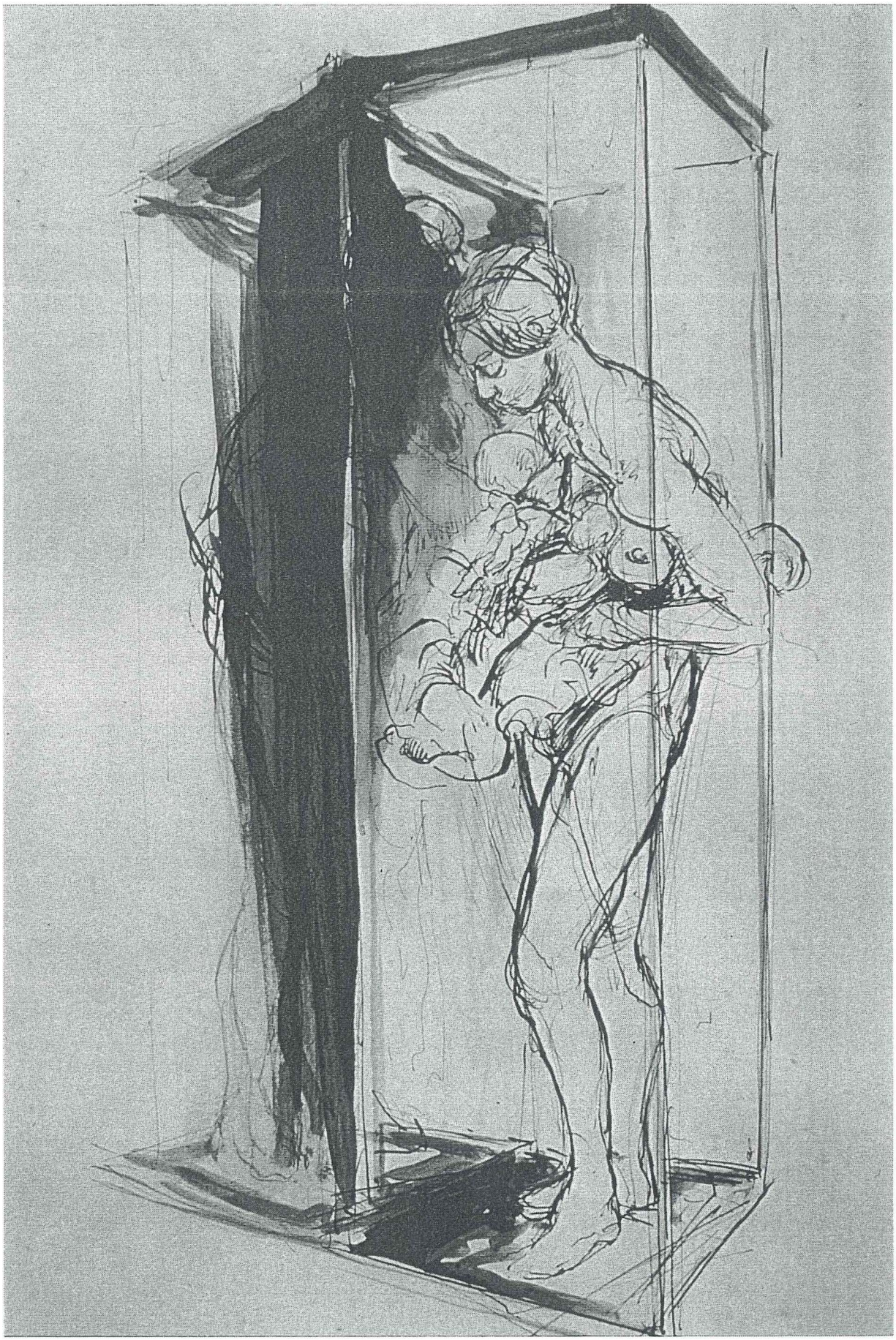
56

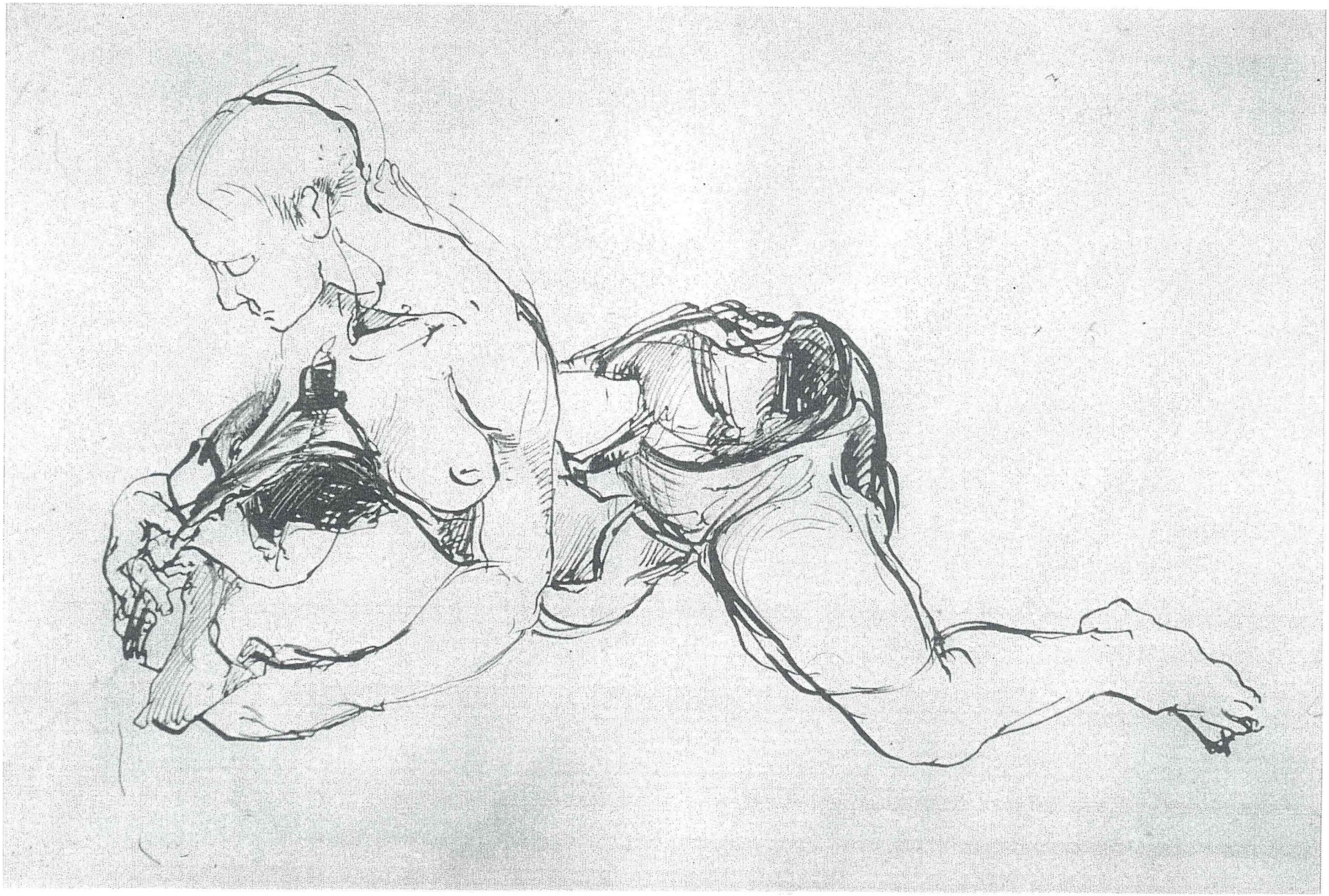





c.
b.
a.







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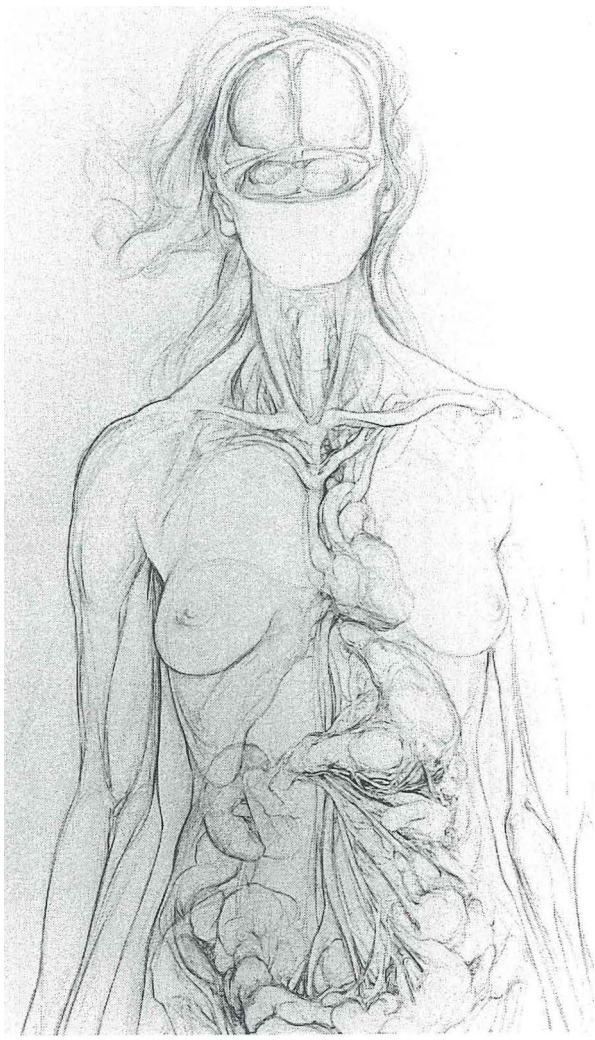

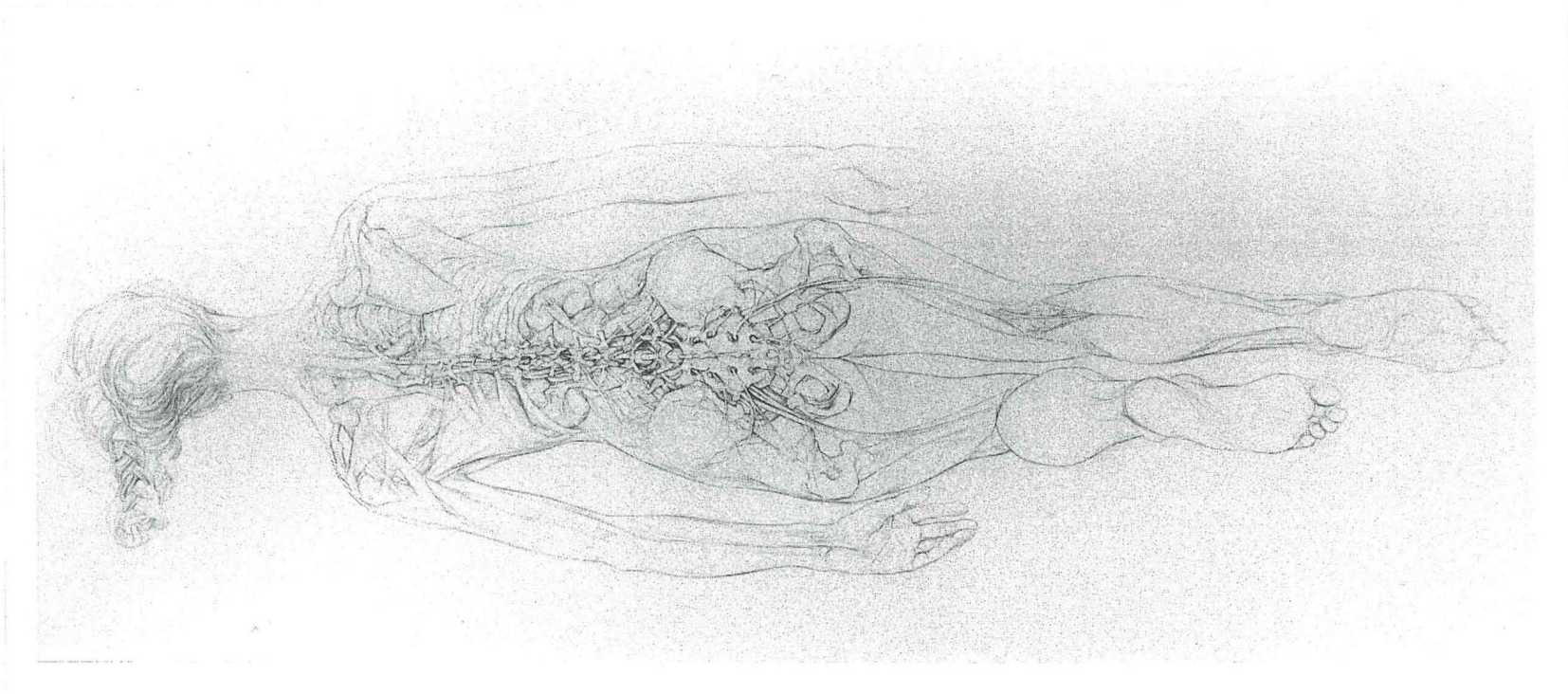

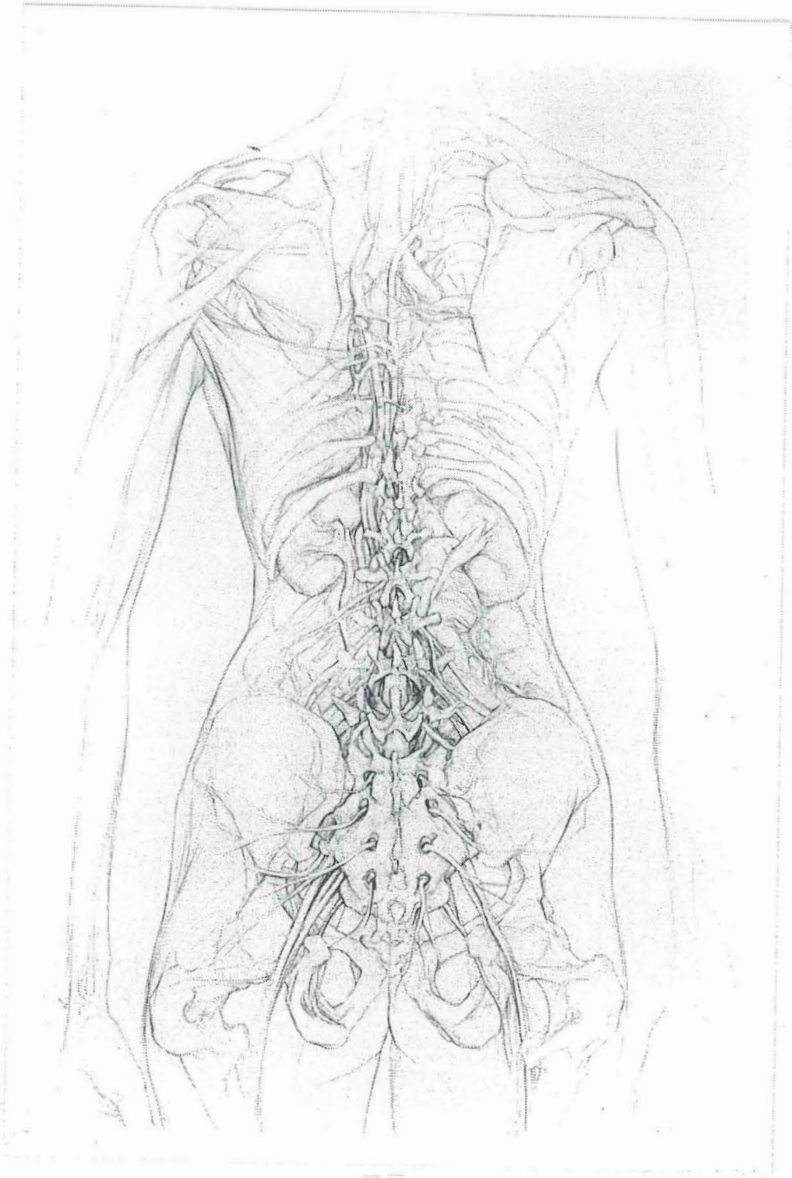

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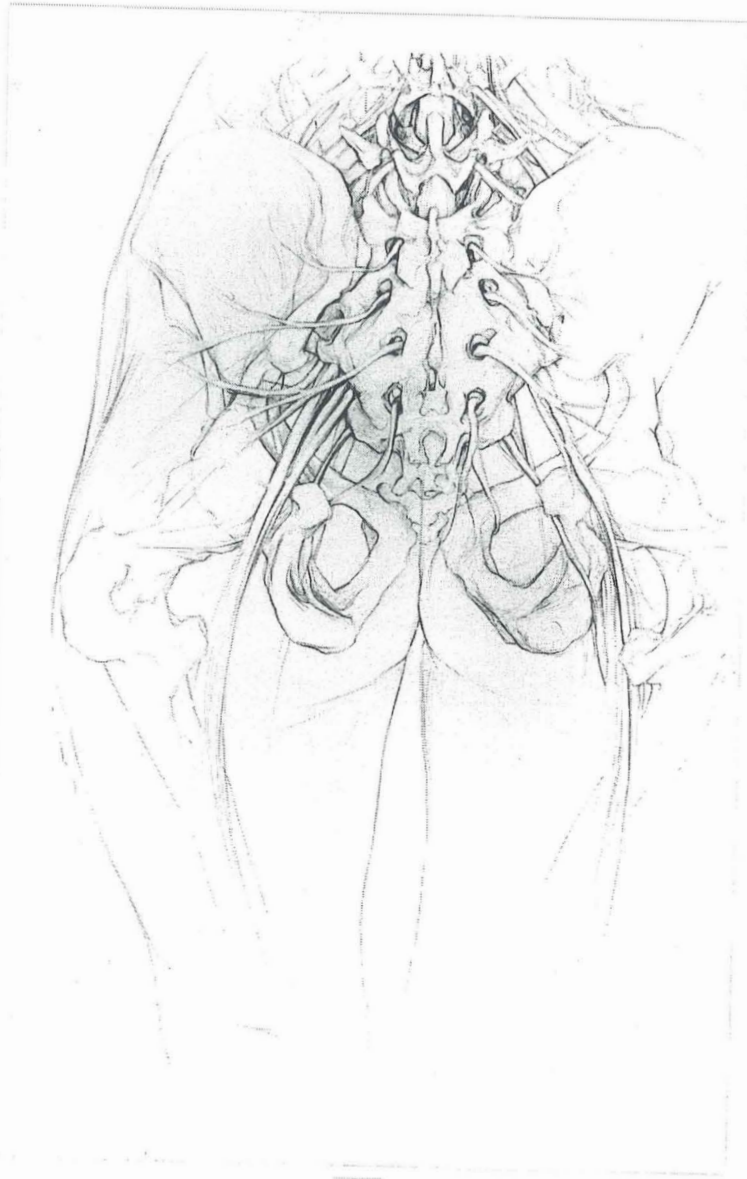

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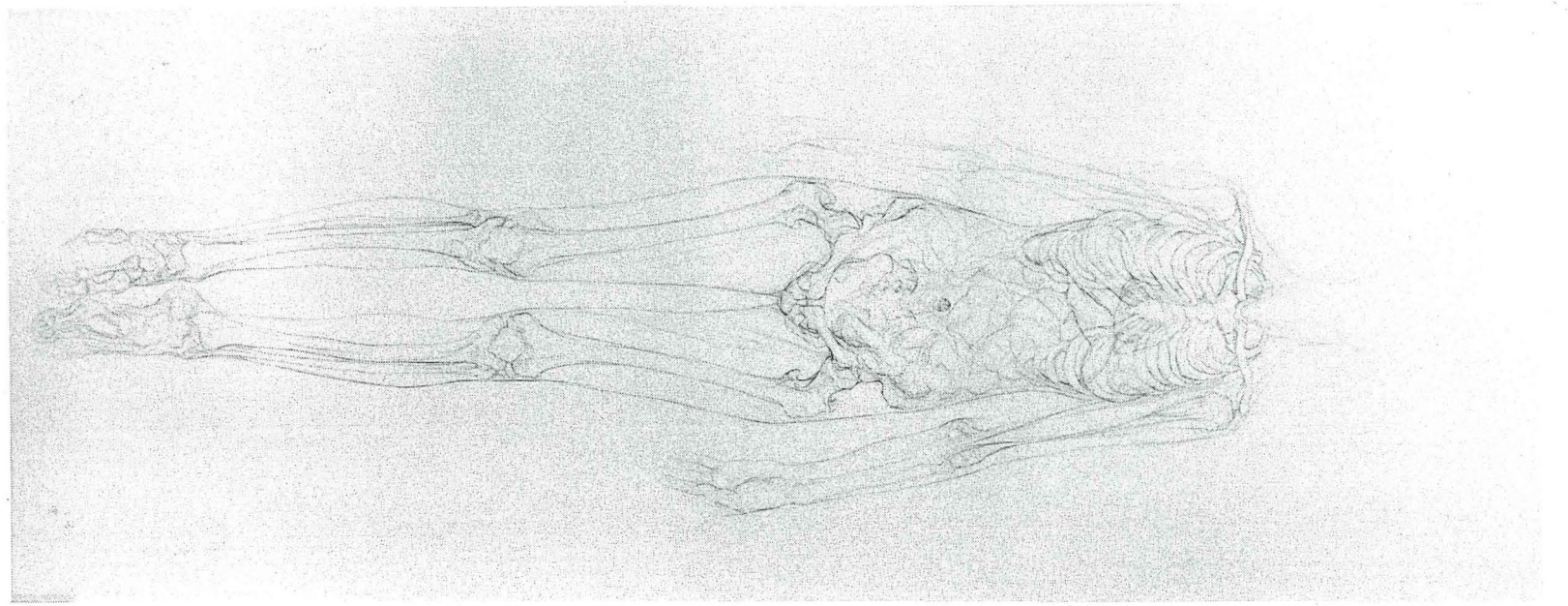

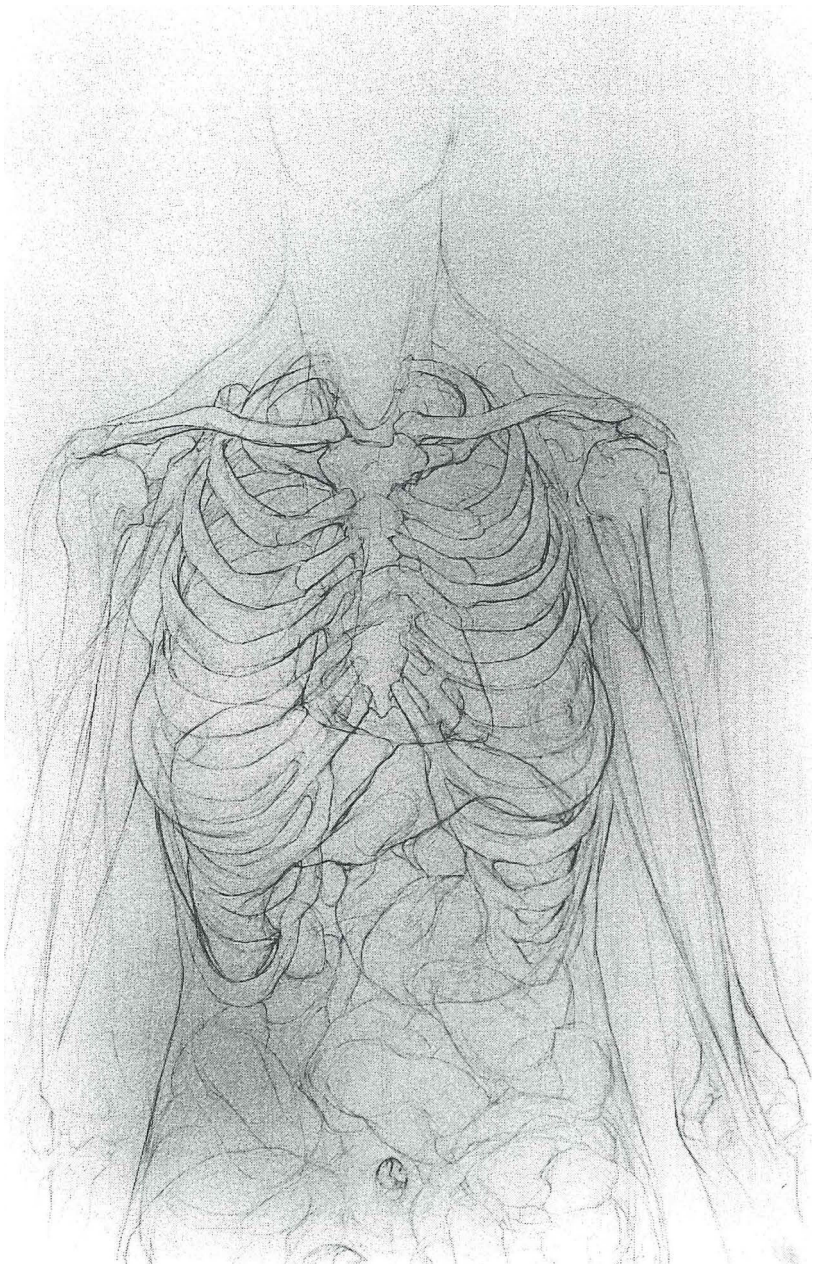

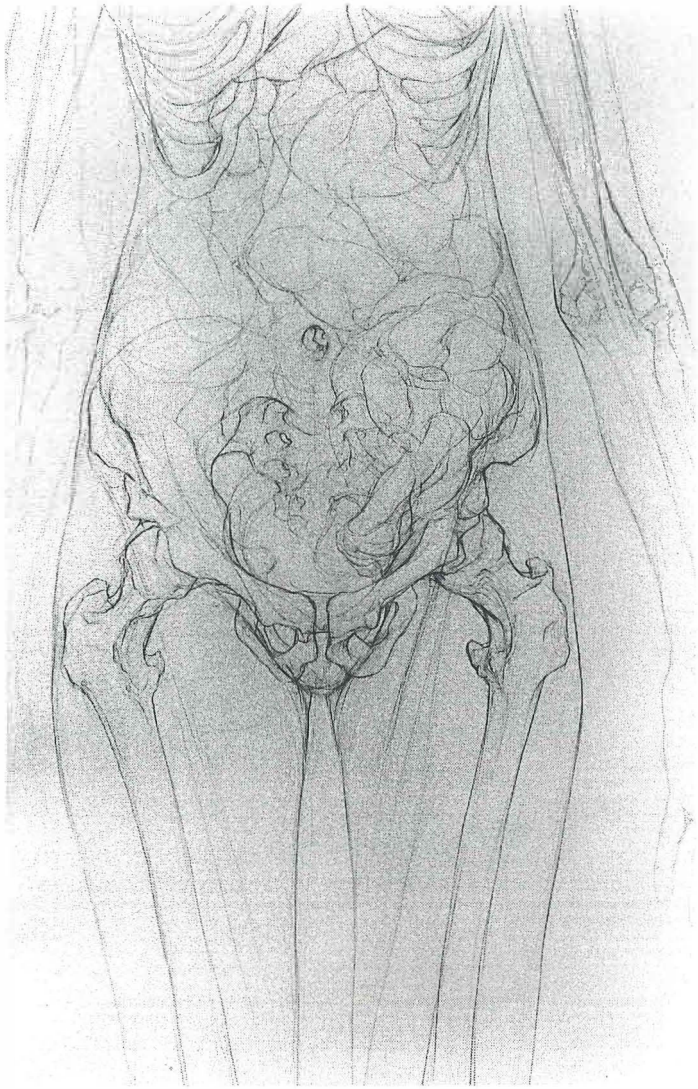

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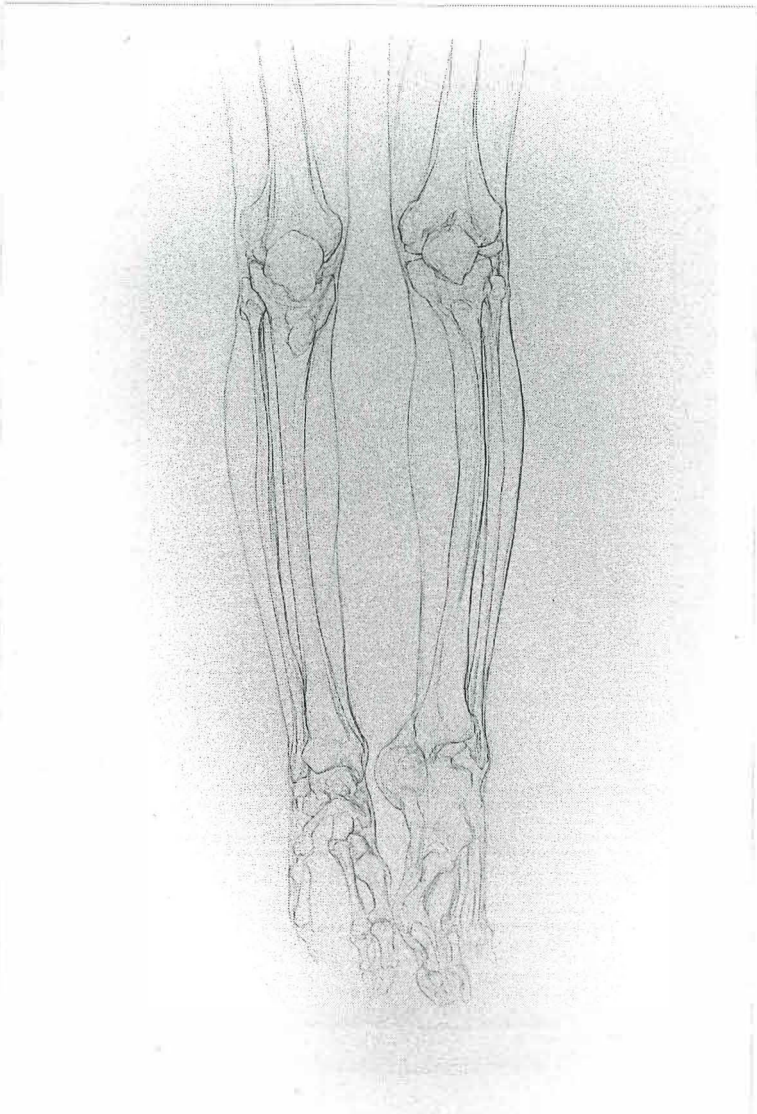

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