# Normalising whiteness: the use of standardised anatomical models in British university teaching, 1860-1910

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I, Rebecca Martin, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

## Abstract

Between 1800 and 1900 both the style and materials used to model normal human anatomy changed drastically. Whilst pre-1800 models in wax have been studied extensively, late-nineteenth century models in plaster and mixed materials have been relatively neglected within the historiography. This thesis investigates these late-nineteenth century models within anatomical education at British universities between 1860 and 1910, with the view to understanding their meaning. I question how meaning is assigned to objects in the past, considering the social construction of meaning and any material or spatial limitations on the production of meaning. I explore the possibility of meaning embedded within the materiality of the models themselves. By demonstrating that these later anatomical models are both aesthetically and materially distinct from their wax predecessors, I argue that they are also epistemologically discrete. Later models, generalised and abstracted, were no longer able to represent the individual body. As a result, they also played a new role within the material context of the anatomical classroom. These models acted as three-dimensional representations of a norm, challenging the perception that anatomical models substituted for cadavers in cases of low body supply. The whiteness of this new generalised norm is highlighted by the research into racial anatomical difference performed by anatomy professors, which suggests but does not confirm that this norm is also an idealisation of whiteness. I propose that a fuller understanding of the relationship between these theories and the meaning of models can be achieved using a new methodology from marketing theory. This approach strengthens traditional historical and material culture studies methodologies, focusing on the creation of meaning through use. Following the marketing theory framework, I demonstrate that these theories of racial difference were present during teaching illustrated with models, thus confirming that these models were used to represent not only whiteness as a norm but also whiteness as an ideal.

## Impact statement

This thesis addresses anatomical models traditionally ignored by nineteenth-century history of science using a methodological framework not yet applied in historical scholarship. As such, the academic impact of this thesis is threefold. Firstly, it provides data on anatomical teaching models in the late-nineteenth century, not recorded elsewhere, to the wider academic community. In doing so, I aim to inspire further work on these models which are currently neglected within the historiography. Secondly, this thesis introduces historians to a new methodology from marketing theory which expands our understanding of the ways through which humans assign meaning and value to objects. This stands to aid work on the history of the unwritten past, allowing further insight into those parts of the historical record. Finally, this thesis demonstrates how this new methodology can be used as part of an interdisciplinary approach to history, offering a more holistic account of the past. This impact will be achieved through the dissemination of outputs within academic journals.

However, this work could also have significant impact outside of academia. This work was inspired by two concerns. Firstly, concern over a widespread assumption that anatomical knowledge is neutral or purely factual. This thesis encourages people to challenge this belief by demonstrating the ways in which theory can affect the production of anatomical knowledge. Secondly, concern that models in the late-nineteenth century style continue to be used in classrooms today. This thesis demonstrates not only how these models were interpreted using scientific racism, but how they contributed to perpetuating a narrative of white superiority within the anatomical classroom. Specifically, I demonstrate that a white norm is not theoretically neutral. This work is timely, as anatomical teaching materials may currently be experiencing a paradigm shift. Traditional three-dimensional models and textbooks are now in competition with computerised three-dimensional visualisations, such as the Anatomage table and 3B Smart Anatomy, both of which allow for the storage of multiple iterations of the human body. Traditional three-dimensional modellers like Adam,Rouilly are also beginning to expand their ranges to include black models. This thesis has the power to impact the design of these new anatomical teaching materials as they develop. Demonstrating the ways in which prejudices and cultural biases have entered these objects in the past, this work encourages present day manufacturers to be more aware of the ways in which social theories might be influencing the production of their new anatomical technologies. I hope my work will encourage us to learn from the past, encouraging reflexivity over the motivation for the inclusion and exclusion of certain bodies within these works. In doing so, this work aims to increase the momentum towards representative diversity within our anatomical teaching technologies.

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# Introduction

We are currently experiencing a cultural moment beyond academia in which there is a rising awareness of structural racism and sexism. Specifically, a moment in which there is a collective heightened consciousness of the impact of racism and sexism on both representational norms and the production of scientific knowledge. Reni Eddo-Lodge, in her critically acclaimed book *Why I'm No Longer Talking To White People About Race*, has highlighted the ongoing frustration of people of colour in response to a presumed white normality.[1] Eddo-Lodge's frustration stems from anger with the white presumption that white experiences of social structures, like education and healthcare, are universal. In this way, Eddo-Lodge has educated white readers about the persistence of white normality within medical, scientific, and media settings. Angela Saini's books *Superior* and *Inferior* have built upon the same movement and encourage the reconsideration of knowledge about racial and sexual difference respectively.[2] Saini exposes the ways in which knowledge about difference has been produced, highlighting the ways in which bias and prejudice have influenced the production of this knowledge. She has encouraged swathes of people to reconsider knowledge that has long been presented to them as fact. This includes an appreciation of historical biases as well as an understanding of how these biases continue to influence knowledge production today. In an example that bears relevance to this thesis, Saini describes the case of the Neanderthal sub-species which when discovered was compared to Aboriginal Peoples and deemed to be, by association, mentally, socially, and technologically inferior to nineteenth-century European man. In contrast, recent DNA testing has revealed that the closest modern descendant of the Neanderthal is in fact the white European, which has led to vast reconsideration of Neanderthal humans as more socially advanced and intelligent than previously believed, simply by European association. Here, Saini demonstrates that both the original thinking which classified Neanderthals as primitive and the current era of repatriation are both heavily linked to white European perceptions of hierarchy within modern human-kind.[3] In doing so, Saini illustrates how bias and prejudice continue to influence the knowledge that the academic community produces today. Through this thesis, I

[1] Reni Eddo-Lodge, *Why I'm No Longer Talking to White People About Race: The Sunday Times Bestseller*, 01 edition (London, Oxford, New York, New Delhi, Sydney: Bloomsbury Publishing, 2018).
[2] Angela Saini, *Superior: The Return of Race Science- The Mad Science of Race and Its Fatal Return*, 01 edition (London: Fourth Estate, 2019); Angela Saini, *Inferior: How Science Got Women Wrong - and the New Research That's Rewriting the Story*, 01 edition (London: Fourth Estate, 2018).
[3] Saini, *Superior*, 18–20.

aim to contribute towards this movement by reconsidering the cultural influences upon the creation of anatomical models; a technology which has long been dismissed by those in positions of privilege as both universal and objective.[4] Human anatomy has long been considered a purely factual branch of science, performed by "disinterested" parties with no room for the performance of an agenda.[5] Although this view of anatomy has been challenged a number of times within scholarly research, it appears that this perception still persists, and change is slow.[6] Indeed, this same style of 'objective' anatomical model has been in continuous use for anatomical teaching for roughly the last one hundred and fifty years.

My thesis considers the meaning of these models of normal human anatomy at the time of their inception during the late-nineteenth century, both within British anatomical classrooms and in relation to the intellectual context of anatomical research into racial difference. During the nineteenth century, European models of normal human anatomy underwent a turbulent period of change, moving inconsistently but surely away from a mimetic depiction of the human body towards a generalised one. This transition involved changing materials from wax to papier-mâché to plaster, which I argue contributed towards this growing generalisation. However, it also involved different approaches to the creation of anatomical models, from the casting of models directly from cadavers to the creation of standardised moulds or specifications. These new models were used primarily within anatomical education, unlike their wax counterparts which were also used as part of sensationalised public anatomy exhibitions. Within the setting of British anatomical teaching, these anatomical models coexisted with a variety of other anatomical teaching materials. These other materials shaped the ways in which models were used, creating a resource gap that models of normal anatomy developed to exist within. More specific resources, like specimens and osteological collections, presented variations on the human form. These objects therefore emphasised the supposed normality of anatomical models and diagrams. However, the narrative which accompanied many of these preserved and osteological specimens was one of racial hierarchy. Specifically, a racial hierarchy which

[4] 'Medical Textbooks Use White, Heterosexual Men As A "Universal Model"', ScienceDaily, accessed 28 November 2019, https://www.sciencedaily.com/releases/2008/10/081015132108.htm; María José Barral Morán, 'Análisis crítico del discurso biomédico sobre sexos y géneros', *Quaderns de Psicologia* 12, no. 2 (2 December 2010): 105–16, https://doi.org/10.5565/rev/qpsicologia.756.

[5] 'The Late Professor John Goodsir', *The British Medical Journal* 1, no. 324 (1867): 308; This claim to distance and disinterestedness in the face of anatomy and surgery is continued into the twentieth century, as illustrated by Agnes Arnold-Forster, '"A Small Cemetery": Death and Dying in the Contemporary British Operating Theatre', *Medical Humanities* Online First (25 July 2019): 1–10.

[6] Linda Villarosa, 'How False Beliefs in Physical Racial Difference Still Live in Medicine Today', *The New York Times*, 14 August 2019, sec. Magazine, https://www.nytimes.com/interactive/2019/08/14/magazine/racial-differences-doctors.html.

prioritised whiteness. I demonstrate that this narrative was pervasive within anatomical research at five British universities during the second half of the nineteenth century and was encouraged by both formal and informal aspects of the discipline. However, as the final chapter of this work will demonstrate, it is only by understanding the use of anatomical models during the act of teaching that we can begin to understand the strength of the connection between these models and theories about racial anatomical difference.

The context of the anatomical classroom is therefore central to this thesis, both as a physical space in which people and objects interact and as a more abstract pedagogical concept or place which encompasses theory, practice, and use. In my efforts to understand the role of anatomical models in medical teaching, I found it necessary to understand the culture and spatiality of the anatomical classroom. I questioned what anatomical education was like in the second half of the nineteenth century and how students and teachers interacted within these spaces which physically contextualised model use.

Unlike modern classrooms, anatomical classrooms in the late-nineteenth century were dingy and overcrowded spaces. Late-nineteenth century anatomical lecture theatres, laboratories, classrooms, and museums were practically overflowing with teaching materials. Blackboards filled with diagrammatic and illustrative drawings and printed or hand-drawn diagrams filled empty wall spaces, whilst specimens and models filled shelves, cabinets, and sometimes even table space.[7] This problem of overcrowding persisted (although lighting and temperature control did seem to improve) despite numerous rounds of building work and expansion of anatomy departments as a result of continued collecting and ever-rising student numbers. Dissections rooms, on the other hand, were often less busy. Although diagrams may still have adorned the walls, there were usually far fewer cabinets of objects within these spaces and at most only one standing skeleton (as can be seen in the images in chapter three). These spaces were instead characterised by their stench, particularly in summer months, which could in effect crowd the space even if it was physically sparse.[8] Building plans at Oxford particularly noted the unsuitability of corrugated iron roofing on the dissection room, which made the space dark and dingy in winter and smell unbearable in summer.[9]

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[7] For a literary depiction of these conditions see H.G. Wells, *A Slip Under the Microscope*, Penguin Little Black Classics (London: Penguin Classics, 2015).

[8] H. M. Sinclair and A. H. T. Robb-Smith, *A History of the Teaching of Anatomy in Oxford*, 1st Edition (Oxford University Press, 1950), 21.

[9] Arthur Thomson, 'Address at the Opening of the New Department of Human Anatomy', October 1893, HA51, University of Oxford Special Collections, Bodleian Library; Anon., 'Human Anatomy at Oxford', *British Medical Journal* 2, 2, no. 1712 (21 October 1893): 902–3.

Within these spaces, different interactions between students and staff occurred. Professors and chairs of anatomy primarily gave lectures and would directly interact with the students less outside of these spaces. However, their research and theoretical interests could have profound impact on the wider direction of the department because they were also overarchingly responsible for the curation of cabinets and museums, as well as for demonstrations and dissections. This work was rarely undertaken by professors themselves and museums and dissection rooms would usually have been supervised by other members of staff. Demonstrations and dissections, for example, were usually led by recent graduates with similar research interests to the professor or chair, some of whom were building teaching experience for future academic careers.[10] These graduates worked under the oversight of senior demonstrators, who often stayed in post for decades and were revered for their extensive practical expertise in the subject.[11] As such, the establishment of a theoretical culture not just departmentally but across the discipline took work from a number of actors. Job applications show that applicants stressed their commitment to ideas of racial categorisation in order to appeal to those on hiring panels, whilst discussions at a disciplinary level show that racial anatomical difference was an important consideration for anatomists across Britain.[12] The culture of teaching, where multiple actors worked together to produce students ready for medical practice, is indicative of the ability of these multiple actors to collaborate towards a goal. It is within these spaces, shaped by interpersonal relationships, that I ask what role models played in the anatomical classroom and how they interacted with theories of racial anatomical difference.

This thesis was inspired by a whiteness I perceived in the physical teaching materials of anatomy during the completion of previous work.[13] In particular, it surprised me that there was such pervasive whiteness within these materials given the concurrent nineteenth-century rise of research into racial difference charted by scholars such as Nancy Stepan.[14] There seemed to be a juxtaposition between these two dissonant narratives – one in which race was seemingly irrelevant and another in which racial difference was crucial – existing harmoniously side-by-

[10] E.g. Arthur Thomson who demonstrated at Edinburgh before moving down to Oxford as a lecturer.
[11] E.g. Charles Robertson who served in post as demonstrator at Oxford from 1860 to 1891.
[12] 'Book 603198197- Letters of Application and Testimonials, Various', 1889, University of Oxford, Bodleian Library, Closed Stack; 'Proceedings of the Anatomical Society of Great Britain and Ireland', 1887, Ms Add 282/D/3, University College London, UCL Archives, UCL Special Collections.
[13] Rebecca Martin, 'Evolutionary Anatomy: A Cult of Personality? An Investigation into the Perpetuation of Evolutionary Based Anatomical Study through Teaching at the University of Oxford, c.1850-1900' (MSc History of Science, Medicine, and Technology, Oxford, University of Oxford, 2014).
[14] Nancy Stepan, *The Idea of Race in Science : Great Britain, 1800-1960* (Hamden, Conn: Archon Books, 1982).

side within the anatomical discipline. This led me to question the meaning of these white anatomical models. Were they designed to represent the anatomical similarities between all people, as they are presented today, or to represent notions of white supremacy? A somewhat pressing concern, given that many of these original nineteenth-century white anatomical models are still used within medical anatomy teaching today.[15] Both of these explanations present plausible meanings for these anatomical models in the late-nineteenth century context. In 1775 Johann Friedrich Blumenbach established the separation of mankind into five distinct races, a theory of racial division developed and expanded throughout the works of nineteenth century anatomists (see chapter four).[16] Where conversely, in 1836 Frederick Teidemann argued that there were no significant anatomical difference between the races; a well-known idea, although studied by a comparatively much smaller group of scientists.[17] As such, I began to consider how we establish the historical meaning of objects. I questioned whether meaning was embedded within objects, whether it was constructed within the spaces in which they were kept, or whether it was socially and intellectually constructed. Primarily, I questioned who assigned meanings to objects and how this constructed meaning has travelled, propagated, and established itself across the anatomical discipline.

These questions have been addressed methodologically by a number of different streams of scholarship. The concept of materially embedded knowledge has been addressed by the sociologist Harry Collins who has shown that logically it is not possible to perfectly transfer practical knowledge as a result of both tactility and varying expertise.[18] Historically this concept has been explored within considerations of the movement of knowledge, inspired by James Secord's foundational article 'Knowledge in Transit'.[19] This branch of historical scholarship agrees that there is a change in the knowledge surrounding an object during its movement, with scholars like James Poskett and Lawrence Dritsas demonstrating the importance of accompanying paperwork in the interpretation of objects within new spatial contexts.[20] Within

[15] Jon Cornwall and Chris Smith, 'Anatomical Models by F.J. Steger (1845-1938): The University of Otago Collection', *European Journal of Anatomy* 18, no. 3 (2014): 209–11.
[16] Johann Friedrich Blumenbach, *De generis humani varietate nativa* (Gottingae : Vandenhoek et Ruprecht, 1775).
[17] Frederick Teidemann, 'On the Brain of the Negro, Compared with That of the European and the Orang-Outang', *Philosophical Transactions of the Royal Society of London* 126 (1 January 1836): 497–527; Luigi Calori, 'Cervello di un negro della Guinea illustrato con otto tavole litografiche', *Memorie dell'accademia delle Scienze dell'Istituto di Bologna* 2, no. 5 (1865): 177–212.
[18] H. M. Collins, *Changing Order: Replication and Induction in Scientific Practice* (London; Beverly Hills; New Delhi: SAGE Publications, 1985).
[19] James A. Secord, 'Knowledge in Transit', *Isis* 95, no. 4 (December 2004): 654–72.
[20] James Poskett, 'Moulding the African Mind: Phrenology, Slavery, and the Material Culture of Scientific Racism, 1791-1861' (STS Research Seminar Series, University College London, 20 January 2016), http://www.ucl.ac.uk/sts/sts-publication-events/calendar_archive/copy_of_2015_12_16_seminar;

this thesis, I consider which elements of knowledge travel with objects and which elements are subject to change or interpretation with respect to late-nineteenth century anatomical models. Working with the concept of limitations, I demonstrate that the materiality of travelling objects must have had some impact on meanings assigned to them; I argue that although materiality cannot necessarily dictate meaning, it can limit the scope of possible meanings. Whilst other scholars, such as John Styles, have approached the emotional meaning of objects by linking the context in which objects were found to perceptions of those materials within wider society.[21] Chapters three through six of this thesis replicate my attempts to extract this kind of meaning from the spatial context of discovery and wider historical records surrounding anatomical models in a number of different ways.

This work has been somewhat hampered by the chronically understudied nature of late-nineteenth century models of normal human anatomy within the historical literature. Whilst Anna Maerker has researched the models of Dr. Louis Jerome Auzoux extensively, later anatomical models by modellers such as Vasseur-Tramond, Steger, and SOMSO have been paid little attention within the extant literature.[22] As such, this thesis contributes to the research performed on these important but ignored anatomical objects, whilst providing an interdisciplinary analysis of their meaning. In doing so, this thesis draws from Maerker's work on more traditional eighteenth-century anatomical models. Following her example, I have understood the meaning of anatomical models by considering the interpersonal relationships of those working with these objects and the impact of these relationships on the values assigned to models.[23] However, I present a different perspective on this creation of meaning, focussing

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Lawrence Dritsas, 'From Lake Nyassa to Philadelphia: A Geography of the Zambesi Expedition, 1858-64', *The British Journal for the History of Science* 38, no. 1 (2005): 35–52.

[21] John Styles, 'Objects of Emotion: The London Foundling Hospital Tokens, 1741-60', in *Writing Material Culture History*, ed. Anne Gerritsen and Giorgio Riello (London: Bloomsbury Academic, 2015), 165–71.

[22] Anna Maerker, 'Human Models', Text, Explore Whipple Collections, 2008, http://www.hps.cam.ac.uk/whipple/explore/models/drauzouxsmodels/humanmodels/; Anna Maerker, 'Dr. Auzoux's Papier-Mâché Models', Text, Explore Whipple Collections, 2008, http://www.hps.cam.ac.uk/whipple/explore/models/drauzouxsmodels/; Anna Maerker, 'Anatomizing the Trade: Designing and Marketing Anatomical Models as Medical Technologies, ca. 1700-1900', *Technology and Culture* 54, no. 3 (July 2013): 531–62; Anna Maerker, 'Models and Materials in Europe 1650-1890', in *Designing Bodies: Models of Anatomy from Wax to Plastics*, ed. Elizabeth Hallam (London: The Royal College of Surgeons of England, 2015), 46–61; See also M. Dreyfuss, 'The Anatomical Models of Dr. Auzoux', *Medical Heritage* 2, no. 1 (February 1986): 60–62; and B. W. J. Grob and K. S. Groos, *Early Surgical Instruments. The Anatomical Models of Dr. Louis Auzoux. The Laboratory Equipment of Willem Einthoven.* (Leiden: Leiden: Museum Boerhaave 2004., 2004); Only more scientifically oriented papers are available on Steger and Vasseur-Tramond models including Cornwall and Smith, 'Anatomical Models by F.J. Steger'; and J. F. Pastor et al., 'Uncovered Secret of a Vasseur-Tramond Wax Model', *Journal of Anatomy* 228, no. 1 (January 2016): 184–89.

[23] Anna Maerker, '"Turpentine Hides Everything": Autonomy and Organization in Anatomical Model Production for the State in Late Eighteenth-Century Florence', *History of Science* 45, no. 3 (2007): 257–

on the professors and students who used these models during their research and study, rather than on the modellers who created them. This focus is in part a response to the work by Secord, Dritsas, and Poskett outlined above, as a focus on the users of objects can capture meaning at various stages in the life and travels of an object. Meanwhile, my consideration of the role of intellectual theories about human anatomy in the creation of meaning for late-nineteenth century anatomical models draws inspiration from Nick Hopwood's concept 'plastic publishing'- model creation as a means of publishing in three-dimensions rather than in written form.[24] Hopwood has concretely demonstrated the relationship between the production of three-dimensional embryological models by Adolf Zeigler and the embryological theories of anatomists Wilhelm His and Ernst Haeckel. Hopwood has connected the marketing of Zeigler's models with academic papers published by His and Haeckel to define Zeigler's models as a form of 'plastic publishing'. Although with generalised models of human anatomy there is not this link between theory and model at the production stage, Hopwood's work demonstrates the possibility of assigning meaning to models at the hand of academic theories. As such, this thesis investigates whether a similar assignation of meaning linked to academic theories might be possible later in the life of generalised models, through their use as objects of research and study.

## Chapter outlines

The elusive nature of the links between objects, theories, and meaning, has encouraged me to draw upon a range of approaches from the highly interdisciplinary field of material culture studies. Beginning in chapter two, I explore the concept of embedded meaning from a largely art-historical perspective. This approach allows me to consider the models first before the records which accompany them. Focussing on the means and materials of model production, as well as the visual and physical aspects of a range of nineteenth century anatomical models, I consider the impact of construction and form upon meaning. In this chapter I examine the models purchased by university anatomy departments in Britain chronologically to examine design change over time. This focus on university teaching allows me to concentrate on the models which were popular teaching aids, rather than on the full mass of models produced during this period. This chronological investigation reveals the inconsistent nature of model

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[24] Nick Hopwood, 'Plastic Publishing in Embryology', in *Models : The Third Dimension of Science*, ed. Soraya De Chadarevian and Nick Hopwood, Writing Science Y (Stanford: Stanford University Press, 2004), 170–206; Nick Hopwood, *Embryos in Wax: Models from the Ziegler Studio* (Cambridge: Whipple Museum of the History of Science, 2002).

development during the 1800s. This century can therefore be considered a site of development, overseeing the incorporation of new methods and ideas into anatomical modelling. However, although the development of models during the century is uneven, I argue that the change in modelling design from the beginning to the end of the century is both demonstrable and complete. Through this chronological investigation, it also becomes possible to quantitatively link the materials of production with the level of generalisation within a specific model. This is an important connection, demonstrating a double break with mimesis in the later models.[25] I argue that this break with mimesis had ramifications for the knowledge that could be produced around these models. Drawing further on methods from Art History, I examine the two distinct styles of model, both eighteenth century wax and late-nineteenth century plaster, iconographically and iconologically.[26] Doing so not only confirms that the knowledge created around these two types of models would have been distinct, but also demonstrates that the later models were limited in their representations of the human body. These late-nineteenth century models were only able to present generalised knowledge about the body, whilst earlier models had been able to present both generalised and seemingly individual knowledge.

In chapter three I consider the spatial construction of meaning around these models, analysing the spaces of anatomical learning in which these models would have been situated and the other materials used to teach anatomy within these spaces. In doing so I draw upon methods of spatial and relational archaeology. These methods use the objects and spaces surrounding materials of interest in order to consider the historical role of those objects. Understanding the spatial elements of the various locations of anatomical teaching, the variety of materials which would have surrounded anatomical models, and their relative placement within these spaces allows me to consider the roles of these different materials within anatomical education. I begin by analysing the placement of models within each of the spaces of anatomical education, considering their use, storage, and movement between spaces. I then analyse the roles of other materials in the classroom, establishing the niche within the classroom available to the new style of anatomical model; the space that these items may have been designed to fill. I also draw upon the concept of missing materials presented by Harry Adamson by examining the surroundings of an object to understand its absence from certain situations. I consider why we may not see

[25] Mimesis, the act of attempting to imitate reality, is broken both in the move away from wax (a material which mimics moist skin, as discussed by scholars such as Ballestriero and Ebenstein) and in the generalisation of the human body within modelling which also moves away from realism in form.
[26] Erwin Panofsky, *Studies in Iconology: Humanistic Themes in the Art of the Renaissance*, Mary Flexner Lectures 7 (New York: Oxford University Press, 1939).

anatomical models within some of the historical spaces that we expect to see them: specifically, the dissection room.

Chapter four then considers the creation of meaning for late-nineteenth century models within their social and intellectual context, examining both the research interests of professors of anatomy as well as their interpersonal relationships. I analyse the works and relationships of these professors individually and divided by institution. In doing so, I demonstrate both the prevalence and pervasiveness of ideas about racial anatomical difference across personal and institutional boundaries. It is evident that interpersonal relationships and informal modes of discipline building helped to influence the research interests of professors, including student-teacher and mentor-mentee relationships as well as networks of correspondence. I argue that these relationships helped to perpetuate an interest in racial anatomical difference in long lines of successive anatomy professors. However, I also demonstrate that more formal aspects of the discipline contributed towards the development of a coherent intellectual culture which prioritised research into racial anatomical difference. In particular, the Anatomical Society of Great Britain and Ireland was both a means of discipline building for these prominent academics, as well as a space in which belief in racial anatomical difference was affirmed and supported. Although different ideological themes run through this work, I argue that there was a coherence of thought around this subject. This intellectual culture, expressed both formally and informally, is important in the contextualisation of anatomical models because of its steady pervasiveness within the intellectual culture of the anatomical discipline. I theorise that these attitudes towards racial anatomical difference entered the classroom and became part of the immediate contexts in which models were assigned meaning. Indeed, within this chapter I present some evidence of the transfer of this intellectual position on racial anatomical difference into the anatomical classroom.

However, although these spaces and ideas surround and frame anatomical models, offering potential interpretations of meaning, there is little certainty about the impact of these surroundings upon the meaning of these models. Anatomical models may have operated independently from these ideas or been ignored in classroom spaces because of their overly-simplified and diagrammatic representations of the body.[27] Although I demonstrate that embedded limitations on meaning creation might exist, in chapter two I demonstrate that embedded meaning could not be concretely established. In chapter three, I demonstrate the

[27] Alexander Macalister, 'An Address on Fifty Years of Medical Education: Delivered at the Opening of the Winter Session at King's College, London', *British Medical Journal* 2, no. 2492 (1908): 960, https://doi.org/10.1136/bmj.2.2492.957.

normative role of anatomical models in the classroom. However, there is little to connect this presentation of models with the theories about racial anatomical difference explored in chapter four. As such, in chapter five I present an alternative methodology aimed at establishing the meaning of objects adopted from the field of marketing theory. This approach offers a framework for understanding how meaning is created, formed around the concept of use-value. Value and meaning are created through use, by those who use objects, in line with a hierarchy of goals which prioritises the personal values of users. I argue that this framework offers us a more concrete understanding of which influencing factors are most important in the creation of meaning and value, how these factors are integrated, and the specific setting for this integration. I therefore test the utility of this methodology for the history of anatomical models in chapter six. Here I analyse models during the practice of teaching, not merely within the spaces used for teaching, as well as the integration of personal values into the practice of teaching by teachers. I demonstrate that, although the creation of meaning might be limited by the physicality of objects provided by companies, it is only within the teaching process that theories about racial anatomical difference are truly translated onto anatomical models. In doing so, I argue that this methodology offers us a more complete and, importantly, concrete understanding of exactly how the social, intellectual, and spatial context influence the creation of meaning around objects. As such, this thesis posits the consideration of objects *during use* as an important historiographical tool for the historical exploration of material culture.

Through attempting to understand the meaning of anatomical models during the second half of the nineteenth century, this thesis makes several claims. Firstly, I establish late-nineteenth century models as fundamentally materially and epistemologically different from those manufactured at the beginning of the century. As a result of their generalisation, I argue that newer anatomical models placed material limitations on the meanings that could be assigned to them. Secondly, my analysis of the impact of spatial context on the meaning of models demonstrates that there was only one function models could have performed within the late-nineteenth century anatomical classroom. These models were only able to act as three-dimensional representations of normality. This again limits the meaning which could have been assigned to these models. Finally, an analysis of the theoretical context of model use demonstrated that models may also have been assigned meaning in relation to beliefs about white anatomical superiority. However, this conclusion only becomes concrete when examining the meaning of models through the lens of methodologies from marketing theory. By considering the operation of models and theories together in spaces *during use*, I argue that the conclusions suggested by the anatomical research presented in chapter four become much

clearer. This further methodology demonstrates that these models not only portrayed whiteness as the norm, with racial difference as deviation from the norm, but presented it as an ideal within the anatomical classroom.

Note: Throughout this thesis, I use the terms 'white' and 'non-white'. I recognise the problematic nature of these terms as they are both white-centred and binary. Indeed, these terms were created to facilitate legal oppression of anyone with "even a small amount of non-white blood" in the years following the abolishment of slavery within the United States.[28] Although not present in the original source materials, I use these terms because they reflect the distinction between white normality and racial abnormality presented in the nineteenth-century two-and-three-dimensional source materials of this thesis.

[28] National Research Council, *Measuring Racial Discrimination* (Washington, DC: The National Academies Press, 2004), 28.

# Chapter 1 : The anatomical corpus: a review of the historical literature on anatomical models and related fields

Anatomical models can simultaneously be considered objects of medicine, science, art, and education. This thesis approaches anatomical models in three new ways: it focuses on use rather than production, on models within education rather than in collections, and on race rather than gender. The novelty of this approach has required me to draw widely from scholarship outside of the narrow historiographical confines of histories of anatomical modelling. Histories of aesthetics and anatomical imagery, of cadaver procurement, of racial representation and medical treatment, of universities and anatomical departments, of models more generally, and of teaching and didactic tools have all informed different aspects of my approach to anatomical models. As such, this thesis speaks to a wide range of historical literature, from gruesome tales of body snatching to visual histories of sexuality.

Within the various historical disciplines from which this thesis draws, we see schools of practice and thought. Within histories of anatomical modelling, we see a conflict between a focus on museum collections and collection preservation, and a need to address the socio-cultural and political context of these anatomical models. This division in the scholarship is reflected in the broader history of anatomical aesthetics, which focuses either on visual development over time or on the cultural construction of imagery. This thesis largely contributes towards the latter branch of each field, particularly addressing the social, cultural, and intellectual context of model *use* to compliment extant work contextualising the models themselves. However, I have drawn from histories of materiality and aesthetic change over time to structure my work. Meanwhile, divisions in the literature on anatomy and anatomical education enunciate tensions within this thesis. The history of anatomy has been dominated by histories of body snatching and scandal, however historians have addressed this topic from two very different perspectives. On the one hand, scholars have looked at the role of physicians, anatomists, and the Anatomy Act (in Britain) in the procurement of bodies. Meanwhile, others have attempted to reclaim the narratives of the deceased and the ways by which these people may have come to be subjected to the anatomist's knife. Similarly, histories of anatomical education focus either on famous personalities and particular institutions, or on those marginalised from mainstream discussions of anatomical education, such as women. In both these cases, this thesis somewhat precariously attempts to bridge the divide between traditional histories of anatomists and those of marginalised voices. Although there are no corpses to be identified within this research, I explore

narratives of silent models with methodologies which can understand their meaning and explore the lost experiences of students through student notes. At the same time, this is a history conducted *within* institutions, not *of* institutions, and as such offers an alternative to traditional histories of prominent male actors. I will outline the contributions of each element of this scholarship to my thinking and arguments in the first half of this chapter.

In the second half of this chapter, I will then address some of the wider methodologies from which this thesis draws. The focus of this thesis on models, rather than modellers, guided me towards methodologies from material culture studies. This highly interdisciplinary field combines existing methodologies from across humanities disciplines in a broad approach to the history of objects. However, in my approach to the problem of understanding the meaning of objects in the past, I have also drawn unconventionally from the discipline of marketing theory. A subsection of marketing theory, Service Dominant Logic, focusses on the creation of meaning and value in objects by those who use them, providing a framework for understanding the factors which contribute towards this meaning creation. Fostering an interdisciplinary approach from material culture studies, I use various humanities methodologies to analyse different factors within the marketing theory approach individually, before using the approach in its entirety at the end of the thesis. In chapter two, I use formal and critical visual analysis from Art History to assess the shape, style, and colour of nineteenth century anatomical models, illustrating how they change over the century and analysing the objects provided to users. I then approach the models from an archaeological perspective in chapter three, assessing their spatial and material situation within this era of the historical record and the usage processes of anatomical models. In chapter four I combine considerations from intellectual history with a sociolinguistic approach to written texts. In doing so, I establish the theoretical context in which late-nineteenth century models of normal human anatomy operated, establishing the value system within which anatomical models operated. I will outline my understanding of these three approaches here, including how they fit into the wider marketing theory framework, before providing a more in-depth discussion of the marketing theory framework in chapter five.

## Basic Materiality

This thesis is novel in its study of late-nineteenth century models of normal anatomy. As such, it contributes somewhat towards a rich historiography that deals primarily with collections,

fabrication, and style of anatomical models.[29] In my engagement with literature on collections of anatomical models, I have primarily focussed on discussions of physical materials, which are

[29] See 'The International Congress on Wax Modelling' (Gordon Museum, King's College London, 2017); International Congress on Wax Modelling in Science and Art, *La ceroplastica nella scienza e nell'arte* (Firenze: L.S. Olschki, 1977); Monika von Düring and Marta Poggesi, *Encyclopaedia Anatomica: A Collection of Anatomical Waxes* (Cologne: Taschen, 1999); Michel Lemire, *Artistes et Mortels* (Paris: Chabaud, 1990); M. Lemire, 'Representation of the Human Body: The Colored Wax Anatomic Models of the 18th and 19th Centuries in the Revival of Medical Instruction', *Surgical and Radiologic Anatomy* 14, no. 4 (1 December 1992): 283–91; Francesco Paolo de Ceglia, 'The Rotten, the Disembowelled Woman, the Skinned Man: Body Images from Eighteenth Century Florentine Wax Modelling', *Journal of Science Communication* 4, no. 3 (September 2005): 1–7; Francesco Paolo de Ceglia, 'The Importance of Being Florentine: A Journey around the World for Wax Anatomical Venuses', *Nuncius* 26, no. 1 (2011): 83–108; Roberta Ballestriero, 'Anatomical Models and Wax Venuses: Art Masterpieces or Scientific Craft Works?', *Journal of Anatomy* 216, no. 2 (February 2010): 223–34; Roberta Ballestriero, 'The Scientific and Pathological Collections for Medical Teaching, an Underestimated Heritage. The Example of the Gordon Museum of Pathology in London', *Museologia Scientifica Memorie* 17 (2017): 157–61; Roberta Ballestriero, 'The Art of Ceroplastics: Clement Susini and the Collection of Anatomical Wax Models of the University of Cagliari', in *Flesh & Wax: Clemente Susini's Anatomical Models in the University of Cagliari*, ed. Alessandro Riva (Ilisso, 2007), 35–46; Roberta Ballestriero, 'From The Contortion of Reality to the Sinister: The Uncomfortable Hyperrealism of Mannequins, Dolls, Effigies and Wax Figures', *Brumal. Revista de investigación sobre lo Fantástico* 4, no. 2 (28 November 2016): 93–115, https://doi.org/10.5565/rev/brumal.312; Roberta Ballestriero and Ruth Richardson, *Joseph Towne at the Gordon Museum* (London: Pureprint, 2014); Alessandro Riva, *Flesh & Wax: Clemente Susini's Anatomical Models in the University of Cagliari* (Ilisso, 2007); Lucia Dacome, *Malleable Anatomies: Models, Makers, and Material Culture in Eighteenth-Century Italy* (Oxford University Press, 2017); Lucia Dacome, 'Women, Wax and Anatomy in the "Century of Things"', *Renaissance Studies* 21, no. 4 (1 September 2007): 522–50; A. W. Bates, 'Anatomical Venuses: The Aesthetics of Anatomical Modelling in 18th- and 19th-Century Europe', in *40th International Congress on the History of Medicine: Proceedings*, ed. János Pusztai, vol. 1 (Budapest: Societas Internationalis Historiae Medicinae, 2006), 183–86; A. W. Bates, '"Indecent and Demoralising Representations": Public Anatomy Museums in Mid-Victorian England', *Medical History* 52, no. 1 (1 January 2008): 1–22; A W Bates, 'Dr Kahn's Museum: Obscene Anatomy in Victorian London', *Journal of the Royal Society of Medicine* 99, no. 12 (December 2006): 618–24; Elizabeth Stephens, 'Venus in the Archive', *Australian Feminist Studies* 25, no. 64 (1 June 2010): 133–45; Elizabeth Stephens, *Anatomy as Spectacle: Public Exhibitions of the Body from 1700 to the Present* (Liverpool: Liverpool University Press, 2011); Alessandro Riva et al., 'The Evolution of Anatomical Illustration and Wax Modelling in Italy from the 16th to Early 19th Centuries', *Journal of Anatomy* 216, no. 2 (February 2010): 209–22; S. Lotti et al., 'Illustrations of the Anatomical Wax Model Collection in the "La Specola" Zoology Museum, Florence', *Archives of Natural History* 33, no. 2 (2006): 232–40; Alessandro Ruggeri, ed., *The Anatomical Wax Model Museum 'Luigi Cattaneo'* (Bologna: Asterisco, 2002); Alessandro Ruggeri and A. M. Bertoli Barsotti, 'The Birth of Waxwork Modelling in Bologna', *Italian Journal of Anatomy and Embriology* 102, no. 2 (1997): 99–107; Francesco M. Galassi et al., 'Marvels of the Bologna Anatomical Wax Museum: Their Theoretical and Clinical Importance in the Training of 21st Century Medical Students', *HAPS Educator* 19, no. 2 (2015): 5–9; G. Giacobini, 'Wax Model Collection at the Museum of Human Anatomy of the University of Turin', *Italian Journal of Anatomy and Embriology* 102, no. 2 (1997): 121–32; D. Mendis and H. Ellis, 'Joseph Towne (1806-1879), Master Modeller of Wax', *Journal of Medical Biography* 11, no. 4 (November 2003): 212–17; Clive Lee and Elizabeth Allen, 'Anatomical Wax Modelling and the Northumberland Museum of the Royal College of Surgeons in Ireland', *Journal of the Irish Colleges of Physicians and Surgeons* 21, no. 3 (June 1992): 213–18; Nick Hopwood, 'Artist versus Anatomist, Models against Dissection: Paul Zeiller of Munich and the Revolution of 1848', *Medical History* 51 (2007): 279–308; Pamela Pilbeam, *Madame Tussaud: And the History of Waxworks* (A&C Black, 2006); Chantal Bouffard and Mickaël Bouffard, 'The Art of Medicine: Spectacular Anatomy: Plastination and Salutary Dread', *The Lancet* 379, no. 9817 (2012): 704–5; Elizabeth Hallam, ed., *Designing Bodies: Models of Anatomy from Wax to Plastics* (London: The Royal College of Surgeons of England, 2015); see also Richard Daniel Altick, *The Shows of London* (Harvard

usually seamlessly intertwined with work on collections and model makers. This thesis engages with this aspect of the field because of the significant material differences in anatomical modelling over time. In particular, the contrast between the qualities of wax and the materials of standardised models present just one of the ways in which this new category of model can be defined and acknowledged. Roberta Ballestriero is just one of many who regularly discusses the qualities of wax which make it useful in the creation of mimetic likenesses of life in anatomy.[30] This relationship between wax and realism is further explored by scholarship on the physicality of models addressing the use of casts over sculpture and the use of structural supports.[31] For example, many of the same model were able to be made using the plaster cast moulding system employed in Florence, showing not only an early example of mass production but also the definitive way in which Florentine models were related more directly to cadavers than their successors.[32] Meanwhile models at Bologna were modelled onto original bone and from original organs and cadavers, also linking them with specific corpses.[33] Similarly X-rays and radiological computerised tomography technologies have revealed that Vasseur-Tramond models (see figure 2.13, page 69) used natural bone, secured with metal supports, as a base for their wax preparations.[34] This scholarship on construction is vital for accurate and sensitive model conservation because of the secrecy which surrounded the artisanal practice of model making, in which makers kept their methods as closely guarded secrets. However, it demonstrates the strong relationship between wax and life-like depiction which I propose leads to its declining use in models of normal anatomy as depictions of the human body began to shy away from realism.

Some work has been completed on the structure and composition of the new style of anatomical models. For example, Dr Auzoux's papier-mâché anatomical models have been shown to be a composite of traditional papier-mâché materials, clay, and cork, and as such are more removed

University Press, 1978); Kathryn A. Hoffmann, 'Sleeping Beauties in the Fairground', *Early Popular Visual Culture* 4, no. 2 (1 July 2006): 139–59; Elizabeth Hallam, *Anatomy Museum: Death and the Body Displayed* (Reaktion Books, 2016); Anita Guerrini, 'Anatomists and Entrepreneurs in Early Eighteenth-Century London', *Journal of the History of Medicine and Allied Sciences* 59, no. 2 (April 2004): 219–139.

[30] Ballestriero, 'Anatomical Models and Wax Venuses', 223–24; Joanna Ebenstein, *The Anatomical Venus: Wax, God, Death & the Ecstatic* (Distributed Art Publishers, 2016), 70; Samuel J. M. M. Alberti, 'Wax Bodies: Art and Anatomy in Victorian Medical Museums', *Museum History Journal* 2, no. 1 (January 2009): 17; Ann Louise Kibbie, 'Realism and Decay in Wax', *Configurations* 25, no. 2 (30 March 2017): 167.

[31] Alberti, 'Wax Bodies: Art and Anatomy in Victorian Medical Museums', 20–21; George Blaine, 'Biological Teaching Models and Specimens', *The Lancet* 258/2, no. 6678 (25 August 1951): 337–40.

[32] Anna Maerker, *Model Experts: Wax Anatomies and Enlightenment in Florence and Vienna, 1775-1815*, Reprint edition (Manchester: Manchester University Press, 2015), 86.

[33] Nadir M. Maraldi et al., 'Anatomical Waxwork Modeling: The History of the Bologna Anatomy Museum', *The Anatomical Record* 261, no. 1 (15 February 2000): 5–10.

[34] Pastor et al., 'Uncovered Secret of a Vasseur-Tramond Wax Model'.

from the human subject.[35] However, where construction techniques are more obvious, for example in the use of ivory and plaster casting, there is little evidence of such a sustained discussion of materiality.[36] Jon Cornwall and Chris Smith have instead done some numerical work surrounding collections of Franz Joseph Steger models (made from plaster- see figures 2.14 and 2.15 on pages 70 and 72) which makes some reference to materiality, showing the geographical and topical spread of these kinds of models.[37] However, this work only includes "known international collections" of *surviving* models and does not include data from institutions which previously had Steger models (such as the University of Oxford) or make reference to the wider Steger repertoire of models through catalogues.[38] This thesis does not attempt to complete work on materiality for models which have not been analysed in this way, as it focuses on model use over model construction. However, it does address the ways in which materials of construction might have impacted the use of these models in comparison to their wax predecessors.

## Anatomical Models and Theory

The main focus of this thesis rests instead on situating this new late-nineteenth century style of normalised anatomical model within its social and theoretical context. More specifically, this thesis investigates the influence of concurrent theories about race and physiological difference on anatomical models; theories both scientific and, as Nancy Stepan has shown, social.[39] In doing so, it builds upon work by others on earlier, embryological, and pathological anatomical models. Indeed, my understanding of the interplay between object and theory has been shaped by these works which situate anatomical models within narratives of aesthetic development, economic power structures, and sexual desire. As such, although the collections histories described above form an important backdrop to this thesis, the overarching search for object meaning within this

[35] Maerker, 'Models and Materials in Europe 1650-1890'; Maerker, 'Dr. Auzoux's Papier-Mâché Models'; Maerker, 'Human Models'; Anna Maerker, 'Dissections in Papier-Mâché: The Models of Dr Auzoux' (Symposium: Anatomy Modelling, Hunterian Museum, Royal College of Surgeons, 30 January 2016); Anna Maerker, 'Inside Auzoux's Models', Text, Explore Whipple Collections, 2008, http://www.sites.hps.cam.ac.uk/whipple/explore/models/drauzouxsmodels/insideauzouxsmodels/; Grob and Groos, *Early Surgical Instruments. The Anatomical Models of Dr. Louis Auzoux. The Laboratory Equipment of Willem Einthoven.*; Dreyfuss, 'The Anatomical Models of Dr. Auzoux'.
[36] K F Russell, 'Ivory Anatomical Manikins.', *Medical History* 16, no. 2 (April 1972): 131–42; Eckart Marchand, 'Image and Thing: The Distribution and Impact of Plaster Casts in Renaissance Europe', *Sculpture Journal* 26, no. 1 (2017): 83–92.
[37] Cornwall and Smith, 'Anatomical Models by F.J. Steger'.
[38] Cornwall and Smith, 210; 'Inventory of the Department of Human Anatomy', 1896 1889, HA 64, University of Oxford Special Collections, Bodleian Library.
[39] Stepan, *The Idea of Race in Science*.

thesis falls rather more heavily on the social history side of this divided scholarly space. These tests encouraged me to explore notions of embedded knowledge and object as actor, questioning whether the current continued use of these models propagates the value system of the era in which they were originally conceived. They also provided different examples of how meaning might be ascribed to objects, encouraging me to consider how I might go about investigating meaning within the classroom.

This thesis takes Nick Hopwood's monograph on the embryological models of Adolf and Friedrich Ziegler as an exemplar of how to concretely demonstrate of the relationship between scientific theory and anatomical modelling.[40] Hopwood refers to correspondence between Ziegler and scientists like Ecker, Haeckel, and His about the representation of their theories of embryological development in three dimensions to make this relationship with theory clear. He then argues that Ziegler used relationships like these to present himself as a plastic publisher, making references to scholarly works alongside advertisements for his models.[41] The quality of these working relationships between modeller and theorist is made clear as Hopwood draws on discussions between Ziegler and Haeckel about the veracity and lifespan of Haeckel's claims.[42] Presenting such concrete evidence, Hopwood's work represents the 'gold standard' for anyone investigating the relationship between anatomical models and scientific theory. However, Hopwood's work ipso facto calls into question the strength of the link created between theory and *normal* anatomical models. In the absence of theories embedded within the very fabric of models by their creators, I argue that we must turn to the users and uses of models to understand their relationship with theory. This thesis aims to take the standard for establishing a relationship between model and theory set by Hopwood and apply it not to the creation of models but to the use of models in a classroom setting.

In the face of an absence of theoretical correspondence, this thesis instead adapts the approach of Scarani et al. to the relationship between models and theory, who assessed the 19th-century collection of anatomical models at the Anatomy Museum in Bologna in parallel with scientific papers published contemporarily.[43] Unlike Hopwood, they focus their attention on the visual connections between models and scientific publications. Noting that anatomical preparations in the museum seem to be identical to illustrations drawn for scientific papers by the modeller

[40] Hopwood, *Embryos in Wax*.
[41] Hopwood, 25.
[42] Hopwood, 'Plastic Publishing in Embryology', 178.
[43] P. Scarani et al., 'Contemporaneous Anatomic Collections and Scientific Papers from the 19th Century School of Anatomy of Bologna: Preliminary Report', *Clinical Anatomy (New York, N.Y.)* 14, no. 1 (2001): 19.

Cesare Bettini, they attempt to identify models, specimens, and preparations by matching them with illustrations in scientific papers of the time.[44] In particular, Scarani et al. conclusively link a model by Leonida Berti (see figure 1.1) with a paper by Luigi Calori, noting the similarities between the illustrations in the paper and the right cerebral hemisphere of the model.[45] It is in this visual way that they recreate Hopwood's "correspondence" between theorist and model.[46] However, Scarani *et al*. present the relationship between models and theory as a cyclical one; models are used to illustrate theory, whilst models themselves might also inspire theorisation. Francesco M. Galassi *et al.* have built of Scarani *et al.*'s work, exploring the particular case of the Berti model in more detail.[47] As such, they are currently the only scholars to conclusively link anatomical modelling and theoretical work on racial physiological difference in the late nineteenth century. They discuss how Luigi Calori used the dissection of a black man's brain to argue for racial equality. This dissection was replicated as lithographs for Calori's publication by Cesare Bettini, chief modeller at the Institute of Anatomy.[48] When combined with the work by Scarani *et al.* on the Berti model (see figure 1.1), the link between modelling and race theory becomes even more apparent. As such, this model can be seen to directly converse with discussions about racial hierarchy and white superiority in the middle of the nineteenth century.

[44] Scarani et al., 19.
[45] Calori, 'Cervello di un negro della Guinea'; Scarani et al., 'Contemporaneous Anatomic Collections and Scientific Papers', 22 Note that this is the only non-white model that I found during the course of this research.
[46] Scarani et al., 'Contemporaneous Anatomic Collections and Scientific Papers', 20.
[47] Francesco M. Galassi et al., 'Luigi Calori (1807-1896)', *Journal of Neurology* 263, no. 8 (August 2016): 1681–82.
[48] Calori, 'Cervello di un negro della Guinea'.


*Figure 1.1 Chalk model by Leonida Berti (1850). (Pathology Museum, University of Bologna; 'Neuroanatomy of Equality', Francesco Galassi, Conference Paper (2014))*

Importantly, it is acknowledged that this overlap between modelling and scientific publication is possibly a product of the unique relationship between museums and journals, and modellers and illustrators in Bologna.[49] As such, I did not expect to find the same clear links between research at British Universities and models of normal anatomy, produced elsewhere, during the course of my research. Indeed, I demonstrate that Calori's work, and indeed the Berti model, are exceptions to the main nineteenth-century narratives about racial physiology. Instead, these papers inspired me both to investigate the visual connection between model and theory and to consider the papers published by those involved with model use to assess how the models may have been used within the classroom.

As such, this thesis extends the approach of Galassi *et al.* and Scarani *et al.* into a classroom setting in a similar way to that of Lucinda Spencer, who has conducted some preliminary research on anatomical models and theory at the University of Melbourne.[50] In her work Spencer states that the new "clinical, objective" models were of a "more educational nature" than those

[49] Scarani et al., 'Contemporaneous Anatomic Collections and Scientific Papers', 23.
[50] Lucy Spencer, 'The Artist's Knife: The Art and Science of Plaster Anatomical Models at the Harry Brookes Allen Museum of Anatomy and Pathology' (Public History Project, Master of Public History, Monash University, 2005); Lucinda Spencer, 'Chance, Circumstance and Folly: Richard Berry and the Plaster Anatomical Collection of the Harry Brookes Allen Museum of Anatomy and Pathology', *University of Melbourne Collections* 2 (July 2008): 3–10.

of the preceding period.[51] I argue that the new style anatomical models are an abstracted concept of the human body, whilst previous models provide exact copies of or are based heavily upon real cadavers or dissections, drawing a similar epistemic dichotomy.[52] Spencer's work also begins to explore possible connections between models and the theoretical work of the Melbourne anatomy professor Richard Berry. Here Spencer claims that "anatomical models could easily be used to argue for either eugenic or psychological theory".[53] However, this claim relies largely on contextual evidence, inspiring this thesis to explore further connections between model and theory closer to the indisputable quality of those in Hopwood's work.

Finally, in my consideration of the relationship between theories of racial hierarchy and anatomical models, I have also drawn from works within the field that have connected anatomical models to some of the broadest themes of historical study; from conceptions of sex and gender, to expressions of power and control. For example, K. F. Russell's examination of the didactic role of delicate female ivory anatomical mannequins addresses the use of these models by physicians and laypeople as a tool to protect female modesty.[54] Ludmilla Jordanova explores this theme further, placing the Anatomical Venus within the narrative of sexual representation and the exploitation of the female body.[55] Joanna Ebenstein builds upon this work in her amalgamation of information about Susini's Anatomical Venus, contextualising the Venus within histories of wax, fetishism, model making, and religious adoration.[56] Exploring the traditional religious uses of wax, in what she terms the "Catholic fetishization of the corporeal body," Ebenstein illustrates how the conception of an idealised body was constructed over centuries.[57] In line with the hypothesis of this thesis, Ebenstein concludes that the Anatomical Venus is "a reminder that science and its artefacts are never truly neutral."[58] In this thesis, I explore concepts of exploitation, othering, and idealisation, looking at both didactic context and at change over time, drawing parallels from these works on gender.

Meanwhile, moving away from a focus on gender, this thesis has also drawn conceptualisations from work on the political and economic relationships of models. Anna Maerker has

[51] Spencer, 'Chance, Circumstance and Folly', 3; Spencer, 'The Artist's Knife', chap. 3.
[52] Spencer, 'Chance, Circumstance and Folly', 5; Spencer, 'The Artist's Knife', chap. 3.
[53] Spencer, 'The Artist's Knife', chap. 4.
[54] Russell, 'Ivory Anatomical Manikins.'
[55] Ludmilla Jordanova, *Sexual Visions: Images of Gender in Science and Medicine Between the Eighteenth and Twentieth Centuries* (Univ of Wisconsin Press, 1993).
[56] Ebenstein, *The Anatomical Venus*; Rebecca Martin, 'Joanna Ebenstein, The Anatomical Venus. London: Thames & Hudson, 2016. Pp. 224. ISBN 978-0-500-25218-5. £19.95 (Quarter Bound/PLC).', *The British Journal for the History of Science* 50, no. 2 (June 2017): 352–54.
[57] Ebenstein, *The Anatomical Venus*, 81.
[58] Ebenstein, 213.

demonstrated the potential engagement of the anatomical model with political power structures as they act as evidence within arguments and products of political turmoil.[59] Here, Maerker illustrates how models could be construed as different symbols of political intent in different arenas.[60] Contrastingly, in her work on the models of Dr. Auzoux, Maerker links anatomical models with the history of marketing and economic competition. Similarly, Eckart Marchand's work on plaster as a casting material in Renaissance Europe solely examines the cultural context in which copies of famous works could become almost as valuable as the works themselves.[61] I initially investigated the concept of different narratives attached to the same model, as in Maerker's work and some of the more theoretical works below. However, what I found was surprisingly homogenous. Through my wider search for the meaning of historical objects, my work instead began to relate more to Maerker and Marchand's conceptualisation of models as economic commodity as a way to explore the relationships between model and power in the form of racial privilege. This conceptualisation lines up with my use of an adapted analytical framework from marketing theory, which approaches this same concept from the perspective of users rather than makers, to assess reasons for purchase and thus the meaning and power given to these items within the universities which purchased them.

## Other Models and theory

The relationship between model and theory has also been explored outside the narrow confines of anatomy and the foundations of this thesis are built on a consideration of these various arguments. Christoph Meinel has investigated similar considerations in the parallel discipline of molecular chemistry, looking specifically at the relationship between changes in theory and modelling style within the same late-nineteenth century period.[62] As such, his work offers some indication of how a relationship between object and theory might be approached. Meinel demonstrates that a transition from abstract to concrete thinking intersects with a disciplinary shift towards researching molecular constitution, resulting in mechanistic three-dimensional models of molecular structure.[63] He shows how the materiality of the models contributed to the

[59] Maerker, ' Turpentine Hides Everything'; Maerker, *Model Experts*.
[60] Anna Maerker, 'Florentine Anatomical Models and the Challenge of Medical Authority in Late-Eighteenth-Century Vienna', *Studies in History and Philosophy of Biological and Biomedical Sciences* 43, no. 3 (September 2012): 730–40.
[61] Marchand, 'Image and Thing'.
[62] Christoph Meinel, 'Molecules and Croquet Balls', in *Models : The Third Dimension of Science*, ed. Soraya De Chadarevian and Nick Hopwood, Writing Science Y (Stanford: Stanford University Press, 2004), 242–75.
[63] Meinel, 242.

structural conceptualisation of the molecule, as well as how conceptualisations influenced the models produced. As such, the creation of three-dimensional models of molecular structure is shown to be more than just the resultant product of a theory; they also profoundly influenced the further development of the theories within the field. I argue that the same is true for anatomical models. For Meinel, the physical limitations of these models limited the future structural conception of molecules, thereby directing research in the field. I interpret the anatomical models in this study in a similar way; by delineating the normal body and widely disseminating this image, the models may have influenced the construction of abnormality and designation of new abnormalities to be seen as medical conditions. This process could be as cyclical as the one described by Galassi *et al.* at Bologna, but on an international scale.

As a result of the consequences of this international scale of model production and shipping, it was also important for me to consider changes in the relationship between theory and model during periods of long-distance travel. Drawing upon James Secord's foundational 'Knowledge in Transit', both Lawrence Dritsas and Harry Collins have made valuable contributions to the consideration of the relationship between objects and theory in transit.[64] Dritsas argues that without the presence of the collector, specimens "could lose their local meaning".[65] The history explored by Dritsas mirrors that of Helen MacDonald, who highlights the fact that collectors of bones for anatomical museums were encouraged to record anthropological information relating to the acquisition, which would sit in the records alongside the specimen, "adding knowledge which might not be immediately apparent in the object itself".[66] Meanwhile, Harry Collins has examined the ways in which written knowledge and the travel of physical and experimental knowledge are combined. Specifically, he has addressed the fact that results of certain experiments are not necessarily repeatable using notes alone, concluding that the prior beliefs of the investigator have a role to play in their ability to repeat an experiment exactly.[67] This discussion greatly impacts how to think about the transfer of knowledge alongside anatomical models; models were so often supplied with accompanying paperwork and one of the tasks of this thesis is to understand how important this paperwork is in the construction of value and meaning in anatomical modelling. Collin's ten propositions include the concept that the transfer of skills necessary for experimentation is an invisible process (proposition four); an idea which

[64] Secord, 'Knowledge in Transit'.
[65] Dritsas, 'From Lake Nyassa to Philadelphia', 47.
[66] Helen MacDonald, 'Corpse Stories: Anatomy, Bodies and a Colonial World', in *Bodies Beyond Borders: Moving Anatomies, 1750-1950*, ed. Kaat Wils, Raf de Bont, and Sokhieng Au (Leuven: Leuven University Press, 2017), 74.
[67] Collins, *Changing Order: Replication and Induction in Scientific Practice*, 30–31.

mirrors the tacit transfer of knowledge which occurs in the movement of models as objects.[68] Ultimately, Collins concludes that it is impossible to truly replicate results, irrespective of the quality of explanation provided with the experiment, questioning the importance of explanatory paperwork in the transfer of knowledge.[69] Both of these concepts increase the epistemic value of the models themselves within this thesis. However, James Poskett has demonstrated the importance of paperwork in the interpretation of plaster cast models, comparing different instances where a plaster cast was transferred with and without paperwork and the differences in the conclusions then drawn.[70] This scholarship encouraged me to question what would happen when there seemed to be little original local meaning attached to an object during production, as in the case of anatomical models. In response to this scholarship, I try to create a balance between the importance of explanatory diagrams and the individual (although not necessarily unique) explanations of the models by lecturers and demonstrators, whilst treating the models themselves as possessors of tacit and embedded knowledge.

## Anatomical Aesthetics

After these conceptual works which influenced the approach of this thesis and the research conducted as part of this project, more practical inspiration was drawn from the history of anatomical aesthetics. In some of the major works of this area of scholarship, Benjamin Rifkin *et al.*, Martin Kemp and Marina Wallace, Michael Sappol, and Deanna Petherbridge have presented a comprehensive look at anatomical imagery from da Vinci and Vesalius to the Visible Human Project, showing the visual developments in anatomical representation over time and its interplay with artistic expression.[71] In chapter two of this thesis, I continue to develop this understanding of the development of anatomical aesthetics over time, demonstrating a shift in nineteenth century three-dimensional imagery.

This chronological approach enabled me to consider the thin line between generalisations and individual representations of the body, addressed by both Thomas Schnalke and Nick Hopwood

[68] Collins, 129.
[69] Collins, 30.
[70] Poskett, 'Moulding the African Mind'.
[71] Benjamin A. Rifkin, Michael J. Ackerman, and Judith Folkenberg, *Human Anatomy: A Visual History from the Renaissance to the Digital Age* (New York: ABRAMS, 2011); Martin Kemp and Marina Wallace, *Spectacular Bodies: The Art and Science of the Human Body from Leonardo to Now* (University of California Press, 2000); Michael Sappol, *Dream Anatomy*, 1 edition (Bethesda, Md.: Washington, D.C: National Institutes of Health, 2006); Deanna Petherbridge, *The Quick and the Dead: Artists and Anatomy* (Berkeley: University of California Press, 1997).

in their works on models and anatomical aesthetics.[72] The delicate interplay between realism and generalisation within anatomy is vital to discussions about representation within this thesis. When I begin to question the lack of racial diversity within anatomical study it is easy to point towards realism as an excuse for underrepresentation. If cadavers are white, then models and images will be too, therefore these images are representative of the population, not the prejudices of an era. These images of the body are then used as general depictions, despite the individualism displayed and, in the preceding context, heralded. However, this provides a clear alternative narrative for normalised and generalised depictions of the body, like the models which form the core of this thesis. These 'bodies' no longer have the relationship with the real to excuse their choice of depiction, and as such require different categorisation.

My conceptualisation of generalised models is built largely upon Schnalke's work on anatomical wax moulages- pathological models depicting the symptoms of disease. Like the work on eighteenth century wax models, the work on moulages does tend to be divided by collection and location.[73] However, there are a number of works which look at wax moulages in general.[74] Within this subsection of the field, Thomas Schnalke creates some important epistemic delineations between styles of anatomical model which I have adopted within this study because they described exactly the materials found in my archival searches. For Schnalke, anatomical models fall into three categories; pathological, obstetric/embryological, and normal.[75] Schnalke discusses the epistemological differences between these three types of models; pathological

[72] Thomas Schnalke, *Diseases in Wax: The History of the Medical Moulage*, trans. Kathy Spatschek (Quintessence Publishing Co., 1995); Thomas Schnalke, 'Dissected Limbs and the Integral Body: On Anatomical Wax Models and Medical Moulages', *Interdisciplinary Science Reviews* 29, no. 3 (1 September 2004): 312–22; Thomas Schnalke, 'Von Der Normierten Anatomie Zum Historischen Patienten. Aus Der Geschichte Der Medizinischen Moulagenkunst', in *Wachs - Bild - Körper: Moulagen in Der Medizin*, ed. Susanne Ude-Koeller, Thomas Fuchs, and Ernst Böhme (Universitätsverlag Göttingen, 2007), 3–23; Hopwood, *Embryos in Wax*.

[73] Michael Sticherling and Uta Euler, 'The Collection of Dermatologic Wax Moulages at the University of Kiel, Germany', *International Journal of Dermatology* 40, no. 9 (September 2001): 586–92; Takashi Imaizumi and Youji Nagatoya, 'Dermatologic Moulage in Japan', *International Journal of Dermatology* 34, no. 11 (1 November 1995): 817–21; Michael Geiges, '[The Museum of Wax Moulages in Zurich--current relevance for dermatology, history of medicine and the general public]', *Journal der Deutschen Dermatologischen Gesellschaft = Journal of the German Society of Dermatology: JDDG* 5, no. 10 (October 2007): 953–57; S. Ständer et al., '[Wax model collection of the Department of Dermatology, University of Münster]', *Der Hautarzt; Zeitschrift Fur Dermatologie, Venerologie, Und Verwandte Gebiete* 52, no. 7 (July 2001): 662–66; A.-M. Worm et al., 'Dermatological Moulage Collections in the Nordic Countries', *Journal of the European Academy of Dermatology and Venereology*, 2017, 1–11; Mechthild Fend, 'Order and Affect. The Museum of Dermatological Wax Moulages at the Hôpital Saint-Louis', in *Collections, Display and the Agency of Objects*, ed. J. Grave et al. (Nürnberg: Sandstein, 2018).

[74] Lawrence Charles Parish and Adrianne Noe, 'Wax Models of the Skin', *International Journal of Dermatology* 28, no. 4 (1 May 1989): 230–230; L. C. Parish et al., 'Wax Models in Dermatology', *Transactions & Studies of the College of Physicians of Philadelphia* 13, no. 1 (March 1991): 29–74; Urs Boschung, *Medizinische Lehrmodelle: Geschichte, Techniken, Modelleure* (Verlag Vogt Schild AG, 1980).

[75] Schnalke, 'Von Der Normierten Anatomie Zum Historischen Patienten', 8.

models represent the individual and act as an example of the disease, normal models represent a general view of the body, whilst obstetric and embryological models walk the line between individual and general as they are intended to be general but also refer to specific conditions.[76] Nick Hopwood reiterates that even in cases where embryological models are intended to be general, they cannot help but be individual because of a shortage of foetal examples from which to sculpt.[77] However, the focus in this thesis remains firmly on the models Schnalke defines as normal.

I only deviate slightly from Schnalke's epistemic construction of normal models because he does not differentiate between the previous style of anatomical models and the newer abstracted style focussed on in this thesis. For Schnalke all wax models of normal anatomy are "anonymisierte, normeirte und idealisierte" (anonymised, normalised and idealised).[78] He emphasises that the earlier anatomical models were also synthetic abstractions of the human form, taken from numerous different preparations. Schnalke describes eighteenth century wax anatomical models as "largely anonymous" and "didactically prepared anatomy"; the direct replacement of the human corpse for anatomical teaching which straddled the boundary between individual and general.[79] I argue that the new style of anatomical model no longer straddled this boundary as they stylistically moved away from realism in favour of abstraction. In this way the new style of anatomical depiction is the only one that is truly anonymous, normal and idealised without reference to any individual, real or imagined. Schnalke's lack of differentiation between new and old style of modelling is largely because he claims that over time pathological moulages, not standardised abstracted models, replaced "normal" anatomical waxworks in anatomical teaching.[80] This mirrors the claims of Parish and Haviland, and as such he does not include any of the non-wax models of normal anatomy which were contemporaries of the wax moulage movement.[81] For Schnalke, the end of all use of models in anatomical teaching came as moulages were eventually outstripped by the advent of medical photography- a claim disputed by the large teaching collections of models still held at universities today.[82] This thesis will demonstrate the continued production of normal anatomical models into the

[76] Schnalke, 8.
[77] Hopwood, *Embryos in Wax*.
[78] Schnalke, 'Von Der Normierten Anatomie Zum Historischen Patienten', 18.
[79] Schnalke, 7.
[80] Schnalke, 'Dissected Limbs and the Integral Body'.
[81] Thomas N. Haviland and Lawrence Charles Parish, 'A Brief Account of the Use of Wax Models in the Study of Medicine', *Journal of the History of Medicine and Allied Sciences* XXV, no. 1 (1 January 1970): 69–70.
[82] Schnalke, 'Von Der Normierten Anatomie Zum Historischen Patienten', 17.

twentieth century in the form of standardised normal models, which could no longer be considered individual.

Working within this framework normality and standardisation, this thesis then attempts to reconstruct conversations about anatomical normality in relation to race. In doing so, it emulates scholarship on the representation of women in anatomical imagery, which, like works on gender and anatomical models, focuses heavily on the social context in which these images were produced to emphasise the connections between visual and social constructions of femininity. Catherine Gallagher and Thomas Laqueur's edited volume on *the making of the modern body* addresses the topic of the creation of a distinct female body in both art and medicine, including the eventual distinction and naming of the female reproductive system.[83] They contextualise these changes in anatomical depiction within the changing social conception of the human body from a one-sex to a two-sex entity. Meanwhile, Ericka Johnson argues that the perpetuation of the male norm and the female as abnormal is something which continues to this day, subscribing to a patriarchal conceptualisation of gender and sex roles.[84] Under a two-sex culture, Ludmilla Jordanova demonstrates the widespread use of bodily representations as means of social control. She argues that female anatomical models simultaneously defined sex roles, supporting the concept of separate spheres for men and women, and illustrated the consequences of wrongdoing.[85] Comparing male and female wax anatomical models from late eighteenth century Italy, Jordanova encapsulates gendered differences in representation in a way which is useful in this thesis. Although others have focused on the presentation of the female as pregnant, Jordanova highlights the differences between the recumbent poses and flesh details of female models and the upright flayed or truncated male models.[86] These male models neither present the submissive and permissive aura nor the facial expression of sexual pleasure which are present in the female models (see figures 2.2 and 2.3, page 52). When compared with images of the period, Jordanova argues that this passive style of female representation was both influenced by and contributed towards a societal view of women as inferior to men. In a parallel consideration, I consider later anatomical models in the context of images depicting race within the period. In doing so, I argue that we can see a clear distinction

[83] Catherine Gallagher and Thomas Laqueur, eds., *The Making of the Modern Body: Sexuality and Society in the Nineteenth Century* (Berkeley: University of California Press, 1987).
[84] Ericka Johnson, 'The Ghost of Anatomies Past: Simulating the One-Sex Body in Modern Medical Training', *Feminist Theory* 6, no. 2 (1 August 2005): 141–59.
[85] Jordanova, *Sexual Visions*; Ludmilla Jordanova, 'Happy Marriages and Dangerous Liaisons: Artists and Anatomy', in *The Quick and the Dead: Artists and Anatomy*, by Deanna Petherbridge (Berkeley: University of California Press, 1997), 100–113.
[86] Jordanova, *Sexual Visions*, 45.

between the representation of whiteness in anatomical models and the depiction of race within the nineteenth century.[87] A particularly relevant difference are the removal of sensationalism to create normality, rationality, and, I argue, idealisation.

## Anatomical Education

Whilst much of the above literature on anatomical models and anatomical aesthetics focusses on the producers and production of anatomical models, this thesis focusses on their lives and uses. As such, this thesis necessarily speaks to histories of anatomical and medical education. Amongst more general histories of formal medical education, there are two works which have assessed the role of models of normal anatomy in formal medical education during the eighteenth and nineteenth centuries.[88] Thomas Haviland and Lawrence Parish generally provide an account of eighteenth century wax anatomical models, ignoring the introduction of generalised models and claiming, like Schnalke, that wax models were supplanted either by an adequate supply of cadavers or by pathological wax moulages. Jonathan Reinarz conversely stresses the importance of the anatomical museum in nineteenth century medical education, both in terms of cost to the institution and value to the student. This helped shape my discussion of the nineteenth century anatomical classroom, highlighting museums as important

[87] See, for example, Sadiah Qureshi, *Peoples on Parade: Exhibitions, Empire, and Anthropology in Nineteenth-Century Britain* (Chicago ; London: University of Chicago Press, 2011); Anne Fausto-Sterling, 'Gender, Race, and Nation: The Comparative Anatomy of "Hottentot" Women in Europe, 1815-1817', in *Deviant Bodies: Critical Perspectives of Difference in Science and Popular Culture*, ed. Jennifer Terry and Jacqueline Urla (Bloomington: Indiana University Press, 1995), 19–48.

[88] Haviland and Parish, 'A Brief Account of the Use of Wax Models in the Study of Medicine'; Jonathan Reinarz, 'The Age of Museum Medicine: The Rise and Fall of the Medical Museum at Birmingham's School of Medicine', *Social History of Medicine* 18, no. 3 (1 December 2005): 419–37; see for discussion of the history of anatomical teaching at specific institutions Sinclair and Robb-Smith, *A History of the Teaching of Anatomy in Oxford*; C. W. M. Pratt, *The History of Anatomy in Cambridge: Brief Study* (University of Cambridge, Department of Anatomy, 1981); J. A. Fairfax Fozzard, *Professors of Anatomy in the University of Cambridge: The First Two Hundred and Sixty-One Years of the Cambridge University Department of Anatomy, 1707-1968* (Cambridge: Fosslia, 1983); see for more general texts Keir Waddington, *Medical Education at St Bartholomew's Hospital, 1123-1995*, Revised edition (Woodbridge, Suffolk ; Rochester, N.Y: Boydell Press, 2003); I. Wotherspoon, '"The Most Powerful Medical Magnet in Europe": Edinburgh University's Medical School and the Overseas World, 1880-1914', *The Journal of the Royal College of Physicians of Edinburgh* 34, no. 2 (2004): 153–59; Mark Weatherall, *Gentlemen, Scientists, and Doctors: Medicine at Cambridge 1800-1940* (Boydell Press, 2000); Susan Wells, *Out of the Dead House: Nineteenth-Century Women Physicians and the Writing of Medicine* (University of Wisconsin Press, 2012); Gabriella Berti Logan, 'Women and the Practice and Teaching of Medicine in Bologna in the Eighteenth and Early Nineteenth Centuries', *Bulletin of the History of Medicine* 77, no. 3 (2003): 506–35.

pedagogical spaces. Whilst other more general histories which address the changes in medical education during the nineteenth century encouraged me to consider the role of models with respect to the professionalisation of medicine. Nutton and Porter's expansive *The History of Medical Education in Britain* and S.V.F. Butler's widely cited PhD thesis on "Science and the Education of Doctors during the Nineteenth Century: A Study of British Medical Schools with Particular Reference to the Development and Uses of Physiology" both discuss anatomical departments, changes made to national requirements for medical qualifications, and the wider impact of empire and professionalisation upon education.[89] Whilst Mark Weatherall explores the way medicine was made into a science in the nineteenth century. Weatherall's work on this topic particularly addresses the clashes between medical practitioners and those the profession was attempting to exclude in the process of professionalisation.[90] This is a common narrative within works on anatomical museums and fairgrounds which also contributed towards my thinking about models and professionalisation. I particularly think there is more to say about the role of three-dimensional standardisation, generalisation, and emotional detachment in anatomical models in the creation of professionalised medicine.

One specifically important aspect of the history of medical education to consider in relation to this thesis is the investigation of Victorian learning practices and philosophies which relate to objects like anatomical models. Carin Berkowitz has explored the encouragement of tactile learning by anatomist Charles Bell in the late eighteenth and early nineteenth century. Berkowitz demonstrates how Bell's anatomical Treatise on the hand can be read as a pedagogical philosophy which presented learning by manual *doing* in the same light as traditional learning by *seeing*.[91] This Treatise can thus be presented as part of a wider tradition of object learning in the early nineteenth century, exemplified by Elizabeth Mayo's 1839 *Lessons on Objects*.[92] This concept of object lessons as a whole has been explored by Mary Leighton and Lisa Surridge, and Adrian Young, although many scholars have looked at the concept with reference to specific objects.[93] However, Berkowitz's work confirms that this primary school concept may have

[89] Vivian Nutton and Roy Porter, *The History of Medical Education in Britain*, 1 edition (Amsterdam: Brill | Rodopi, 1995); S.V.F. Butler, 'Science and the Education of Doctors during the Nineteenth Century: A Study of British Medical Schools with Particular Reference to the Development and Uses of Physiology' (UMIST, 1981).
[90] Mark W. Weatherall, 'Making Medicine Scientific: Empiricism, Rationality, and Quackery in Mid-Victorian Britain', *Social History of Medicine* 9, no. 2 (1 August 1996): 175–94.
[91] Carin Berkowitz, 'Charles Bell's Seeing Hand: Teaching Anatomy to the Senses in Britain, 1750–1840', *History of Science* 52, no. 4 (1 December 2014): 377–400; Carin Berkowitz, *Charles Bell and the Anatomy of Reform* (Chicago ; London: University of Chicago Press, 2015).
[92] Elizabeth Mayo, *Lessons on Objects: Their Origin, Nature, and Uses : For the Use of Schools and Families* (Haswell, Barrington & Haswell, 1839).
[93] Mary Elizabeth Leighton and Lisa Surridge, 'Object Lessons: The Victorians and the Material Text',

influenced university pedagogical methods. Other explorations of learning by touch in nineteenth century anatomy and medicine include Anna Maerker's recent work on the human body as epistemic object.[94] Here, Maerker analyses how the physical forms and display of anatomical models actively encouraged touch as a learning methodology. However, Maerker also demonstrates how touch could be used to create a hierarchy of learners as the display of anatomical models and dissections developed, with only the most privileged able to learn by touch.[95] This encouraged me to consider the privilege and practicalities of tactile learning, particularly surrounding the storage of and access to models.[96]

Finally, there is also a concurrent and growing body of literature on anatomical representation within anatomy textbooks as part of the wider history of medical education. This scholarship has informed my discussion of the depiction of anatomical normality in contrast to the above analyses of anatomical difference. Veronique Deblon and Ruth Richardson have both extensively analysed the creation and social situation of anatomical illustration.[97] Deblon uses Constant Crommelinck's *Handbook of Anatomy* (1841) to demonstrate the common reproduction of anatomical images and the international circulation of knowledge within the field. In particular, Deblon asserts that the re-use of images is just as informative as the original for the historian, as we can see how they are moulded to fit changing narratives.[98] Meanwhile, Richardson has focused on the canonical *Gray's Anatomy* and the technical processes and social circumstances in which new illustrations were produced. As demonstrated by the critiques levelled at Gray, it is the visual aspects of his textbook, actually produced by Henry Vandyke Carter, which presented a novel take on the anatomical textbook. Richardson demonstrates how these new images were designed to be both clear and didactically useful with their direct labelling, universal style, large size, and quantity.[99] It is also these images which Richardson argues are

*Cahiers Victoriens et Édouardiens*, no. 84 Automne (1 November 2016); Adrian Young, 'Material Wisdom: Learning from Object Lessons', *Cabinet Magazine*, no. 50 (2013): 16–19; For examples of scholarship on object lessons in relation to specific objects see Lorraine Daston, ed., *Things That Talk: Object Lessons from Art and Science* (New York, NY: Zone Books, 2007).

[94] Anna Maerker, 'Towards a Comparative History of Touch and Spaces of Display: The Body as Epistemic Object', *Historical Social Research / Historische Sozialforschung* 40, no. 1 (151) (2015): 284–300.

[95] Maerker, 291.

[96] This approach was inspired by comments around storage cupboards and access in Hopwood, *Embryos in Wax*.

[97] See also Katherine Cober, 'Dissecting Race: An Examination of Anatomical Illustration and the Absence of Non-White Bodies' (Halifax, Nova Scotia, Dalhousie University, 2015).

[98] Veronique Deblon, 'Imitating Anatomy: Recycling Anatomical Illustrations in Nineteenth-Century Atlases', in *Bodies Beyond Borders: Moving Anatomies, 1750-1950*, ed. Kaat Wils, Raf de Bont, and Sokhieng Au (Leuven: Leuven University Press, 2017), 117.

[99] Ruth Richardson, *The Making of Mr Gray's Anatomy* (Oxford: Oxford University Press, 2008), 221.

responsible for the (continued) success of Gray's above other contemporary student texts.[100] Of particular interest to this thesis, Deblon imagines images in the same role/the same epistemic space as models, in both their provision of clear didactic images of the human body and in the facilitation of paper dissections. As both Richardson and Deblon argue, the style of anatomical drawing and representation of the eighteenth and nineteenth centuries tended away from individualism and towards idealism, "whereby the particularities of one body were erased."[101] Deblon thus presents these images as a challenge to the epistemic hierarchy which valued the human body or cadaver most highly, challenging the utility of the messy and unclear vision of the body that corpses provided.[102] This mirrors the style of representation shown in the vast majority of models, both of the eighteenth century and beyond, with those of Joseph Towne forming the obvious exception. Meanwhile, Deblon describes the pop-up illustrations in Crommelinck's work, which allowed readers to perform paper dissections, as "an attempt to transfer the functionality of anatomical models to images".[103] As such, Deblon argues that these images should be considered as both illustrations and as models, indeed believing them to be inspired by the successful use of papier-mâché in model making.[104] As I will demonstrate, the crossover between model and diagram becomes particularly interesting when considering the impact of shading and colouration on mental visualisation.

## Morbid Anatomy

As Mitchell *et al.* so aptly state in their paper on anatomical education from 1700, "the study of anatomy in England during the 18th and 19th century has become infamous for bodysnatching from graveyards to provide a sufficient supply of cadavers."[105] As such, any work in the field, including this one, necessarily touches upon this topic. Indeed, Mitchell *et al*. also focus on the topic of cadaver procurement in their article. A prominent narrative within these histories, when they do discuss models at all, is to frame anatomical models as tools for temporary use in times of cadaver shortages. I therefore engage with this literature in this thesis by challenging the

[100] Richardson, 209–10.
[101] Deblon, 'Imitating Anatomy', 118; Richardson, *The Making of Mr Gray's Anatomy*, 226–27.
[102] Deblon, 'Imitating Anatomy', 118.
[103] Deblon, 120.
[104] Deblon, 120.
[105] Piers D Mitchell et al., 'The Study of Anatomy in England from 1700 to the Early 20th Century', *Journal of Anatomy* 219, no. 2 (August 2011): 91.

narrative that models were a stop-gap for shortages in cadaver supply. In particular, I argue that this literature which focuses on cadavers demonstrates the fallibility of this argument. Models neither address the most pressing gaps in supply, nor cease to be of use because an adequate supply has been found.[106] As such, this thesis reconsiders the position of models within the history of anatomy more generally.

As such, this area of scholarship provides this thesis with useful data about the demographics of corpses in British dissection rooms with which to frame the use of anatomical models. A number of scholars have picked up on the failings of the 1832 Anatomy Act to fully and efficiently regulate the movement of corpses; Helen MacDonald in particular has noted that the act did not refer to dismembered body parts.[107] Such works stress the social class of those who found themselves in dissection rooms post-mortem, and in particular the public disquiet around such a practice.[108] However, many offer more specific demographic details. In Mitchell *et al.*'s discussion of the archaeological evidence at the Oxford Castle informs us that the bodies dissected here in the 17th and 18th centuries were of young or adolescent men, but of the bodies dissected from an Oxford workhouse in the 19th century only one was a child.[109] This potentially indicates a dwindling supply of young cadavers as the supply chain moved away from prisons and towards workhouses. Similarly, Elizabeth Hurren has given fairly detailed statistics of the age and gender spread of bodies procured by the University of Cambridge anatomical theatre showing that "anatomists valued infant or young female research material".[110] She shares the argument that more attention should be given to the supply of bodies to anatomy schools in order to understand how research was undertaken with Ruth Richardson, who has also worked extensively on the topic.[111] I have used this idea that cadaver supply information

[106] Elizabeth T. Hurren, *Dying for Victorian Medicine: English Anatomy and Its Trade in the Dead Poor, c.1834 - 1929* (Page Publishing, Inc., 2014), 232.
[107] Elizabeth T. Hurren, '"Abnormalities and Deformities": The Dissection and Interment of the Insane Poor, 1832-1929', *History of Psychiatry* 23, no. 89 Pt 1 (March 2012): 65–77; Elizabeth T. Hurren, 'Whose Body Is It Anyway?: Trading the Dead Poor, Coroner's Disputes, and the Business of Anatomy at Oxford University, 1885-1929', *Bulletin of the History of Medicine* 82, no. 4 (2008): 775–818; Helen MacDonald, 'Procuring Corpses: The English Anatomy Inspectorate, 1842 to 1858', *Medical History* 53, no. 3 (July 2009): 379–96; Helen MacDonald, 'A Body Buried Is a Body Wasted: The Spoils of Human Dissection', in *The Body Divided: Human Beings and Human 'Material' in Modern Medical History*, ed. Sarah Ferber and Sally Wilde, 1 edition (Burlington, VT: Routledge, 2012), 9–28.
[108] Sean Burrell and Geoffrey Gill, 'The Liverpool Cholera Epidemic of 1832 and Anatomical Dissection-Medical Mistrust and Civil Unrest', *Journal of the History of Medicine and Allied Sciences* 60, no. 4 (2005): 478–98; Ruth Richardson, *Death, Dissection and the Destitute* (London: Routledge & Kegan Paul, 1987).
[109] Mitchell et al., 'The Study of Anatomy in England from 1700 to the Early 20th Century', 93–94.
[110] Elizabeth T. Hurren, 'A Pauper Dead-House: The Expansion of the Cambridge Anatomical Teaching School under the Late-Victorian Poor Law, 1870–1914', *Medical History* 48, no. 1 (1 January 2004): 84; Hurren, *Dying for Victorian Medicine*, 38.
[111] Richardson, *Death, Dissection and the Destitute*.

can be used to shed light on research within the biological sciences within this thesis to discuss the creation of body norms within anatomy; norms that we continue to see represented in modern anatomical images and literature.

Meanwhile, Helen MacDonald, David Humphrey, and Michael Sappol have all addressed the issue of race in connection with the supply of bodies to anatomy classrooms. This discussion helps to frame the arguments in this thesis about the representation of racial difference in anatomical models. However, all of these authors take a vastly different view on the topic; whilst MacDonald looks at the novelty of race in Australia and New Zealand where bones were stolen because of their rarity and collector value, Humphrey discusses the propensity of black bodies in American dissection rooms as intertwined with their social status and segregation and Sappol conversely demonstrates that this was not the case in every state.[112] Whilst these works focus on North America and Oceania, they provide a good comparison, and indeed juxtaposition, to this work on British demographics and the nineteenth century assumption of a white norm unless otherwise stated in the source material.

However, MacDonald has also demonstrated how racialised collections of skulls might be amassed via a large colonial network of contacts, connecting this story of race and anatomy to Britain.[113] MacDonald's work is part of a wider trend within this area of scholarship towards corpse identification and narrative reclamation. Narrative reclamation, as above in the history of anatomical education, is extremely important to the central tenets of this thesis: that non-white features are excluded from the normalised body in the nineteenth century. This scholarship can focus on either the contribution of the individual towards the advancement of medical knowledge, as in the case of Elizabeth Hurren's paper on "abnormalities and deformities" and her book *Dying for Victorian Medicine*, or on the power dynamics of science in which scholars bring the erased stories of minorities into the foreground, as in the work of both MacDonald and other scholars such as Farrah Lawrence.[114] As a result of this thesis' focus upon models in the classroom rather than models during creation, discussion of the bodily origins of

[112] Helen MacDonald, *Human Remains: Episodes in Human Dissection* (Melbourne University Press, 2005), 136–82; MacDonald, 'Corpse Stories'; David C. Humphrey, 'Dissection and Discrimination: The Social Origins of Cadavers in America, 1760-1915', *Bulletin of the New York Academy of Medicine* 49, no. 9 (September 1973): 819–27; Michael Sappol, *A Traffic of Dead Bodies: Anatomy and Embodied Social Identity in Nineteenth-Century America* (Princeton and Oxford: Princeton University Press, 2002), 98–135.

[113] MacDonald, 'Corpse Stories'.

[114] Hurren, '"Abnormalities and Deformities"'; Hurren, *Dying for Victorian Medicine*; MacDonald, 'Corpse Stories'; MacDonald, *Human Remains*; Farrah Lawrence-Mackey, 'Medical Appropriation in the "Red" Atlantic: Translating a Mi'kmaq Smallpox Cure in the Mid-Nineteenth Century' (London, University College London, 2019).

models was an unavoidable omission. Although this thesis can therefore only draw inspiration rather than practical additions from this scholarship, this scholarship has vitally shaped the wider aims of classroom decolonisation attached to this thesis and is an important frame within which to view my work.

## Race, science, and medicine

The final area of scholarship which this thesis both draws from and contributes to is the history of race and medicine. Literature on the history of race and anatomy/science/medicine co-exists with scholarship on the demographics of corpses and narrative reclamation, forming a wider backdrop for this study. This scholarship has been particularly influential as my work has moved away from delineating the new style of anatomical modelling to its relationship with late-nineteenth century European perceptions of race.

MacDonald's work, discussed above, is obviously relevant to this conversation about race in science which has fed into this thesis. Racial categorisation was a pervasive part of nineteenth century bone collecting, which fed into medical and anatomical museums across the world. As Helen MacDonald has emphasised in her work on colonial anatomy, most, if not all, large institutions like the Royal College of Surgeons, were interested in organising their osteological collections by race.[115] Stephen J. Gould has famously noted that these skulls could be used to argue for a racial hierarchy which idealised whiteness.[116] Although this argument has been disputed, other historians have shown the comparative ways in which bones were used in the nineteenth century.[117] As MacDonald notes; "anatomy had always been an inherently comparative process" with a range of male and female, normal and abnormal, and human and animal comparisons being made.[118] These comparisons produced what Helen MacDonald describes as "anatomical knowledge of a certain kind" when interpreting bones, bodies, and models using a belief in permanent racial difference.[119] In particular, Stephen Kenny notes that the 1907 meeting of the International Association of Medical Museums in Washington D.C categorised black bodies as "a compendium of scientific facts, a storehouse of material for

[115] MacDonald, 'Corpse Stories', 73.
[116] Stephen Jay Gould, *The Mismeasure of Man*, 1st ed. (New York ; London: Norton, 1981).
[117] For details of the controversy surrounding Gould's claims see Jason E. Lewis et al., 'The Mismeasure of Science: Stephen Jay Gould versus Samuel George Morton on Skulls and Bias', *PLOS Biology* 9, no. 6 (7 June 2011): e1001071; For a defence of Gould see Michael Weisberg, 'Remeasuring Man', *Evolution & Development* 16, no. 3 (1 May 2014): 166–78.
[118] MacDonald, 'Corpse Stories', 74.
[119] MacDonald, 76.

research-work, and as a teaching medium."[120] This keenness for material for racial comparison is reflected in the lists of desired specimens ("desiderata") issued by places like The Oxford Museum for anthropological research.[121] Samuel Redman has examined the importance of this museum and display element to the collection of skulls and other non-white bones. In particular, he argues that the display gave scientific legitimacy to the concept of scientific racism, with classifications of race and gender displayed as "viable concepts".[122] This construction of race science within the anatomical museum has been highly influential in my treatment of these learning spaces, encouraging me to consider the narratives created by the spatial construction of models.

Although much of this history of bone collections often focuses on skull collecting, MacDonald emphasises the importance placed on the receipt of complete skeletons when working with the Australian Aborigines in order for them to be most useful for science.[123] This scholarship thus demonstrates that medical men were interested in more than the current historiographical obsession with phrenology and craniology. "Lumber (sic.)" vertebrae are something MacDonald makes specific reference to, informing us that a count of the vertebrae was requested by the British Association for the Promotion of Science and the Ethnographical Society of Paris in the surveys sent out to colonial authorities "since an additional one is said to be common in some tribes".[124] Indeed, lumbar measurements were just one of the detailed measurements included in the Thesaurus created by Joseph Barnard Davis to describe his extensive collection, illustrating their importance to the anthropological community and the role of these measurements in racial comparison.[125] This is an area of the body on which my research into anatomical bodily difference focuses, as a specific place in which perceived racial differences in the body are evident. This focus is partially in response to scholarship on this area as well as a response to archival materials at the University of Edinburgh.

This aspect of the thesis obviously operates within the narrative set by Nancy Stepan in her canonical 1982 work *The Idea of Race in Science.* This thesis agrees with the idea that it was not until well into the second half of the Nineteenth Century that evolutionary theory became

[120] Stephen C. Kenny, '"Specimens Calculated to Shock the Soundest Sleeper": Deep Layers of Anatomical Racism Circulated On-Board the Louisiana Health Exhibit Train', in *Bodies Beyond Borders: Moving Anatomies, 1750-1950*, ed. Kaat Wils, Raf de Bont, and Sokhieng Au (Leuven: Leuven University Press, 2017), 167.
[121] MacDonald, 'Corpse Stories', 74–76.
[122] Samuel J. Redman, *Bone Rooms: From Scientific Racism to Human Prehistory in Museums* (Cambridge, Massachusetts ; London, England: Harvard University Press, 2016), 8.
[123] MacDonald, 'Corpse Stories', 78.
[124] MacDonald, 80.
[125] Davis in MacDonald, 85.

commonly accepted as the explanation of human inheritance.[126] However, it is more concerned with Stepan's idea that in this acceptance was borne the idea of biologically explainable and quantifiable human difference. The theory of evolution provided a new means of explaining human difference and expressing old prejudices; it gave biological origins to race, gender, and other physical differences. This thesis concerns itself with the manifestation of this "scientific racism" in anatomical models as the picture of biological idealisation.[127] However, more than this, this thesis looks to see whether this racism is manifest within the very materiality of the model style we still use today or whether it is applied post-construction by academics and students with a particular interest in biological categorisation.

When my work on the nineteenth century British anatomical classroom considers the operation of narratives of racial difference within these teaching spaces, I draw upon one final set of scholarly works in this area. Helen MacDonald, Rana Hogarth, Andrew Curran, and Suman Seth's works on the interactions between race and medicine have been highly instructive background reading, offering examples of how to understand the subtleties of conversations about race in a medical context.[128] Curran explores the linguistic and theoretic construction of the concept of racial "variety", whilst Hogarth examines the "labels and logic" applied by white physicians to black bodies.[129] Their work demonstrates both how to draw broader conclusions from limited source materials and the social meaning of medical language about race. It has specifically inspired me to ensure that I am reading primary materials "aright", in the manner that they would have been understood by anatomical contemporaries.[130] For example, Ian Law discusses in his history of racism in Liverpool the example of Aphra Benn's *Oronooko, the Royal Slave* (1688) in which the similarity of the black slave's nose and lips to those of the European white man were praised and lauded as evidence of this particular slave's eminence; "the black hero, suitably Europeanised".[131] Here, Law links back to the focus on skulls and craniometry in nineteenth century anthropometry and anthropology and the plethora therein of discussion about mental inferiority of non-white races, partly as a means to both justify and condemn the

[126] Stepan, *The Idea of Race in Science*, 83.
[127] Stepan, ix.
[128] MacDonald, 'Corpse Stories'; Rana A. Hogarth, *Medicalizing Blackness: Making Racial Difference in the Atlantic World, 1780-1840* (Chapel Hill: The University of North Carolina Press, 2017); Andrew S. Curran, *The Anatomy of Blackness: Science and Slavery in an Age of Enlightenment*, Reprint edition (Johns Hopkins University Press, 2013); Suman Seth, *Difference and Disease*, 1 edition (Cambridge, United Kingdom ; New York, NY: Cambridge University Press, 2018).
[129] Curran, *The Anatomy of Blackness*, 25; Hogarth, *Medicalizing Blackness*, 3.
[130] Nazera Sadiq Wright, *Black Girlhood in the Nineteenth Century* (Urbana: University of Illinois Press, 2016), 8–9.
[131] Ian Geoffrey Law, *A History of Race and Racism in Liverpool, 1660-1950*, ed. June Henfrey (Liverpool: Merseyside Community Relations Council, 1981), 4.

continued practice of slavery in this period. Hogarth in particular addresses linguistic nuances around both physical and mental difference with respect to blackness concurrently, forming a complete picture of the medical categorisation and control over blackness enforced on the conquered world in the late eighteenth and early nineteenth centuries.[132] This scholarship thus provides not only practical inspiration for working with these kinds of source materials but also the impetus for my research into racial representation in anatomical classrooms by demonstrating the need for such a study.

## Methodologies

Within this thesis I investigate anatomical models in the context of rising scientific racism within the late nineteenth century. In doing so, I aim to elucidate the unwritten meaning assigned to objects within the historical record. However, the history of unwritten everyday practices is notoriously difficult to ascertain, and the more complex or commonly accepted the idea the more difficult this becomes. In order to overcome this problem, this thesis takes two methodological standpoints which originate from a field far removed from historical study. Firstly, it prioritises those who use materials over those who make materials when considering the creation of meaning. This approach gains traction partly because of the questions raised by recent scholarship over the transmission of ideas through objects and partly because of long-standing philosophical questions about exact replicability in science. Whilst historians following in the footsteps of James Secord have begun to examine the ways in which knowledge moves, questions have been raised over the transmission of knowledge through objects alone.[133] For example, James Poskett has found that without accompanying paperwork different interpretations arise of the same object.[134] This difficulty in knowledge transmission is supported by Harry Collins' assertion that the core concept of replicability in science is flawed due to the impossibility of exact recreation of all elements of context.[135] As such, it was methodologically important for a this present study to locate a theory of value construction that considers the value created at each site of interaction, a methodological approach I found within literature from marketing theory. Secondly, this thesis focusses on the users' personal values as the most important aspect of context. Whilst excellent work on the analysis of object meaning and value through the social construction of knowledge has been produced, this kind of work does not yet

[132] Hogarth, *Medicalizing Blackness*.
[133] Secord, 'Knowledge in Transit'; Dritsas, 'From Lake Nyassa to Philadelphia'.
[134] Poskett, 'Moulding the African Mind'.
[135] Collins, *Changing Order: Replication and Induction in Scientific Practice*.

have a method for prioritising the various contextual influences on value creation.[136] It was instead in marketing theory that I found a framework to explain why emotions might do more to motivate the creation of value and meaning in objects than practicalities, allowing us to be more certain of the conclusions we can draw from the often limited historical record. I use this framework from marketing theory, explained in full in chapter five, as an overarching guide throughout this thesis, acting as the outer layer of a Russian doll of different methodologies. However, different elements of this framework, inner Russian dolls, need to be explored individually before I combine them at the end of the thesis to understand the whole. In this section I will explore the different sub-methodologies I use to investigate these individual elements of the marketing theory framework, before explaining in chapter five exactly how these different elements are combined.

I use various approaches from Material Culture studies to investigate the individual elements of this marketing theory framework, looking at the form of the models chosen for purchase, spatial limitations on value creation, and the personal values of the anatomists who purchased models. In the first instance, an art-historical approach offers potential interpretations of these models based solely on their material form. Within this approach we gain a better understanding of the unique features of newer models and by extension material limitations placed upon value creation. An archaeological approach can then be employed to analyse the spatial limitations on value creation, as well as narratives suggested by the immediate context of use. A sociolinguistic approach towards material culture studies is particularly helpful in chapter four when analysing the choice of descriptive words within texts surrounding model use. Finally, an approach from intellectual history draw out intellectual networks and the development of ideas about racial physiological difference. These approaches alone do not help us understand the meaning created around objects; it is still important to combine these diverse methodologies with the overarching structure provided by marketing theory methodologies. However, they do each contribute an important element to this overarching framework. These various approaches are therefore explored in more depth here.

## Art History: formal and critical visual analyses

The first material culture methodologies employed to support this framework from marketing theory are formal analysis and critical visual analysis from Art History. I employ an Art Historical

[136] See, for example, Styles, 'Objects of Emotion: The London Foundling Hospital Tokens, 1741-60'.

approach in my analysis of the models within this thesis partly because the models of the preceding period, the anatomical Venus's, are discussed by historians as *objets d'art.*[137] The primary method of engagement with objects within Art History is formal analysis. This methodology is useful within this thesis because at its most fundamental level it employs description as an analytical and comparative tool, with "careful looking" as the primary mode of engagement.[138] Indeed, Jas Elsner argues that art history is nothing more than "an extended argument built on ekphrasis", the description of a work of art.[139] This approach particularly allows an analysis of form, as well as comparison with other similar forms. Whilst often used to analyse works of high art within art history, this technique is often employed by material culture scholars to analyse more mundane objects. For Martin and Garrison, the intersection between art history and material culture is embodied by the concept of connoisseurship, which takes these descriptive techniques usually used to analyse high art to look at "the decorative and utilitarian arts".[140]

From the descriptive and comparative base that formal analysis provides, Art History can then explore the processes of production and design development in the utilitarian arts, as well as addressing the concepts of taste and style. As Erwin Panofsky's foundational work on critical visual analysis established, after formal analysis it is also possible to conduct iconographical and iconological analyses of works of art.[141] Although originating in the 1950s, this methodology still forms the core strand of art historical research.[142] Iconographical elements of a work are clearly displayed within the work itself and make reference to clearly identifiable external phenomenon. For example, if a work includes the image of a cross it is making direct reference to Christianity. Iconology, on the other hand, must be inferred from the visual and social context which surround an object. When considering the models described in this thesis, the iconological significance of their whiteness is determined by external factors, explored in chapters four and

[137] Ebenstein, *The Anatomical Venus*, 15.
[138] Viccy Coltman, 'Material Culture and the History of Art(Efacts)', in *Writing Material Culture History*, ed. Anne Gerritsen and Giorgio Riello (London: Bloomsbury Academic, 2015), 19.
[139] Jas Elsner, 'Art History as Ekphrasis', *Art History* 33, no. 1 (February 2010): 11.
[140] Ann Smart Martin and J. Ritchie Garrison, 'Shaping the Field: The Multidisciplinary Perspectives of Material Culture', in *American Material Culture: The Shape of the Field*, ed. Ann Smart Martin and J. Ritchie Garrison (Winterthur, Del. : Knoxville, Tenn: Winterthur Museum & Gardens, U.S., 1997), 11.
[141] Erwin Panofsky, *Meaning in the Visual Arts*, New edition (London: Penguin, 1955).
[142] See, for example, Marion G. Müller, 'Iconography and Iconology as a Visual Method and Approach', in *The SAGE Handbook of Visual Research Methods*, by Eric Margolis and Luc Pauwels (London: SAGE Publications Ltd, 2011), 283–97; Theo van Leeuwen, 'Semiotics and Iconography', in *The Handbook of Visual Analysis*, ed. Theo van Leeuwen and Carey Jewitt, 1 edition (London ; Thousand Oaks Calif.: SAGE Publications Ltd, 2001), 92–118; Giorgia Aiello, 'Theoretical Advances in Critical Visual Analysis: Perception, Ideology, Mythologies, and Social Semiotics', *Journal of Visual Literacy* 26, no. 2 (1 January 2006): 89–102.

five. In this way, an art historical analysis, which begins in chapter two with an approach to form and iconography, is also useful later in my investigation. This methodology helps to focus this historical thesis upon the visual rather than the traditional textual materials of historical study and offers a link between the personal values of anatomists and the iconological meaning assigned to anatomical models, discussed in chapter four.

## Archaeology: spatial analysis

The form that this investigation into the visual and social context of model use takes is in part defined by methodology from archaeology. Dan Hicks, referencing Ian Hodder, describes the archaeological approach as "the making of the familiar, unfamiliar".[143] Spatial analysis, an established archaeological method used by material culture scholars, within Hicks' description can be considered to be the reduction of artefacts to the unknown until proven otherwise by the immediate situational and contextual evidence.[144] Through this process, objects can become known by their "locational relationship" to other objects and spaces within an archaeological site, either contextually or stratigraphically.[145] The strict recording of the location of objects within an archaeological site creates a complete depiction of a place, including the architecture of a space and the relational locations of the artefacts contained within it: information useful to the material culture historian.[146] Through spatial analysis, this enables the archaeologist to understand "the spatial distribution of artefacts and the activity patterns they represent", as

[143] Dan Hicks, 'The Material-Cultural Turn: Event and Effect', in *The Oxford Handbook of Material Culture Studies*, ed. Dan Hicks and Mary C. Beaudry (Oxford, New York: Oxford University Press, 2010), 65; Ian Hodder, *Theory and Practice in Archaeology* (London; New York: Routledge, 1995).

[144] For works on spatial analysis as an archaeological method see, for example, Harold Hietala, *Intrasite Spatial Analysis in Archaeology* (Cambridge Cambridgeshire ; New York: Cambridge University Press, 1985); Ian Hodder and Clive Orton, *Spatial Analysis in Archaeology* (Cambridge University Press, 1979); Ellen M. Kroll and T. Douglas Price, eds., *The Interpretation of Archaeological Spatial Patterning*, Interdisciplinary Contributions to Archaeology (Springer US, 1991); Luke Lavan, Ellen Swift, and Toon Putzeys, *Objects in Context, Objects in Use Material Spatiality in Late Antiquity / Edited by Luke Lavan, Ellen Swift and Toon Putzeys ; with the Assistance of Adam Gutteridge.*, Late Antique Archaeology ; v. 5 (Leiden ; Boston: Brill, 2007); For the use of archaeological methods in material culture scholareship see, for example, David Gaimster, 'Material Culture, Archaeology and Defining Modernity: Case Studies in Ceramic Research', in *Writing Material Culture History*, ed. Anne Gerritsen and Giorgio Riello (London: Bloomsbury Academic, 2015), 59–66; David Gaimster, 'Archaeology of an Age of Print? Everyday Objects in an Age of Transition', in *Everyday Objects: Medieval and Early Modern Material Culture and Its Meanings*, ed. Tara Hamling and Catherine Richardson (Farnham and Burlington: Ashgate, 2010), 133–44; Kaori O'Connor, 'Anthropology, Archaeology, History and the Material Culture of Lycra', in *Writing Material Culture History*, ed. Anne Gerritsen and Giorgio Riello (London: Bloomsbury Academic, 2015), 73–91.

[145] Susan M. Pearce, 'Thinking about Things', in *Interpreting Objects and Collections*, ed. Susan M. Pearce, Leicester Readers in Museum Studies (London: Routledge, 1994), 130.

[146] Simon Werrett, 'Matter and Facts: Material Culture in the History of Science', in *Material Evidence: Learning from Archaeological Practice*, ed. Robert Chapman and Alison Wylie (New York: Routledge, 2014), 346.

well as enabling the identification of unknown objects and their uses.[147] This is just one of the reasons that archaeologists decry the destruction of sites of archaeological importance either as a result of conflict or through acts of irresponsible archaeology in which the context of objects is lost.[148] Through the creation of these detailed micro-contexts for objects, archaeologists create what Nancy Farriss describes as a *system*, not a *process*. Farriss describes a *system* as a specific context at a specific point in time, giving us a detailed idea of a place or an idea at this given time. *Process* describes the change in something over time, a label that Farriss gives to historical methodology. Farriss maintains that either the *process* must be frozen to analyse the *system*, or the *system* watched to discuss the *process*.[149] Spatial analysis in archaeology is one method of freezing the *process*.

In chapter four, I will freeze the process in multiple places to analyse snapshots of the anatomical classroom and the objects within it, investigating the specific context in which my anatomical models were used. Taking an archaeological approach to the importance of context in meaning creation, I will take into account all other objects within the specific context of the classroom to build up an image of how models were used in conjunction with the other resources available, such as diagrams and textbooks.[150] I look here to create a cross-sectional image of the classroom at each university at the end of the nineteenth; the micro environmental context which forms point five of Susan Pearce's process of archaeological investigation.[151] In doing so, I aim to reveal the spatial limitations placed upon model use, as well as the influence of material context on the likely uses of the models.

## Literature: sociolinguistics

A linguistic approach to material culture encourages us to think about the ways in which objects are described in texts and supporting documents that either accompany or replace them in the historical record. For example, in their analysis of the objects that constructed a middle class household in the Seventeenth Century, Mark Overton *et al.* use the recording of possessions in the last will and testament of householders to assess relative value, use, and emotional

[147] Lavan, Swift, and Putzeys, *Objects in Context, Objects in Use Material Spatiality in Late Antiquity / Edited by Luke Lavan, Ellen Swift and Toon Putzeys ; with the Assistance of Adam Gutteridge.*, 1.
[148] See, for example, Derek Fincham, 'The Fundamental Importance of Archaeological Context', in *Art and Crime: Exploring the Dark Side of the Art World*, ed. Noah Charney (Rochester, NY: Greenwood Publishing, 2009), 1–12; Elizabeth Pye, *Caring for the Past: Issues in Conservation for Archaeology and Museums* (London: Routledge, 2000), 71–73.
[149] Nancy Farriss, 'Foreword', in *The Social Life of Things: Commodities in Cultural Perspective*, ed. Arjun Appadurai (Cambridge: Cambridge University Press, 1986), x.
[150] On the importance of context see Pye, *Caring for the Past*, 72–76.
[151] Pearce, 'Thinking about Things', 129.

attachment.[152] This linguistic approach is particularly key when studying objects that have not survived in the historical record; "absent objects", as Glenn Adamson describes them.[153] Adamson, in his work on eighteenth-century footstools, demonstrates the necessity of analysing modes of description in order to understand deliberately missing objects. In doing so, he implies that in the case of lost objects a linguistic approach can help to create a clear outline of the object that has been lost, recreating it from the edge rather than the centre. As such, this methodology is of particular use in the case of anatomical models, as historically these items have not been seen as important to preserve. In the archive material of the University of Liverpool School of Medicine, the language surrounding bodies and patients was extremely normative. This was particularly evident within the post-mortem, dissection, and case records where organs were described either as 'normal' or not, and where a normative body model was used in case notes to draw areas of abnormality on. Obviously, these patients no longer being present, this linguistic approach can help us to reconstruct their treatment experience. In a more object focused example, in 1992 the Anatomical Department at the University of Oxford ordered "five models of human heads with brain in situ, two models of ape heads with brain in situ, [and] two models of foetal brains".[154] Here we can see not only the continued emphasis on the presence of the brain in these models but also the grouping of human, ape, and foetal material, suggesting comparison. Throughout this thesis, but particularly in chapter five, I will focus on descriptive categories and linguistic grouping in Overton's sociolinguistic manner. In doing so, I include the social interpretations of words, placing these words within wider context rather than considering them alone in a strictly linguistic manner.[155] Although this is but a small facet of the field of linguistics, I argue that it is the most useful here for elucidating the "coded" nature of language before linking to other texts as a supporting role within an intellectual history approach.[156] This approach looks to understand the development of intellectual theories; I chart the development of theories about racial anatomical difference through the works and correspondence of anatomical professors and their successors.

[152] Mark Overton et al., *Production and Consumption in English Households 1600–1750* (Routledge, 2004).
[153] Glenn Adamson, 'The Case of the Missing Footstool: Reading the Absent Object', in *History and Material Culture: A Student's Guide to Approaching Alternative Sources*, ed. Karen Harvey (Hoboken: Taylor and Francis, 2013), 192–207.
[154] 'Inventory of the Department of Human Anatomy'.
[155] Francisco Yus, 'Relevance Theory', in *The Oxford Handbook of Linguistic Analysis*, ed. Bernd Heine and Heiko Narrog, Second edition, Oxford Handbooks in Linguistics (Oxford: University Press, 2015), 643–62.
[156] Bernd Heine and Heiko Narrog, 'Introduction', in *The Oxford Handbook of Linguistic Analysis*, ed. Bernd Heine and Heiko Narrog, Second edition, Oxford Handbooks in Linguistics (Oxford: University Press, 2015), 22–23; Yus, 'Relevance Theory', 662.

This area of material culture studies can also be particularly self-reflective, in that it encourages us to consider the language we use to describe the phenomenon we are seeing. Linguistics as a discipline shows material culturalists that it is necessary not just to unpick the words written by others to understand their intent, but to unpick the meaning of our own words as well. Indeed, Jas Elsner begins to address the linguistics of the ekphrasis he produces as an art historian and what this shows about his own biases in his approach to the works.[157] Within this thesis, I use one out of many of the varying linguistic uses and contexts of the words 'meaning' and 'value'. I understand value as more than purely economic, taking it's broader meaning to incorporate the concepts of emotional and sentimental value.[158] I also understand meaning as an individual creation, unique to each actor, but socially influenced. I have placed several disclaimers about my use of othering and racist language throughout the text, however when using these terms from original texts I have also attempted to understand their meaning at that time rather than imposing a retrospective and anachronistic meaning. This includes understanding concepts of race and nation in the late-nineteenth century, as explored in chapter four.

## History: object focussed and intellectual

As a historical thesis, this work obviously draws heavily on historical methodologies. However, the historical discipline has a particular place within material culture studies which has defined the focus of this thesis. Within material culture studies, history is often disparaged for using material culture for non-material ends.[159] Objects can be used by historians as a kind of alternative source material to texts, investigated to serve a higher purpose or hypothesis. This use depicts material culture as merely the "handmaiden" for historians.[160] However, Martin and Garrison argue that historians have begun to move away from this simplistic use of objects and have begun to use objects as the focus or end to their research.[161] Igor Kopytoff's methodology expressed in his foundational *The Social Life of Things* is a reflection of these object oriented historical methodologies. He encourages the creation of a cultural biography of objects, making the object the focus, with discovery of information about the object intended to be the outcome of the endeavour. In doing so, we ask the same questions of objects as we would of people,

[157] Elsner, 'Art History as Ekphrasis', 12–13.
[158] 'Value, n.', in *OED Online* (Oxford University Press), accessed 28 November 2019, https://www.oed.com/view/Entry/221253.
[159] O'Connor, 'Anthropology, Archaeology, History and the Material Culture of Lycra', 75; Werrett, 'Matter and Facts: Material Culture in the History of Science', 346.
[160] Martin and Garrison, 'Shaping the Field: The Multidisciplinary Perspectives of Material Culture', 9; Dan Hicks and Mary C. Beaudry, 'Introduction- Material Culture Studies: A Reactionary View', in *The Oxford Handbook of Material Culture Studies*, ed. Dan Hicks and Mary C. Beaudry (Oxford, New York: Oxford University Press, 2010), 3.
[161] Martin and Garrison, 'Shaping the Field: The Multidisciplinary Perspectives of Material Culture', 9.

engaging with philosophical questions of agency. As historians focused on material culture, we explore the change of the object with age, and what happens to it when it comes to the end of its life. We question the origins of the object, and investigate its trajectory compared to the ideal trajectory for such a thing. We analyse the objects status within society, and look at socially constructed periods of use, or "ages", in its "life".[162] As such, we create the histories of objects, as well as including objects within our histories. This thesis is grounded in this way, using textual material to investigate objects, with the understanding of objects as the end not the means of this work.

By investigating the textual to understand the material, I will draw upon the methods of intellectual history. In chapter five, I will investigate the personal values of anatomists as they relate to their conception of the body. This will trace ideas about racial physiological difference through both the published and unpublished works of anatomists, grouped by institution. Here, I take what Richard Whatmore perceives to be the core approach of intellectual history – "that ideas matter as first-order information about social phenomena" – without delving further into any one specific approach.[163] I consider not only the linguistic meaning of the words written but the intellectual traditions they link to and the references they make that can only be understood in the context of other contemporary texts. I explore the development of ideas between teacher and student, predecessor and successor, the creation of intellectual communities, and the networks of textual knowledge exchange which encourage pan-institutional knowledge creation.

## Conclusion

This thesis investigates the connections between late-nineteenth century models of normal adult anatomy and scientific theory within the British university classroom setting. In doing so, it both contributes to and draws inspiration from various areas of historical scholarship including the history of anatomical modelling, aesthetics, and education, as well as histories of anatomy more generally and the history of race and medicine. This thesis contributes towards collections narratives in the history of anatomical modelling by addressing models traditionally ignored in the wider historiography. In doing so, I expand scholarly work on the development of anatomical

[162] Igor Kopytoff, 'The Cultural Biography of Things: Commoditization', in *The Social Life of Things: Commodities in Cultural Perspective*, ed. Arjun Appadurai (Cambridge: Cambridge University Press, 1986), 66–67.
[163] Richard Whatmore, *What Is Intellectual History?*, What Is History? (Cambridge, UK: Polity, 2016), 9.

aesthetics over time to include these models. Drawing on the examples given by Nick Hopwood, Anna Maerker, Ludmilla Jordanova, and Joanna Ebenstein in their study of earlier and other types of contemporary models, I approach these anatomical models as social objects. However, by focussing on the use and lives of these anatomical models, rather than on their production, this thesis also draws from and contributes to an understanding of medical and anatomical teaching at British universities in the late-nineteenth century. I create an image of anatomical pedagogy at this time which reveals the role of these models within the classroom, helping us to understand the social life of these objects. Finally, my investigation of the theoretical context of model use reveals connections between scientific racism and the teaching of medicine. As such, this thesis also contributes towards and draws from scholarship on the historical relationship between race and medicine, illustrating yet another route for the maintenance and propagation of these biases within the profession.

The subject matter of this thesis does not necessarily make it a material culture studies thesis. I have chosen to focus on objects as the main end of this study, using textual and visual sources in the service of understanding these objects more fully. Taking this approach has required me to go beyond traditional historiographical methodologies to incorporate methods from disciplines that traditionally address three-dimensional materials. As such, this thesis embodies both main elements of the material culture studies approach: a focus on objects over other materials and interdisciplinarity. Here I have outlined a large array of methodologies which have contributed to the formation of this thesis; perhaps so many that Gerritsen and Riello's label of post-disciplinary rather than interdisciplinary would be most appropriate. However, despite their disparate nature, each approach described here adds a key element to my exploration of the historical meaning of objects and *unwritten* historical knowledge. I found that common historical approaches to the social construction of knowledge about anatomical models led to unsatisfactory and somewhat circumstantial conclusions. Instead, I use an overarching approach from marketing theory to concretely link information about personal values, descriptive categories, and spatial positioning to the creation of meaning, allowing me to draw much more substantial conclusions. This method allows me to take into account the material, spatial, intellectual, and linguistic elements of knowledge construction under the broader framework provided by marketing theory. These sub-methodologies, or inner Russian dolls, each explore one individual element of the marketing theory approach before I explain and explore how these elements combine to help us understand the meaning applied to objects in chapters five and six. An art-historical approach to the models allows me to analyse the significance of the changing materiality of anatomical models as well as drawing out multiple potential meanings.

Methods from archaeology consider objects within a context, offering a conceptualisation of models within a space as well as spatial limits on their uses. Intellectual history offers us a context for objects and of knowledge production and elucidates the personal values of actors with relation to models, as is the priority in value creation identified by marketing theory. Finally, linguistic analysis reveals the nuances of textual materials that surround models within these epistemic spaces which contribute towards the creation of meaning.

This reliance on different methodologies for individual aspects of the thesis may, despite the overarching presence of marketing theory, lead to a somewhat disjointed feel. However, for Hicks and Beaudry, to create a unifying methodology would detract from the idea of material culture studies as a post-disciplinary field. [164] As such, my approach within this chapter and throughout the thesis has been to draw clearly from each field in areas which stand to gain from specific methods. These disjointed methodologies, unified under marketing theory, together create one holistic account of the use and meaning of anatomical models.

[164] Hicks and Beaudry, 'Introduction- Material Culture Studies: A Reactionary View', 19–20.

# Chapter 2 : Introducing Models

"Seeing comes before words."

- John Berger, 1972[165]

As John Berger so wisely introduced his formative work *Ways of Seeing*, sight is often the first way in which we interact with objects, both developmentally and in the ways in which we experience the world. As such, this chapter addresses the visual aspects of nineteenth-century models of normal human anatomy as the first point of access to the meaning of these objects. As outlined in chapter one, this thesis focuses on the birth of what I call a new style of anatomical model. Anatomical models in the year 1900 were vastly visually and materially different from their counterparts just one century earlier. By the turn of the twentieth century, models of normal anatomy were made from different materials, using different processes, and in a different style from those produced in 1800. I argue that these two distinct styles of model also had different meaning for those who interacted with them. I propose that this occurred partially because of the material and visual nature of these objects, and question whether this constitutes embedded meaning. In this chapter, I will chart the developments that these models of normal anatomy underwent during the nineteenth century. In doing so, I discuss the experimentation of modellers with different modes and materials of production. I demonstrate, through an exploration of these modellers in chronological order, that this was not a smooth transition between eighteenth and twentieth-century styles of modelling normal anatomy. Rather, the history of anatomical modelling I display here demonstrates a kind of trial and error approach towards the development of their craft, moving unevenly towards the creation the modern style of modelling normal anatomy. In this chapter I explore exactly how the style of modern models emerged during the nineteenth century to become the dominant style of three-dimensional anatomical representation. I then examine the extent of this change iconographically and iconologically to understand the meaning created around these objects. I conclude that, although there are clear links between the materiality of these models and their possible meanings, there is not specific meaning embedded within these materials. I propose instead that there may be embedded limitations on the meaning able to be created for these objects.

[165] John Berger, *Ways of Seeing*, 1st Edition (London: Penguin Classics, 2008), 7.

This history presents a narrative which at first glance appears to be at odds with the traditional representation of the development of anatomical modelling throughout history. Thomas Schnalke claims that models of normal anatomy gradually fell out of use as more detailed models of pathological anatomy in wax (moulages) became more common. Within this narrative, pathological models were ultimately replaced by the advent of photography which superseded the need for accurate models of pathological conditions.[166] The current historiography on anatomical models, as demonstrated in chapter one above, supports this narrative through its focus on earlier models, making it appear as though models of normal anatomy also fell out of use alongside pathological models. However, this chapter challenges this narrative, charting how models of normal anatomy adapted to survive both the expansion and professionalisation of medical education in the nineteenth century Britain. I argue that the story of the development of generalised anatomical models, rather than being incompatible with the current historical narrative surrounding anatomical models, offers an expansion to the traditional tale. I argue that this narrative presents an alternative branch of development within anatomical modelling which ran parrallel to the birth and use of pathological moulages, described by Schnalke.[167] Depicted visually in figure 2.1, this concept proposes not one, but two concurrent streams of development within the history of anatomical modelling and offers a complementary history to the Schnalke's claims that wax models were succeeded by wax moulages. This narrative chimes with Daston and Galison's exploration of nineteenth-century scientific objectivity. Beginning with truth-to-nature in eighteenth century models, with casting, moulaging, and the use of bone mid-century representing the move to mechanical objectivity, models finally come to rest as objects of trained judgement in their early-twentieth century presentation of a "subjective smoothing of the data".[168] As such, I argue in this narrative representation that models of normal anaomty in this period are illustrative of the "intervention of subjectivity" into anatomical modelling.[169] Importantly, within this narrative, as in Daston and Galison's framework, the concept of idealisation is never superseded by later developments in anatomical modelling, but continues to inform them within the new contexts of creation. I argue, in line with their conclusions, that the eventual return to the practice of grouping variations under the period of "trained judgement" has significant implications for racial grouping by physiognomy at this time.[170]

[166] Schnalke, 'Von Der Normierten Anatomie Zum Historischen Patienten'.
[167] Schnalke, 8.
[168] Lorraine Daston and Peter Galison, *Objectivity* (New York, NY: Zone Books - MIT, 2010), 21.
[169] Daston and Galison, 19.
[170] Daston and Galison, 335–40.

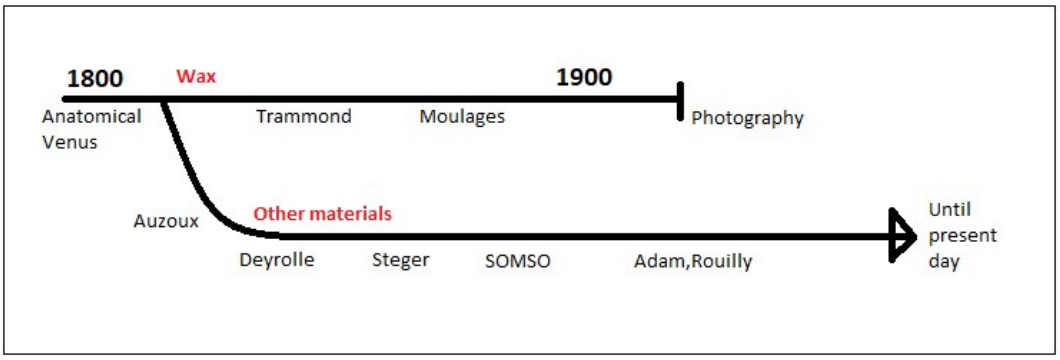


*Figure 2.1 Visual depiction of proposed development of anatomical models in wax and other materials taking parallel but different routes for development.*

The models I have chosen to represent this narrative are specifically ones that were purchased for university education. The models listed here are the models of normal anatomy purchased by the Universities of Oxford, Cambridge, Edinburgh, Liverpool, and University College London; universities which represent both the centres and wider diversity of medical and anatomical education in Britain during the nineteenth century. In doing so, I focus on models that were purchased, rather than ones which were offered for sale.[171] The rationale behind this choice is that these were models that were seen to be useful by anatomical lecturers themselves, thus helping to indicate the impact of consumer choice and purchasing power upon the development of model design. This focus shares the agency for model design between modellers and those who used these models in cases where prolonged direct contact between the two, as Nick Hopwood has described, does not appear to have occurred. Whilst hundreds of anatomical models were recorded within catalogues of university teaching materials, it has not been possible to identify them all. This is largely because extant records of models contain few details about the models and because most of these models have not survived within collections until the present day. As such, in the first half of this chapter I will describe the various brands of model that it has been possible to identify within British university archival materials.[172] In doing so, it becomes possible to understand the stylistic changes occurring within the modelling of normal anatomy during this period.

[171] Models were offered for sale in catalogues such as Louis Thomas Jérôme Auzoux, *Catalogue des préparations d'anatomie clastique du Dr. Auzoux* (Auzoux, 1853); or in expositions such as the *Official Catalogue, Exhibition of the German Empire.* (Saint Louis: Stilke, 1904); Claire L. Jones, *The Medical Trade Catalogue in Britain, 1870–1914* (Routledge, 2015).

[172] NB: This list represents only the anatomical models at each university which I have been able to identify.

The second half of this chapter then considers the impact and importance of this stylistic and material change in the modelling of normal anatomy. Using the iconological approach developed by Erwin Panofsky in the early-twentieth century, I argue that the changes made to anatomical models in this period influenced their epistemological status, and thus their meaning within anatomical education.[173] In this section, I will analyse both the materiality and the visuality of anatomical models from the late-eighteenth and early-twentieth centuries, forming a comparison between the two. Through this comparison, I will demonstrate that a significant change in style occurs over the course of the century, concurrently considering the intellectual significance of this change through iconological analysis. Early steps in iconological analysis look to wider visual materials in order to contextualise the visual changes within anatomical modelling. Through this visual analysis, I conclude that whilst meaning is not embedded within objects, limitations on meaning certainly are. Importantly, this change in visual style is not unique to modelling, occurring also within other anatomical teaching materials of the period and in artistic representations of the body. However, chronology suggests that anatomical models might be considered the driving factor behind these changes, rather than the recipient of them. Understanding the development of these anatomical models is therefore not only historiographically important but may have wider consequences for the history of human depiction more generally.

## Part 1: Models

### Wax models in the Florentine style, 1770s: realism in wax

In order to understand the changes that anatomical modelling of normal anatomy underwent during the nineteenth century, we must first consider the models of the eighteenth century which form the starting point for this gradual and uneven change. These models are what I am calling the Florentine style because of both the scale of production and notoriety of the La Specola workshop, although there were a number of centres of anatomical model production within Italy at this time.[174] These models were produced through a combination of the efforts of Felice Fontana and a number of different modellers from the 1770s until the early-nineteenth

[173] Panofsky, *Studies in Iconology*.

[174] The first wax sculpture artist at the Florentine workshop, Giuseppe Ferrini, had actually been trained at the anatomical modelling workshop in Bologna- giving the Bolognese workshop precedence in the creation of this style of anatomical model. However, the anatomical Venuses are uniquely Florentine, with Clement Susini, Ferrini's successor, constructing a Venus model ('*Venerina*') for the Bologna school in 1782.

century in the La Specola workshop.[175] They were made entirely from wax mixed with resin for longevity, which was then varnished.[176] They were designed to be as lifelike as possible, presenting the functioning and perfect, not the dead, body.[177] This is demonstrated in both the life-like size of the models and the addition of glass eyes and real human hair, when suitable (see figure 2.2). This reflection of life is emphasised in the most famous of the models from this collection: the Anatomical Venus. Produced between 1780 and 1782, this model presented a hyper-realistic depiction of the human body, incorporating not just real human hair but also a pearl necklace which revealed these depictions as idealisations (see figure 2.3, page 52).[178] We can see the importance of these Venus models within the Florentine style collections as they are presented in pride of place in the two largest collections of these models in the La Specola (Florence) and Josephinum (Vienna) exhibition rooms (see figure 2.4, page 53). However, the anatomical Venus models form only a small part of the collections, despite the relative amount of attention they receive in both popular and scholarly literature.[179] There are only one or two Venus models in each of the Florentine and Viennese collections, as well as one at Bologna and at Montpellier. In these collections other full body waxworks, and life-size sections of the body occupy the majority of the space, alongside diagrams also presented alongside each model to act as a didactic tool for public enlightenment.[180]

[175] For an exploration of the varying roles and influence of Fontana and the modeller Susini see Maerker, ' Turpentine Hides Everything'.
[176] As per the expertise of Eleanor Crook, wax modeller, who restored some models in the Florentine collection in 2017.
[177] Maerker, *Model Experts*, 120.
[178] Ebenstein, *The Anatomical Venus*, 14.
[179] See Ballestriero, 'Anatomical Models and Wax Venuses'; Bates, 'Anatomical Venuses: The Aesthetics of Anatomical Modelling in 18th- and 19th-Century Europe'; de Ceglia, 'The Importance of Being Florentine'; Ebenstein, *The Anatomical Venus*; Stephens, 'Venus in the Archive'.
[180] Maerker, ' Turpentine Hides Everything', 260.


*Figure 2.2 Anatomical Venus model in wax (c. 1780-1782). (Museo di Storia Naturale/La Specola, Florence; The Anatomical Venus, Joanna Ebenstein (London, 2016), pp. 22-23)*


*Figure 2.3 Close-up of the anatomical Venus model (c.1780-1782). (Joanna Ebenstein, Anatomical Theatre Exhibition, University of Alabama, Birmingham (2007); The Anatomical Venus, Joanna Ebenstein (London, 2016), p. 181)*


*Figure 2.4 One of the rooms at the Museo di Storia Naturale/La Specola, Florence. This image illustrates the prominent central placement of supine models compared with others. (Museo di Storia Naturale/La Specola, Florence; 'Anatomical models and wax Venuses', Roberta Ballestriero, Journal of Anatomy 216:2 (2010), p. 226)*

Despite their common origins, Anatomical Venus models and the other kinds of wax models in these collections have enjoyed quite different routes to the same fate: obscurity. Venus models became the centrepiece of a number of traveling anatomical museums, for example Dr. Spitzner's or Dr. Kahn's anatomical museums.[181] Presented alongside wax models of sexual organs and sexually transmitted diseases, as well as exotic animals and other show goods, they were often used to titillate and frighten members of the public. Although these models were presented with the veneer of education, with purveyors arguing that their institutions played a similar public health role to the museums in Florence and Vienna, in reality these institutions were more closely aligned to the fairground than to medical institutions.[182] Wax mimesis has been likened to other disquieting human representations such as android robots and ventriloquist dolls, placing them within the *uncanny valley* of human relationships with humanoid likenesses.[183] In this way, we can see how mimesis holds heavy links with the kind of sensationalism that nineteenth century medicine was attempting to distance itself from.

[181] Hoffmann, 'Sleeping Beauties in the Fairground', 1 July 2006; Bates, 'Dr Kahn's Museum'; Stephens, *Anatomy as Spectacle*.
[182] Bates, '"Indecent and Demoralising Representations"'.
[183] Ebenstein, *The Anatomical Venus*, 201–15.

However wax moulages and the more sectional, less sensational, anatomical models were kept within the medical sphere, gradually fading into obscurity as a result of different forces at play including the advent of photography. Indeed, it appears that two smaller models of sections of the human body were purchased from Florence by the University of Oxford in 1805. However, they appear to have fallen out of use some time before the collections were transferred to Arthur Thomson in 1894.[184] It is likely, considering later developments in the field that the adherence of these models to life, whilst aesthetically pleasing, was found not as didactically helpful in a solely medical, and not public, setting. I therefore argue that the materiality of these models is accountable simultaneously for their sensationalisation and their replacement, as well as their modern-day resurgence in public popularity.[185]

## Dr. Louis Jerome Auzoux, 1820s: demountable anatomies

Wax models were supplanted in the nineteenth century by models made from other materials. Our visual journey through nineteenth century models of human anatomy begins with Dr. Louis Jerome Auzoux. Dr. Auzoux began to produce papier-mâché anatomical models in France in the 1820s, with his company continuing to manufacture them in his name after his death in 1880 until the company closed in the 1990s (although beginning to make models from resin in the 1980s).[186] The unique feature of these models, at least in the 1820s, was that they were completely demountable: they could be disassembled and reassembled again. These models had hundreds of pieces, with Auzoux's first model including 665 (although the full-size model he brought to mass market in the 1830s had only 129, see figure 2.5, page 57). The pieces were numbered to be used with an accompanying key with 1115 details labelled in his full-size body models.[187] Each piece of these intricate models was designed to fit seamlessly with the others and as such were constructed of material that was designed not to warp and change shape over time to preserve the model's usability; papier-mâché. They were also painted in vivid colour, which clearly separated the various elements of the body, contributing to the didactic nature of the models. As such, there are three important aspects of these models to discuss: their

[184] 'Anatomy School: Papers on the Creation and Administration of the Anatomy School, Including the Transfer of the Specimens to the University Musem, and the Conversion of the School for a Laboratory', n.d., MS Estates 127, Christ Church College Archive.
[185] See Ebenstein, *The Anatomical Venus* and contemporary collections such as the Morbid Anatomy Museum.
[186] 'Musée de l'Ecorché d'Anatomie', accessed 2 October 2019, http://www.musee-anatomie.fr/indexFR.htm.
[187] Charles Savona-Ventura, *Contemporary Medicine in Malta [1798-1979]* (Malta: P.E.G. Ltd, 2016), 316.

materiality, their accompanying materials, and their use of numbers and colour for didactic purposes.

When considering the materiality of these models, it is important to note that Dr. Louis Auzoux was not the first modeller to attempt to break the mould, so to speak, of the previous style of wax model. Indeed, it was Felice Fontana himself, director of the Florence waxworking workshop at the La Specola museum, who first attempted a "dissectible" anatomy.[188] However, Auzoux was the first to produce a commercially successful and viable demountable model. Fontana attempted to carve his dissectible anatomy out of wood, whilst Auzoux's were constructed from a mixture of papier-mâché, plaster, and cork.[189] Here we can truly see the importance of materiality in the development of anatomical modelling in the nineteenth century. Wood would deform over time, expanding and contracting in response to heat, thus making it unsuitable for a dissectible model in which the pieces must both fit together seamlessly and easily come apart. Moreover, the investigative process for Fontana was extremely costly, both professionally and financially.[190] In contrast, Auzoux's unique blend of ingredients allowed the pieces to remain pliable and thus removable, stay resistant to the effects of heat and moisture, and robustly stand up to the wear of use. Meanwhile, the use of these cheaper materials meant that Auzoux's models would not only have been cheaper to develop but also sold at a comparatively much lower price to models from the Florentine workshop.

Part of this price differential was a result of the process of mass production that Auzoux's workshops followed. As Anna Maerker has explored in her work on the Auzoux factory and advertising process, these models were produced in a kind of production line.[191] The sheer number of different models and, as previously discussed, pieces for each denotes the scale of the production operation. As such, Auzoux models were not exactly cheap to produce, but still considerably cheaper than their wax predecessors. Full-size models of the human body were priced at 3000 Francs (approx. £119), with three different smaller versions available at later dates costing 1000, 500, and 250 Francs.[192] The University of Oxford paid £140 for their "whole

[188] Maerker, *Model Experts*, 133–37; Renato G. Mazzolini, 'Plastic Anatomies and Artificial Dissections', in *Models: The Third Dimension of Science*, ed. Soraya De Chadarevian and Nick Hopwood (Stanford: Stanford University Press, 2004), 43–70; Simone Contardi, *La Casa Di Salomone a Firenze. L'imperiale e Reale Museo Di Fisica e Storia Naturale (1775-1801)* (Florence: Olschki, 2002).
[189] Maerker, 'Inside Auzoux's Models'; Maerker, 'Anatomizing the Trade'.
[190] Maerker, *Model Experts*, 133–38.
[191] Maerker, 'Inside Auzoux's Models'; Maerker, 'Dissections in Papier-Mâché: The Models of Dr Auzoux'.
[192] 'What is the equivalent of 3000 French franc [1795-1960] in year 1833 in the currency of UK pound [1658-2015] in year 1833?' Rodney Edvinsson, 'Historical Currency Converter', accessed 2 October 2019, https://www.historicalstatistics.org/Currencyconverter.html; Savona-Ventura, *Contemporary Medicine*

length" Auzoux model and accompanying stand in 1833 (not including shipping, handling, or papers).[193] Whilst this is considerably less than a similar model in wax, it is much more expensive than the later alternatives which follow.[194] However, these costs did not seem to deter anatomy schools who understood the importance of this new style of didactic tool. As well as Oxford, Cambridge and Edinburgh both possessed a model of the full human body, while Liverpool purchased a model of the human ear, and Cambridge a number of animal models. However, as more anatomy schools were set up and student numbers grew throughout the nineteenth century, we see an almost inevitable rise in the purchase of pure plaster models; despite its rigidity, it was much cheaper.

*in Malta [1798-1979]*, 316.

[193] 'Anatomy School: Papers on the Creation and Administration of the Anatomy School', 242.

[194] As noted before, wax models cost c.£400, whilst plaster models could be bought for c.£71 for 39 models (by Steger) Birte Barbian, 'Die Geschichte Der Anatomischen Sammlungdes Institutes Für Anatomie in Münster Mit BesondererBerücksichtigung Ihrer Historischen Modelle Und Präparate' (Medizinischen Fakultätder Westfälischen Wilhelms- Universität Münster, 2010), 24; In 1909, a set of 39 Steger models cost c.£71. Source: What is the equivalent of 1450 German mark [1871-1924] in year 1909 in the currency of UK pound [1658-2015] in year 1909? Edvinsson, 'Historical Currency Converter'.

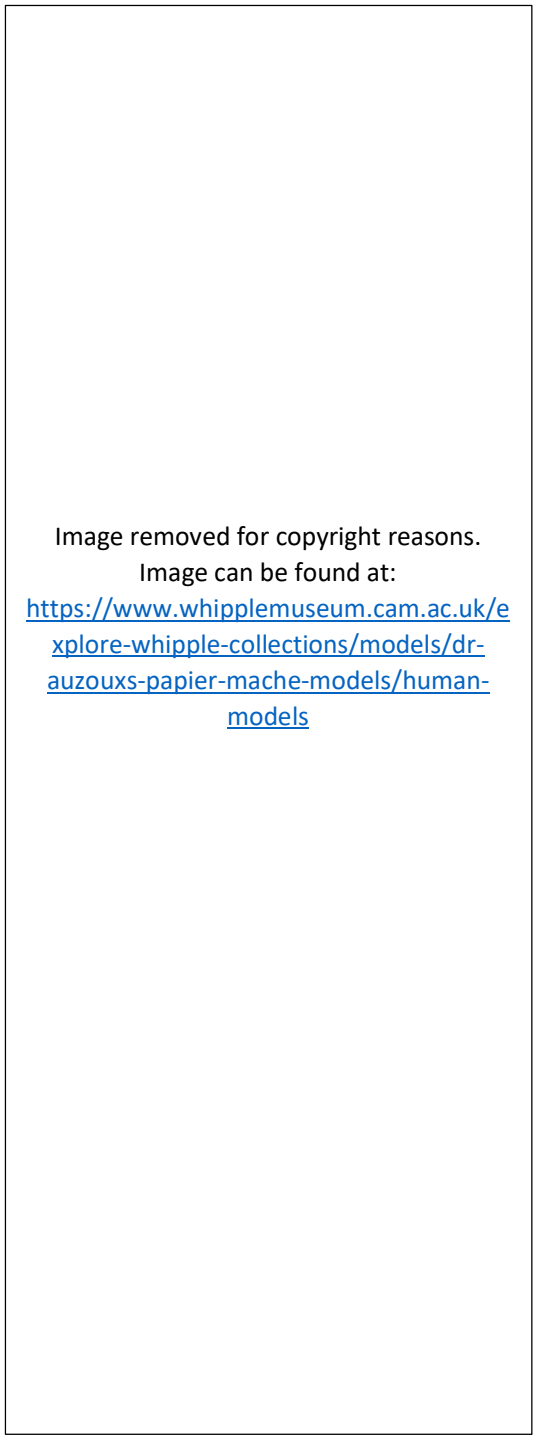


*Figure 2.5 Papier-mâché and plaster model of a human by Dr. Auzoux (1848). (Wh.5893, Whipple Museum of the History of Science, University of Cambridge)*

## William Bally, 1830s: function over form

The second figure in our exploration of nineteenth century anatomical models is the unlikely William Bally. Bally was a sculptor, artist, and phrenologist active in Manchester and Liverpool during the early half of the nineteenth century who worked in both plaster and wax. Not a great producer of models of normal anatomy, he is most well-known for a series of 60 miniature phrenological models made from plaster and produced in 1831/2 (see figure 2.6, page 59). These were described by Dr. Johann Gaspar Spurzheim and exhibited at the 1851 Great Exhibition as Bally's only entry.[195] However, two larger and more anatomically didactic models labelled W. Bally and dated 1834 are also present in the collection of anatomical models at the University of Liverpool (see figures 2.7 and 6.1 on pages 60 and 189). There are several differences between these models – most notably, size, number, and colouring – which lead us to assume that they had different purposes; one would show a range of cases, whilst the other two would show either specific examples or more general anatomy of the head. However, there are also similarities which would lead us to conclude that they were in fact produced by the same W. Bally. Firstly, there are similarities in the techniques and materials used to produce both kinds of model. They are both plaster models, and both show evidence of brush marks suggesting that the casting process was similar (see figures 2.7 and 2.8, pages 60 and 61). In Bally's published accounts of his casting process he recommends both lining moulds with various substances and methods for "completing" models after casting, any of which could have produced these brush marks.[196] Secondly, despite their visual differences these two different types of models do both deal with the same subject matter; the head. Although different styles, these models study the same topographical area of the body, suggesting the work of the same modeller. This assumption is supported by Bally's published works which show he gave lectures on the completion of anatomical casts, although he does not provide details of his methods.[197] Finally, there is some evidence to suggest that William Bally was resident in Liverpool during this period.[198] Although his miniature phrenological models have also been assigned Manchester or Dublin as potential cities of provenance, if William Bally was resident in Liverpool in the early 1830s it is entirely plausible that he produced these models for an anatomist or anatomical school in the city.

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[195] Alice Cliff, 'Coming Home- Bally's Miniature Phrenological Specimens', *Science Museum Group Journal* 1, no. 01 (2014), http://journal.sciencemuseum.org.uk/browse/2014/coming-home/.
[196] William Bally, *Mons. Bally's Lectures on Casting, Modelling, &c.* (Nottingham: J. Hicklin & Co, 1859), 6.
[197] Bally, *Mons. Bally's Lectures on Casting, Modelling, &c.*
[198] 'Mr. Bally, of Liverpool' Anon., 'Classified Ad', *Manchester Guardian*, 7 September 1833.

Bally's models are the first in this series to use plaster as their main material. Although he was working with wax simultaneously, wax modelling was reserved for fruits, plants and coins.[199] The use of wax in these cases suggests a heightened need for realism in these artistic pieces, whilst simultaneously demonstrating Bally's prioritisation of form over aesthetics in his phrenological and didactic anatomical models in plaster. This is emphasised by the visibility of brush marks on his finished models which would detract from the aesthetics of mimetic likeness but not from the information intended to be imparted through form.

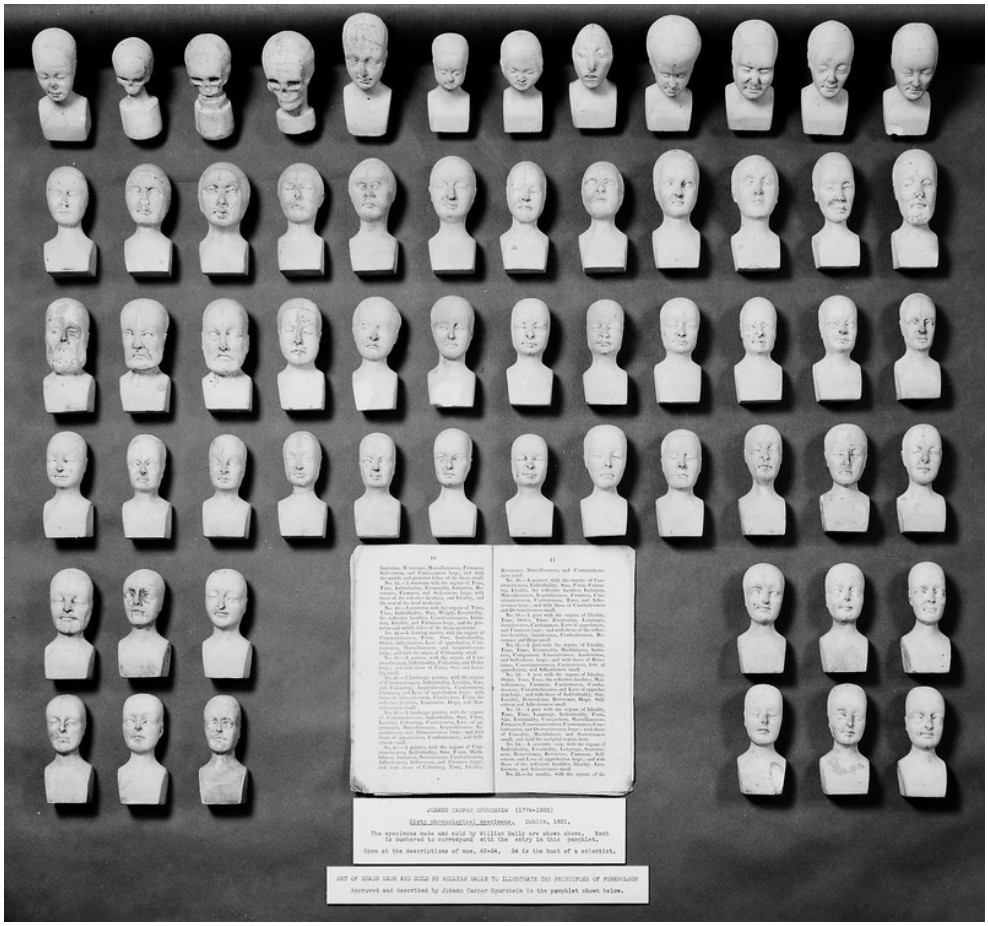


*Figure 2.6 Principles of Phrenology, W. Bally (Dublin, 1831). Set of heads to illustrate the principles of phrenology made and described by William Bally together with a descriptive pamphlet by J. C. Spurzheim. (Wellcome Collection Images, CC BY)*

[199] Bally, *Mons. Bally's Lectures on Casting, Modelling, &c.*

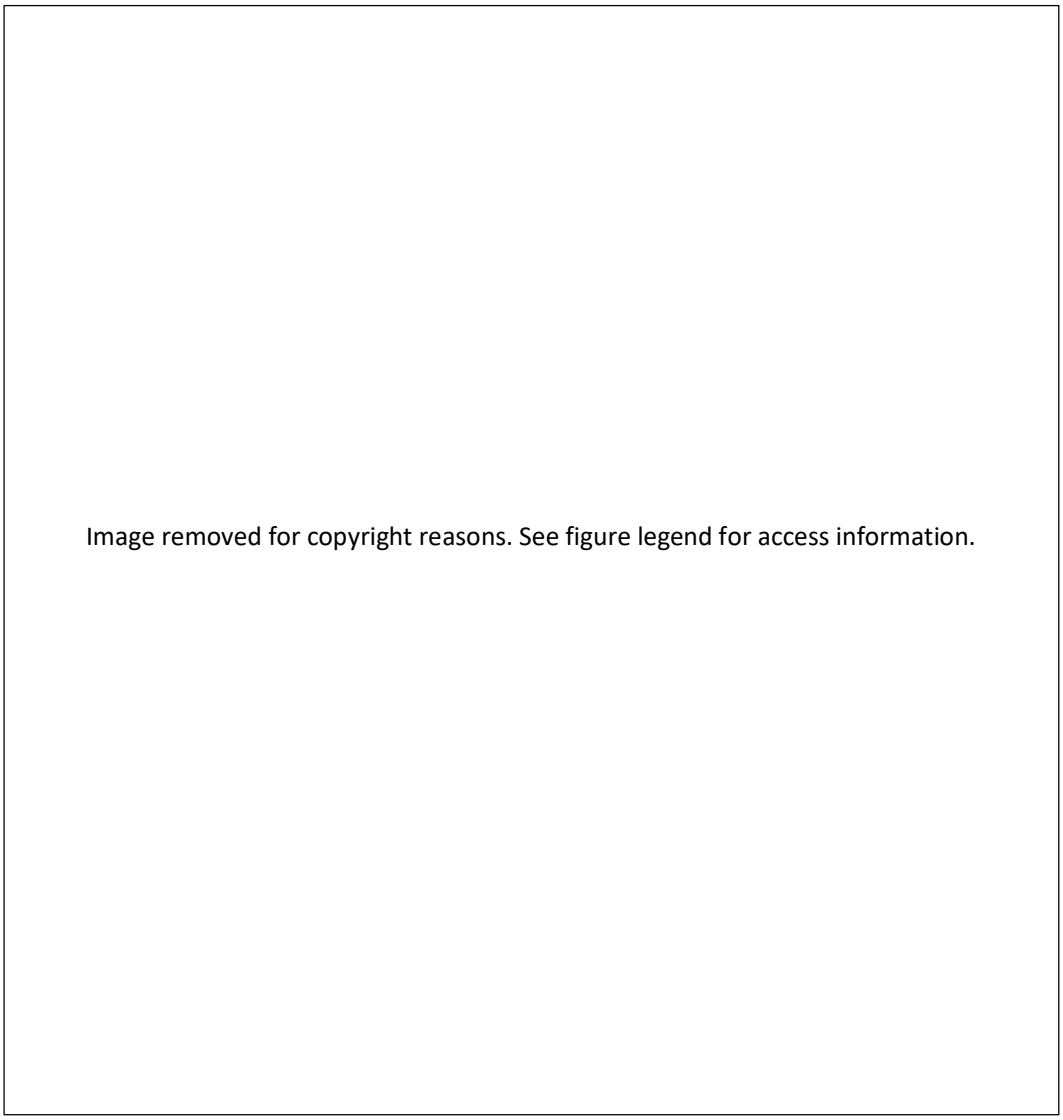


*Figure 2.7 Model of the cranial fossae, W. Bally (1834). (ANA.46, University of Liverpool Heritage Collections (Victoria Gallery & Museum))*

Image removed for copyright reasons. Image available at:
http://journal.sciencemuseum.ac.uk/browse/2014/coming-home/ (Figure 3)

*Figure 2.8 W. Bally phrenological model. Close-up showing the presence of brush marks around the eye and ear. (Museum of Science and Industry, Manchester; 'Coming Home- Bally's Miniature Phrenological Specimens', Alice Cliff,* Science Museum Group Journal*, 2014)*

## Casciani & Son, 1857: casting the body

Plaster cast models by Dublin firm Casciani & Son (See figure 2.9, page 63), although similar to Bally's models in subject matter and materials, offered both a return to realism as well as a collaboration with current research. Although losing the mimetic qualities of wax, Casciani models replicated the realistic facial expressions of the bodies from which the originals were cast. A number of these models appear in the work of Scottish anatomist D. J. Cunningham on the brain (see figure 2.10, page 64) with Casciani & Son creating replicas for wider distribution.[200] As a result of this collaboration between modeller and anatomist, many extant Casciani & Son models focus on the head and brain. However, there are models of both the arm and pelvis created by Casciani & Son in the collections at the University of Liverpool.[201]

Lucy Spencer has assumed that possession of such models by the University of Melbourne demonstrates that they were used to support and further an interest in phrenology, eugenics, and brain differences in the mentally ill by anatomists at the university. However, the same assumption cannot be made about possession of these models displaying anatomical interest in racial anatomical differences. Although the University of Oxford ordered five Casciani & Son models in 1890, we cannot assume that these five models in any way represented the five "races of man" that were commonly assumed to exist within this period.[202] As can be seen in figure 2.10 (page 64), as well as other plates within Cunningham's volume on cerebral hemispheres, Casciani & Son models only represented Caucasian individuals or apes. The "model of a brain of a negro" is the only non-Caucasian nineteenth century anatomical model by any manufacturer that I have located during my research into this area. Produced in Bologna in 1850 this model was not reproduced but was used as the basis for a publication refuting racial differences in the anatomy of the brain (and thus racial differences in intelligence); one of only two publications to do so at this time.[203] This model was used, as Francesco Galletti *et al.* have demonstrated, in an argument for the fundamental similarity of mankind, irrespective of race. As such, we cannot assume without further evidence that the presence of these Casciani & Son models in British university collections was necessarily a result of interest in racial differences in the brain, when

[200] D. J. (Daniel John) Cunningham and Victor Horsley, *Contribution to the Surface Anatomy of the Cerebral Hemispheres* (Dublin : Academy House, 1892); Samuel J. M. M. Alberti, 'Frozen in Time', Royal College of Surgeons Library Blog, 16 February 2016, https://www.rcseng.ac.uk/library-and-publications/library/blog/frozen-in-time/.
[201] ANA.29 and ANA.30, University of Liverpool Heritage Collections (Victoria Gallery & Museum), Liverpool
[202] See Blumenbach, *De generis humani varietate nativa*.
[203] Calori, 'Cervello di un negro della Guinea'; which followed an earlier paper on the matter by Teidemann, 'On the Brain of the Negro, Compared with That of the European and the Orang-Outang'.

it may have indicated research into brain similarity. However, the abundance of these models within British university classrooms in this study suggests that a large number of British anatomists were interested in Cunningham's work and that Nick Hopwood's concepts of plastic publishing extended beyond embryological models at this time.

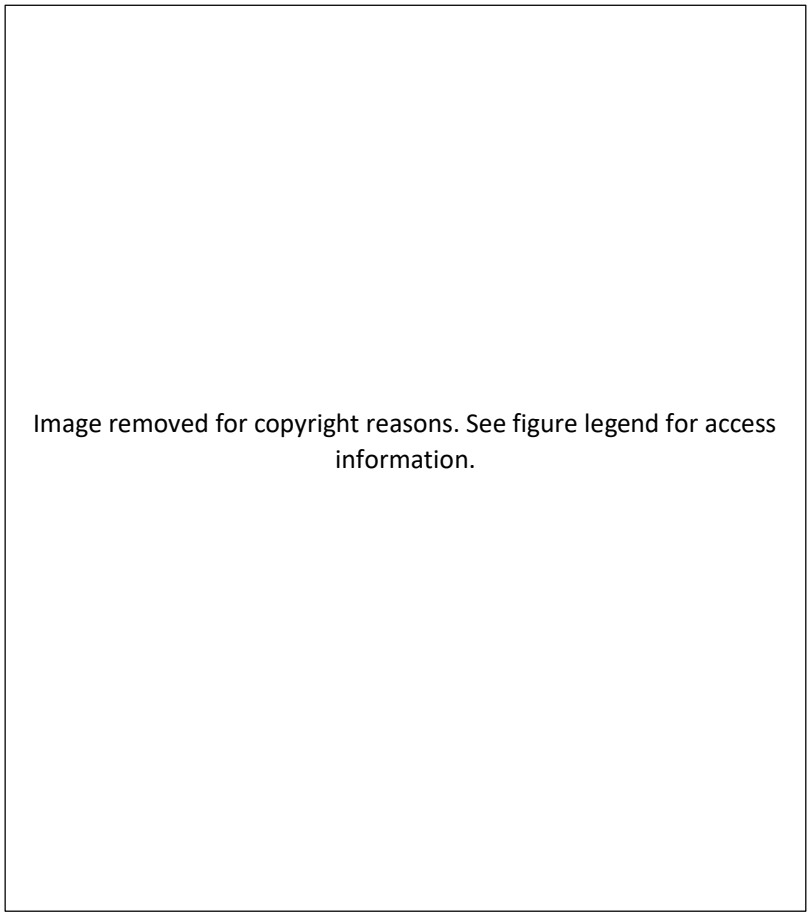


*Figure 2.9 Model by John Casciani & Son. (ANA.26, University of Liverpool Heritage Collections (Victoria Gallery & Museum), image taken by author)*

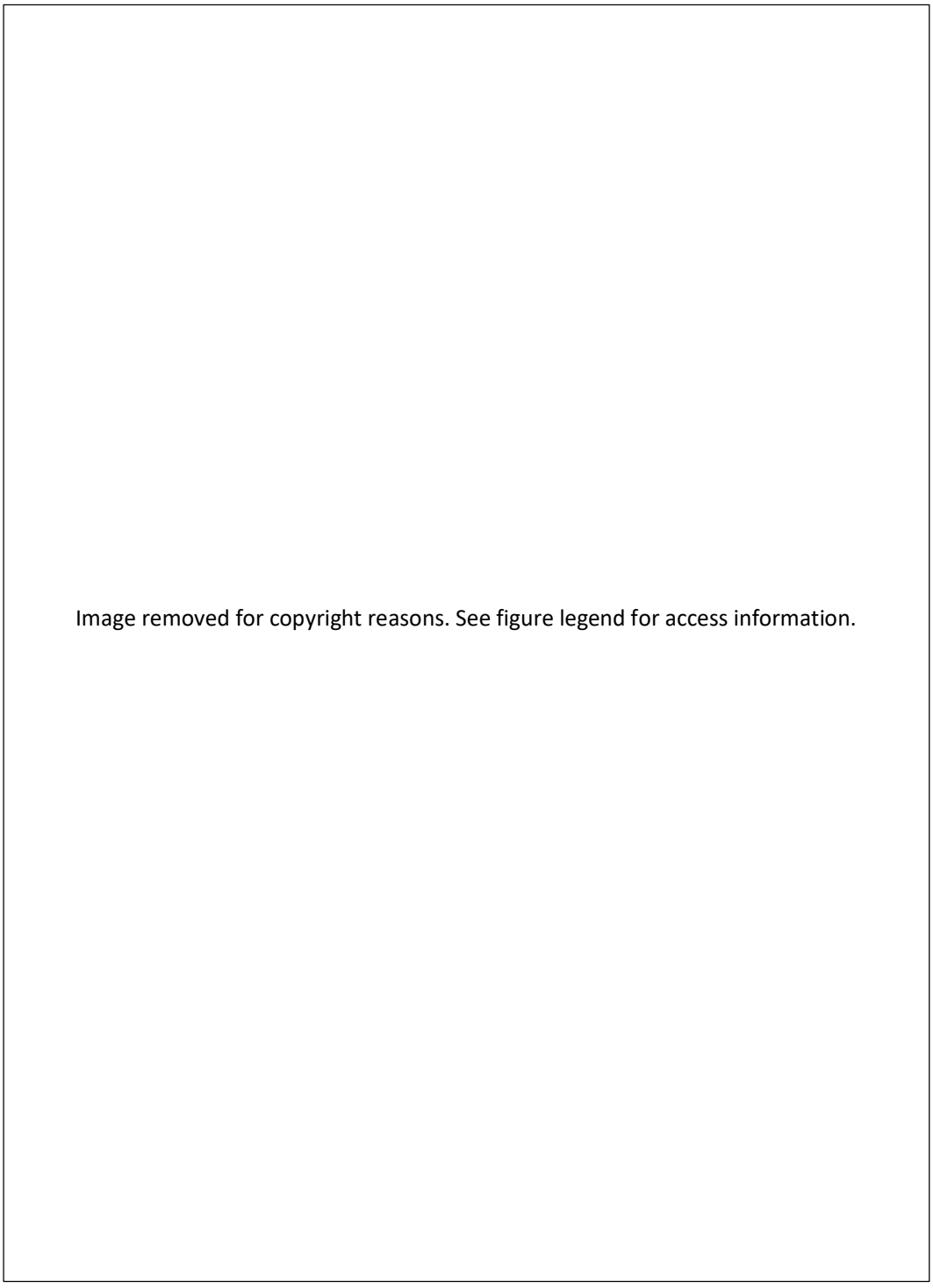


*Figure 2.10 Photographs of Casciani & Son models published by D.J. Cunningham (1892). (Contribution to the Surface Anatomy of the Cerebral Hemispheres, D. J. Cunningham (Academy House, Dublin, 1892), p.371)*

### Maison Deyrolle, Émile Deyrolle, 1831/1866: didactic colouring

Maison Deyrolle first opened in Paris under Jean-Baptiste Deyrolle in 1831, but in 1866 his grandson Émile Deyrolle took over the business and began the production of educational materials. These materials included a range of wall charts as well as models in both plaster and papier-mâché. Whilst the Maison Deyrolle biological models appear largely to have been produced in papier-mâché, most of their anatomical models are rendered in plaster, amongst other materials. The full body models produced by Deyrolle are made from plaster and are clearly not cast from life (see figure 2.11), replicating the pose and flayed presentation of Auzoux models.[204] All of the anatomical models produced by Deyrolle are considerably simplified in comparison with both Auzoux's models and the papier-mâché biological models produced by the same workshop. The full-sized body models have no labels, with Deyrolle's smaller models having only a few (see figure 2.11, right). This could suggest a younger or less educated intended audience for these larger Deyrolle models, as was the case with the wall-charts produced by the Deyrolle company.[205] The full-body models in this style demonstrate this hypothesis with none purchased by any of the British universities in this study. However, at least one was purchased for use in high school classroom teaching at the Normal School in São Paulo, Brazil, showing that they were deemed suitable for a younger audience. Preferring instead to order small and topographically specific models of the heart, spine, and brain, the universities of Edinburgh and Liverpool were clearly still able to make use of simple and didactic models in plaster on a smaller scale. This demonstrates that whilst the full-body models produced by Deyrolle might have been too oversimplified for medical schools, their brightly coloured didactic plaster models were useful on a much smaller scale.

[204] Maerker, 'Anatomizing the Trade'.
[205] Diana Gonçalves Vidal, 'Transnational Education in the Late Nineteenth Century: Brazil, France and Portugal Connected by a School Museum', *History of Education* 46, no. 2 (4 March 2017): 228–41.

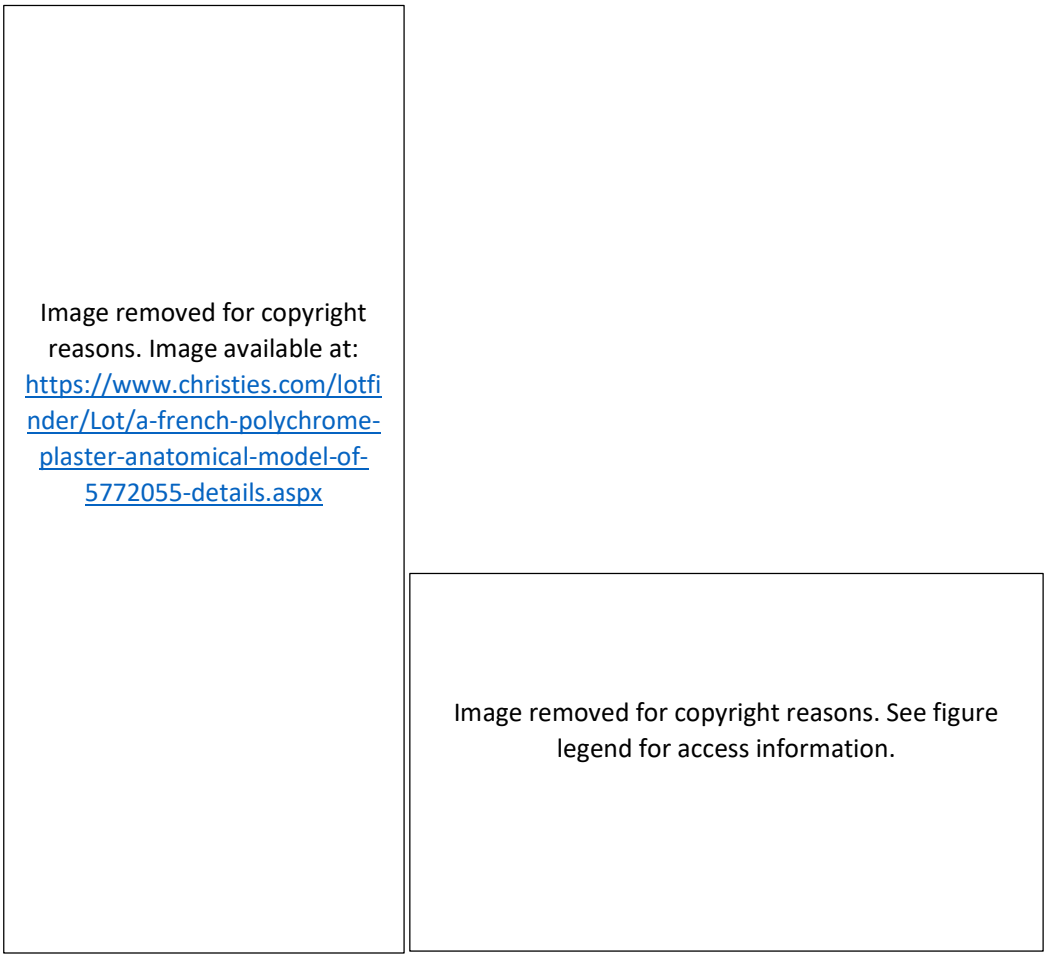


*Figure 2.11 Maison Deyrolle models. Left; Example of a Maison Deyrolle full body human model, early-twentieth century. (www.christies.com) Right; Maison Deyrolle model of the human heart. (ANA.48, University of Liverpool Heritage Collections (Victoria Gallery & Museum))*

## Maison Vasseur-Tramond, Gustave Tramond, 1850s/1878: realistic remains

Pierre Vasseur founded the Vasseur-Tramond workshop in Paris in the 1850s and was joined by his son in law Gustave Tramond in 1878. Much in the same way as Émile Deyrolle's contribution to the Deyrolle workshop, Tramond is famed as the producer of the vast majority of the models to emerge from the Vasseur-Tramond workshop. These models represent an outlier in this narrative of gradual change, presenting wax anatomical models in a style similar to those of the eighteenth-century Florentine workshop. Indeed, on the surface these models share a number of characteristics with the Anatomical Venus models of the preceding century. They are made from wax and present ideal and sexualised visions of the female body during dissection, as well as being adorned with real human hair (see figures 2.2 and 2.3, page 52). However, when we delve beneath the 'skin' of these models we find that materials like metal and bone have been

used to construct the basis of the models' forms.[206] As such, these models blur boundaries between individual and generalised representations of the body in a rather different way from many of the other models in this study. By physically including some of the individual within the model, these models become hyper realistic; going beyond mere mimesis, these models are augmented remains. As such, these models demonstrate the complexity of the change from wax to plaster and from individuality to standardised. Not only were wax and plaster models used concurrently, continuing to be used side-by-side today, but their production and sale overlapped considerably during the nineteenth century.[207] Indeed, these models must have been produced side-by-side after the Tramond company was subsumed into the Auzoux company in 1926.[208] However, what these models make clear is that wax was rarely used to present non-realistic depictions of the body. These models demonstrate how entrenched the relationship between construction materials and overall style are within the history of anatomical modelling.


*Figure 2.12 Models by Tramond at the University of Liverpool. The use of bone structures as base materials is clearly visible, as is the similarity of Tramond models with those from the La Specola workshop in Florence. (Left; ANA.1, Right; ANA.3, University of Liverpool Heritage Collections (Victoria Gallery & Museum), Liverpool)*

[206] Pastor et al., 'Uncovered Secret of a Vasseur-Tramond Wax Model'.
[207] The anatomical museum at the University of Edinburgh remains a working museum to this day. It is reserved for the use of medical students and classes and researchers only by invitation. Here preparations in wax, plaster, and plastic co-exist harmoniously within the teaching collection.
[208] 'Teaching Aids: Teaching Models: Wax Models', University of Malta: Virtual Medical History Museum, accessed 6 December 2019, http://home.um.edu.mt/med-surg/museum/models.html.

### Franz Josef Steger, 1880s: generalisation in plaster

Franz Joseph Steger was a German modeller who worked predominantly in plaster, producing both "free-form sculpture and direct casts" in collaboration with Carl Ernst Bock and Wilhelm His at the University of Leipzig.[209] His sculpted works are standardised and simplified (see figure 2.13, page 69) whilst his cast works appear to be a result of the freezing technique employed for dissection in the University of Leipzig where Steger was based.[210] These different cast and sculpted models have a number of things in common. Although many Steger models of the full human body depict the body from numerous angles, they all feature a cut-out section or side. They are all also formed of one solid piece and are not demountable anatomie clastiques like the models produced by Auzoux. In some of Steger's models both methods of construction are visible simultaneously, with evidence of casting as well as post-cast sculpting (see figure 2.13, page 69, right). This potential mixture between the two production methods shows the gradual nature of the transition away from mimetic likeness, both within and outside of the medium of plaster.

Interestingly, Steger produced a prepubescent female model (see figure 2.13, page 69, right) which presents an unusual depiction of the female body without child. As Ludmilla Jordanova has explored, the sexualisation and tautological presentation of woman as pregnant in the history of anatomical depiction (both in two and three dimensions) is pervasive.[211] However, this model offers us a unique opportunity to view the presentation of a female body in neither of these modes. The model is neither sexualised, nor pregnant, and does not present any marked differences from the representation of the male body produced by Steger (see figure 2.13, page 69, left). This suggests that perhaps puberty was the point after which women were no longer seen to be normal but now abnormal in their capacity to produce children. These models clearly do show an effort to fill the gap in available cadavers. This presentation of the prepubescent female body was replicated in the two-dimensional work of Johnson Symington of 1887, a doctoral student in anatomy at the University of Edinburgh. Again, the prepubescent female was presented in exactly the same way as the male body, with Symington focussing on children's bodies of both male and female sex in order to show the distinct differences from the adult body. However, more than an acknowledgement of bodily difference between child and adult, he also noted that these kinds of cadavers may be difficult to obtain which is why they were so

[209] Spencer, 'Chance, Circumstance and Folly', 6.
[210] Spencer, 6.
[211] Jordanova, *Sexual Visions*.

faithfully reproduced in his work.[212] It is interesting that both Symington's work on this subject and the Steger modelling company chose to represent only the prepubescent female body and not others which were also perceived by anatomists as lacking in the cadaver supply during the nineteenth century.


*Figure 2.13 Plaster models of torso showing partial dissection by Franz Josef Steger. (Left; 3208, Right; 3143, Anatomical Museum Collection, University of Edinburgh)*

[212] Johnson Symington, *The Topographical Anatomy of the Child* (Edinburgh: Livingstone, 1887).

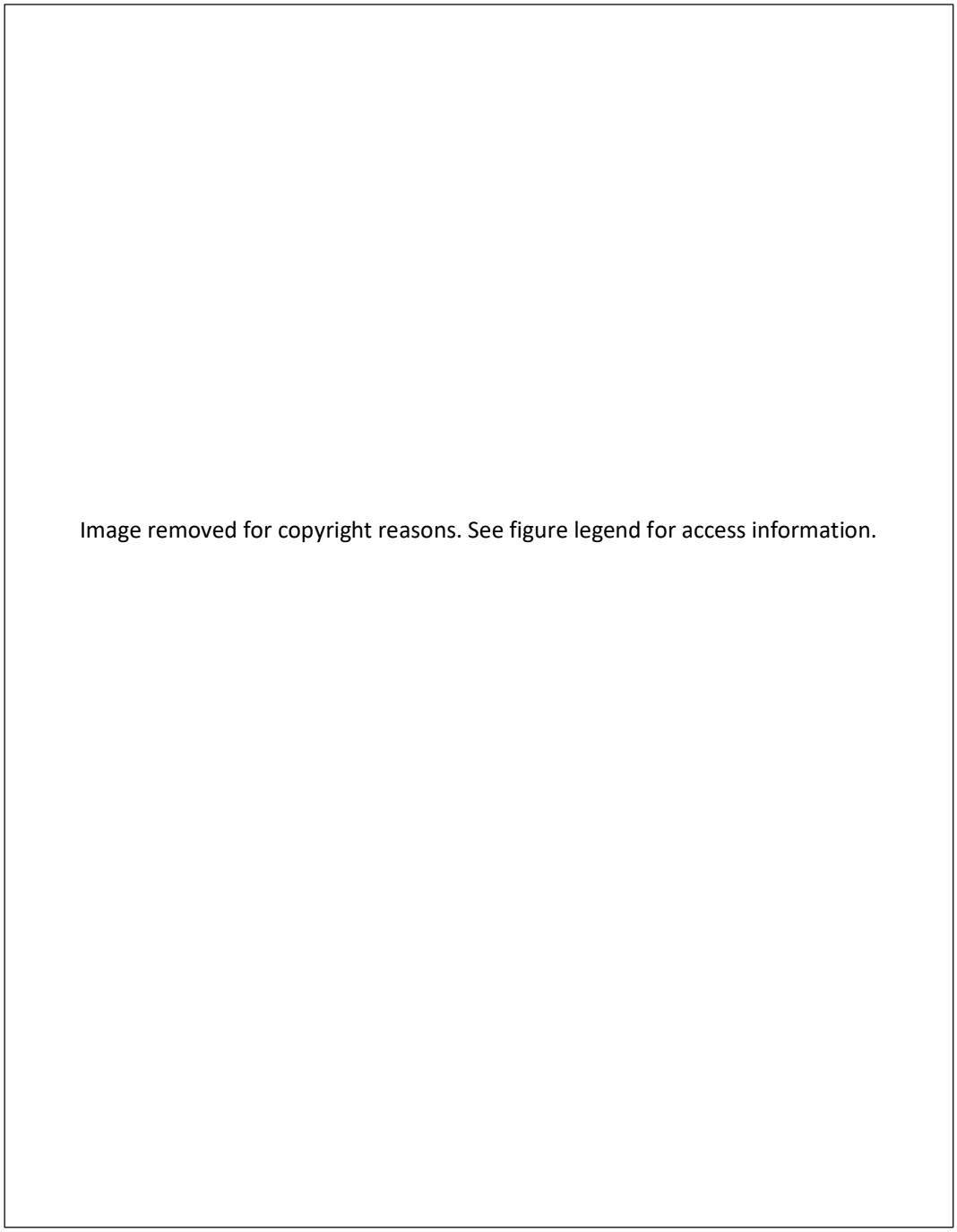


*Figure 2.14 Face profile model by Steger with damaged base. This model displays clearly sculpted elements and didactic colouring and numbering. (ANA.20, University of Liverpool Heritage Collections (Victoria Gallery & Museum), Liverpool)*

### Berlinische Verlagsanstalt G.m.b.H, c.1910: generalisation in wax

Berlinische Verlagsanstalt G.m.b.H, on the other hand, produced models of the face similar to the Steger models in style but made from wax (see figures 2.14, page 70, and 2.15, page 72). Operating in Berlin c.1910, Berlinische Verlagsanstalt created teaching aids ('lehrmittelwerk' [sic]) presenting a side profile of the face; these simplified, generalised and didactically coloured teaching aids perform a similar task to those created by Steger. However, the use of wax as a construction material made these models more fragile and susceptible to breakage. As such, these models were sold within small presentation cases (see figure 2.15, page 72, left) which would have limited the usefulness of anatomical representation in three dimensions. There are two of these models at the University of Liverpool, one of which has been removed from its original case and has suffered damage to the most delicate parts, perhaps although not certainly as a result of the removal of its original casing. Another can be found in the Whipple Museum Collection at the University of Cambridge. Although this collection was formed in the mid-twentieth century, some donations from university departments have been made to the museum. For this particular model, there is no purchasing information within the accessions catalogue, leading me to believe that this model was donated by a department in this manner. Both of these examples of Berlinische Verlagsanstalt models are accompanied by original didactic paperwork which names the parts of the model indicated by small printed numbers, continuing this tradition of model accompaniment. Berlinische Verlagsanstalt continues to trade to this day as an educational publisher of teaching materials in a variety of mediums.

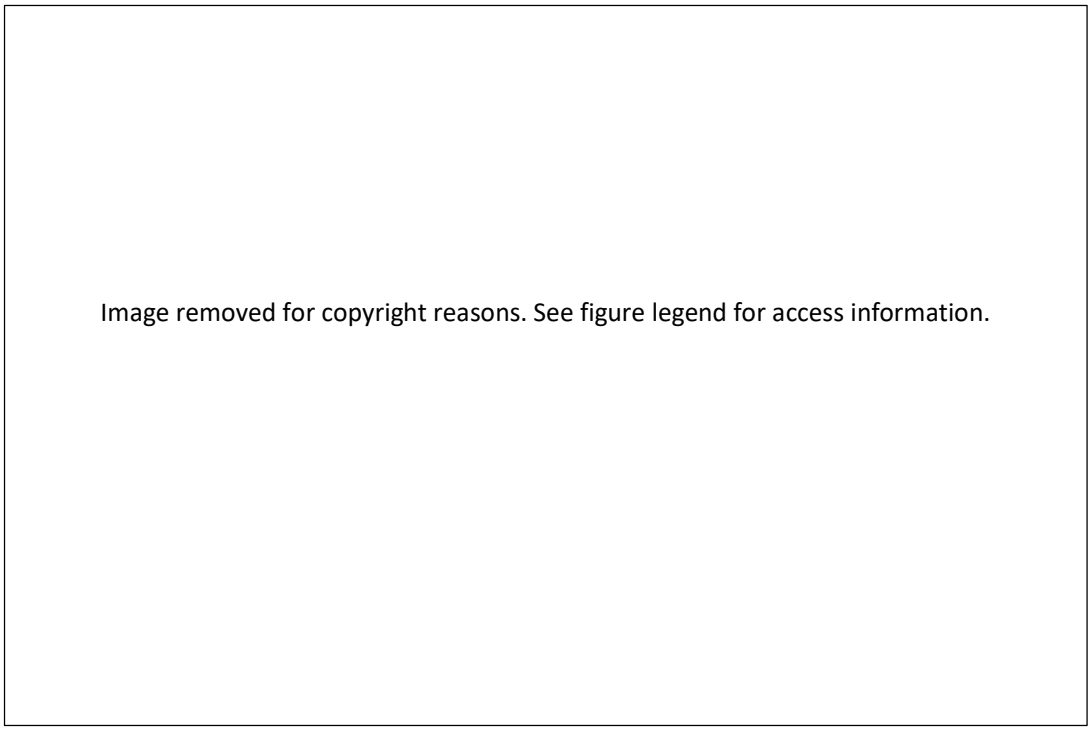


*Figure 2.15 Wax model labelled Berlinische Verlagsanstalt G.m.b.H with accompanying explanatory chart. (Wh.5240 Whipple Museum of the History of Science, University of Cambridge)*

## Adam,Rouilly and Somso, 1918 and 1876 (Partnered 1927): demountable and general

The final modelling company in this narrative is Adam,Rouilly/SOMSO, a partnership formed in the early-twentieth century. University College London possesses a large collection of early Adam,Rouilly models, a British modeller based in London. It is unclear whether these models are Adam,Rouilly originals or were supplied by the German modelling company SOMSO and then distributed by Adam,Rouilly sporting labels with the supplier's details. However, the full-body models produced by the two companies were largely similar (see figure 2.16, page 73); both depicted the frontal view of the torso that we are accustomed to seeing in modern anatomical classrooms, both were deconstructible, and both were standardised and generalised sculpted models of normal anatomy. SOMSO models were originally made from a papier-mâché and plaster mix when Marcus Sommer Senior oversaw production in 1876.[213] However, by the 1920s SOMSO were producing models in plaster instead. Models attributed to Adam,Rouilly follow a similar pattern with some models containing a mixture of the two materials. This may have been because papier-mâché was a more useful material for individual deconstructible pieces.

[213] 'SOMSO - History - 1876 - 1929', SOMSO® MODELLE GmbH, accessed 9 March 2019, https://www.somso.de/en/somso/firmengeschichte/1876-1929/.

However, there is a clear tendency towards plaster within the Adam,Rouilly line into the 20th century until the development of plastic replaced plaster. Although in their earlier years Adam,Rouilly stocked a number of models by other manufacturers, including those of the Auzoux company, their closest business partners were SOMSO. The relationship between Adam,Rouilly and SOMSO continues today, with Adam,Rouilly now stocking only SOMSO anatomical models within their human anatomy collection.[214]


*Figure 2.16 Anatomical models c.1930. Left; Anatomical model by Adam,Rouilly (c.1930). (Era Brighton, www.etsy.com) Right; Anatomical model by SOMSO (c.1930). (www.1stdibs.com)*

[214] 'Anatomical Models', accessed 28 November 2019, https://www.adam-rouilly.co.uk/products/anatomical-models.

## Joseph Towne: the exception that proves the rule

Joseph Towne, wax anatomical modeller at King's College London from 1826 to 1879, is rather the exception in this narrative of anatomical modelling which proves the rule. Continuing to work in wax until his death in 1879, Towne is renowned for his extensive and expansive collection of anatomical works which supposedly number up to 10,000 portrayals of pathological and normal anatomy.[215] Towne's works are all highly realistic depictions of human skin in wax, depicting even the perceived pain of the persons and corpses on whom his models were based.[216] Given the dates Towne's work spans, his models call into question the move from reality to abstraction that I posit here in this chapter. However, I argue that we can distinguish Towne's models of normal anatomy (see figure 2.17, page 75) as his earlier works and his dermatological moulages (see figure 2.18, page 76) as his later pieces, thus supporting the narrative of change I have identified in other models of this era. Although many avoid dating Towne's models specifically, there are two reasons to believe that Towne's models of normal anatomy were produced earlier than his pathological and dermatological moulages. Firstly, Towne produced other pieces which represented the normal human figure in his earlier period: namely busts. Between 1834 and 1866, Towne produced 16 busts.[217] However, 12 of these busts were produced before 1842, showing that he was much more prolific in his production of busts during the earlier years of his career and with some dating his sculpting work between 1834 and 1841.[218] Secondly, Towne's models of normal anatomy are known to be linked to dissections made by the demonstrator John Hilton. Hilton was an anatomy demonstrator at Guy's Hospital in 1828 until he was appointed assistant surgeon in 1844.[219] Whilst it is possible that he continued to produce dissections for Towne's use in modelling after this time, this would not fall under the normal duties of an assistant surgeon and surgery would have occupied much of Hilton's time. It is therefore more likely that Towne's models of normal anatomy based upon Hilton's dissections were produced during Hilton's time as demonstrator. The dating of these works depicting normal anatomy is important because it demonstrates how wax modelling moved away from depictions of normality and toward pathological representations over time.

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[215] '"Joseph Towne", Mapping the Practice and Profession of Sculpture in Britain and Ireland 1851-1951', online database, University of Glasgow History of Art and HATII, 2011; E. J. Pyke, *A Biographical Dictionary of Wax Modellers* (London, 1981), 149.

[216] Ballestriero, 'Anatomical Models and Wax Venuses'.

[217] Ingrid Roscoe et al., *A Biographical Dictionary of Sculptors in Britain, 1660-1851* (New Haven, Conn. ; London: Yale University Press, 2009), 1277–78.

[218] Maurice Harold Grant, *A Dictionary of British Sculptors. From the XIIIth century to the XXth century.* (London: Rockliff, 1953), 248.

[219] John Kirkup, 'Hilton, John (1805–1878), Anatomist and Surgeon', Oxford Dictionary of National Biography, 23 September 2004.

As mimetic likeness became less important than didactic use in the anatomical classroom, wax modellers turned to pathological representations in which the mimetic likeness provided by wax was still highly valued.[220] Towne's work demonstrates the alternative route taken by anatomical modellers; instead of developing generalised models in cheaper materials, Towne continued to work in wax to create pathological moulages. Thus, it is possible to demonstrate Thomas Schnalke's narrative of the change undergone within wax modelling in this period without disrupting the narrative of changes in representations of normal anatomy. Although, this does suggest that the current historiographical narrative in which models developed from normal to moulage may have been influenced by the prominence of Towne as well as a historiographical preoccupation with wax.


*Figure 2.17 Specimen by Joseph Towne (mid-19th century). (Gordon Museum, Kings College, London; 'Anatomical Models and Wax Venuses', Roberta Ballestriero, Journal of Anatomy 216:2 (2010), p. 232)*

[220] Schnalke, 'Von Der Normierten Anatomie Zum Historischen Patienten', 8.

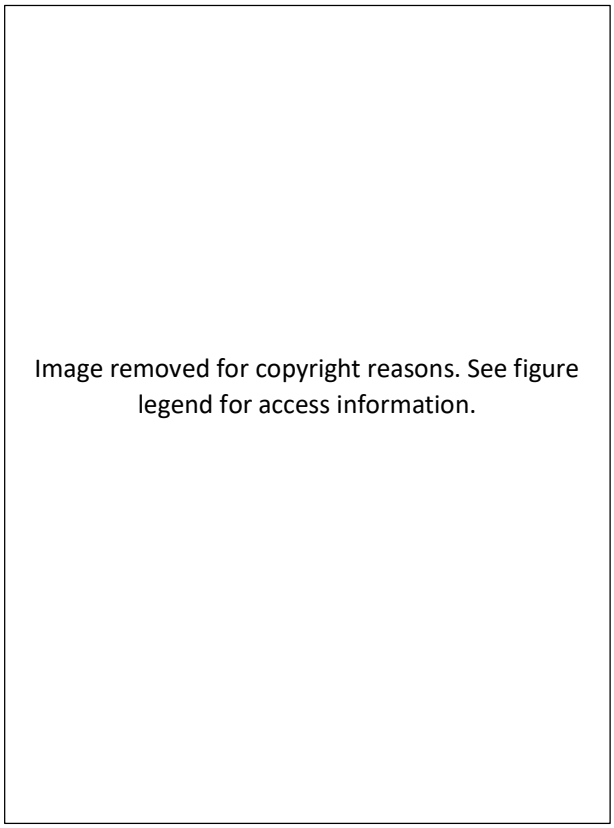


*Figure 2.18 Specimens of pathological anatomy by Joseph Towne: (A) Vaccinia; (B) Variola. (mid-19th century). (Gordon Museum, Kings College, London; 'Anatomical Models and Wax Venuses', Roberta Ballestriero, Journal of Anatomy 216:2 (2010), p. 228)*

## Analysis

As the above descriptions show, the transition in anatomical modelling style which occurred between the wax anatomical models of the eighteenth century and the plaster anatomical models of the twentieth century is a complex one. It does not occur immediately or in an even and linear manner. This is the complex story of anatomical models as they navigate Daston and Galison's changing landscape of scientific practice, straddling the move from truth-to-nature to mechanical objectivity and back to trained judgement again.[221] However, there is a clear tendency over time, both between modellers and within the works of single modelling companies or individuals (I.e. Towne, SOMSO, Steger) towards standardised models in plaster. I have illustrated this transition quantitatively in tabular form to provide a clearer view of the non-linear progress of the development of modern modelling style (see figure 2.19, page 78). Considering factors like material, form, colouring, and production method, I have identified two

[221] Daston and Galison, *Objectivity*.

or more sub-classifications which can be assigned to each model brand. Representing these subcategories numerically, the non-sequential change of numbers in each column represents both the messy and eventually complete nature of this transition in modelling style over time. Considering the models qualitatively, it is perhaps pertinent to question, given the connection with Germany with each of these most prominently standardised modelling companies, whether this phenomenon is more heavily related to national style than to change over time. However, as the table below quantitatively illustrates, the most prominent German modellers of normal anatomy come to the fore at similar times towards the end of the nineteenth and beginning of the twentieth century, making national style indistinguishable from change over time.

However, whilst this quantitative analysis elucidates the complex process of visual development through the uneven changing of numbers between the top and the bottom of the table, it is still necessary to fully contextualise these visual changes. Concurrent works of art and anatomical illustration demonstrate that this shift in representation of the human body was not unique to anatomical modelling at this time. In art during the nineteenth century there is a shift from realism to impressionism, modernism, and eventually cubism which begins to occur simultaneously to this transition in the style of anatomical models. Berger posits that these shifts may have occurred because the invention of the camera had a profound effect on all forms of visual representation.[222] This seems a likely explanation given that the replacement of realism with photography is mirrored within the development of anatomical imagery. As in the case of pathological moulages discussed by Thomas Schnalke and produced by Joseph Towne, improvements in photography spelled the death for the presentation of realism. It is therefore possible that photography, as well as the discovery and clinical use of X-rays (used diagnostically in London hospitals by as early as 1896), also influenced the visual representation of normal anatomy.[223]

This may have encouraged what was initially a tentative and uncertain shift away from realism in normal anatomical modelling to become more permanent at the end of the nineteenth century. This hypothesis is supported by developments in anatomical illustration during the nineteenth century, in which the changing style of depiction for normal anatomy in models is mirrored. Ruth Richardson has explored the making of *Gray's Anatomy*, arguably one of the most influential anatomical publications of the nineteenth century.[224] In doing so, she has

[222] Berger, *Ways of Seeing*, 18.
[223] H. F. Hope-Stone, *A History of Radiotherapy at the London Hospital 1896-1996* (Orpington: Bishops Print, 1999).
[224] Richardson, *The Making of Mr Gray's Anatomy*.

demonstrated that the images in Gray's move significantly away from a previous style of anatomical depiction. In particular, she notes Henry Vandyke Carter's removal of the trappings of anatomical dissection – hooks, wires, and other suspension devices – from his drawings in order to present the abstract notion of anatomy, rather than the grisly reality. However, she also details how Carter removed abnormality from his images, attempting to synthesize the material in front of him with his prior knowledge of the organs. These drawings, much like the anatomical models, are simultaneously taken from life, designed to present an average, and enhanced for educational purposes. This new style of illustration is repeated in many of the anatomy manuals produced in the second half of the nineteenth century, for example Cunningham's.[225]

| | Date | N= | Material | Form | Colouring | Production method |
|---|---|---|---|---|---|---|
| **Pre-1800** | 1700s | N/A | 1 | 1 | 1 | 1 |
| **Auzoux** | 1820s | 5 | 2 | 2 | 2 | 3 |
| **Bally** | 1830s | 2 | 3 | 2 | 1 | 3 |
| **Casciani** | 1857 | 11 | 3 | 1 | 1 | 2 |
| **Deyrolle** | 1866 | 8 | 2/3 | 2 | 2 | 3 |
| **Tramond** | 1878 | 7 | 1/4 | 1 | 1 | 1 |
| **Steger** | 1880s | 25 | 3 | 2 | 1/2 | 2/3 |
| **Berlinische Verlagsanstalt** | 1910 | 2 | 1 | 2 | 2 | 3 |
| **Adam,Rouilly /SOMSO** | 1920s onwards | N/A | 3 | 2 | 2 | 3 |

Key:

| Material | Form | Colouring | Production method |
|---|---|---|---|
| 1- Wax | 1- Realistic | 1- Realistic | 1- 'From' life |
| 2- Papier-mâché | 2- Generalised | 2- Didactic | 2- Direct cast |
| 3- Plaster | | | 3- Sculpted |
| 4- Bone | | | |

*Figure 2.19 Table indicating changes in qualities of anatomical models over time, created by the author. All qualities change between row 1 and row 9 (highlighted in green), quantifying the inconsistent but complete shift in anatomical modelling style over course of the nineteenth century.*

[225] D. J Cunningham, *Manual of Practical Anatomy*, 1st Edition (Edinburgh; London: Young J. Pentland, 1893).

It is unsurprising that two- and three-dimensional representations of the human body are visually linked. However, in this instance, the order in which the two developed is significant. In the eighteenth century, Felice Fontana and Clement Susini are described as taking their inspiration for the style of the Venus models from contemporaneous art and anatomical illustrations. As such, the resultant anatomical Venus models remain very much within the stylistic paradigm of Vesalius's 1543 *Fabrica*. Creating links with great works of art would have given the La Specola models prestige and academic authority.[226] However, in the nineteenth century the order of development is reversed, with medical imagery taking after the development of new modelling styles. Dr. Auzoux's first models were produced in the 1830s and 40s, whilst the first edition of *Gray's Anatomy* was not published until 1858. Importantly, work did not begin on the images for Gray's until 1856, demonstrating that arguably models led the way into this new era of anatomical representation.[227] Indeed the same stylistic change can even be seen in deconstructible paper models of the body. It was not until 1893 that W. S. Furneaux produced a generalised and sterilised paper answer to Auzoux's deconstructible 'anatomie clastique' models. Furneaux's works presented various paper models of the human body, both male and female, which were deconstructible and dissectible through the lifting of flaps as their predecessors had been (see figure 2.20, page 81). However, Furneaux's models now followed this new style of anatomical depiction. It is thus demonstrably the models which drive the move into a new era of anatomical illustration. If, as Daston and Galison claim, "atlases set standards", anatomical models must be considered as the atlases of anatomical study in the nineteenth century.[228]

Economic factors may have had a significant impact upon not only this visual development but upon the order in which models and illustrations changed. As discussed above, wax anatomical models could be extremely expensive. A drive towards cheaper materials may have meant a potentially unconscious and unintentional move away from mimetic likeness by virtue of the very properties of the materials used. Meanwhile, a growing middle class fuelled demand for anatomical resources as greater numbers trained to enter the medical profession. This is clearly reflected in the booming size of anatomical departments at this time, growing the requirement for anatomical models.[229] Models were needed quickly and in large quantities as medical

[226] Maerker, ' Turpentine Hides Everything'.
[227] Richardson, *The Making of Mr Gray's Anatomy*.
[228] Daston and Galison, *Objectivity*, 19.
[229] Anon., 'Human Anatomy at Oxford'; 'The Oxford Medical School', *The British Medical Journal* 1, no. 2373 (1906): 1479–91.

departments grew across the continent and thus the economic influence is evident upon the choice of materials that were cheaper and easier to integrate with new mass production technologies. The same economic pressures are not necessarily applied to printing; although smaller images would be cheaper, standardised images of the same dimensions would cost the same to produce in print. As Ruth Richardson discusses, in the case of anatomical illustrations, reducing spending on images could have been a somewhat false economy if the book was then less popular with medical students as a result.[230] This continues to suggest the development of anatomical models before anatomical illustration in this regard. However, to give credit for the stylistic change in anatomical modelling solely to the use of new and cheaper materials and the need for mass production ignores the agency of modellers within this process. As Anna Maerker and Nick Hopwood have discussed, anatomical modellers were intelligent businessmen who understood the need to present a competitive product to market, demonstrating both the success of their products to their intended audiences and linking their work to cutting edge developments in scholarly research. In this way, the development of a new style of anatomical model can also be conceptualised as a product of economic competition. With wax models dominating the market, but unable to provide more than one view of the internal organs or stand up to robust handling by students, there was a gap in the market for a new three-dimensional medium to represent the body. As such, the move away from realism may have been economically strategic rather than economically required by the cost of materials and a new production scale.

[230] Richardson, *The Making of Mr Gray's Anatomy*, 103–16.

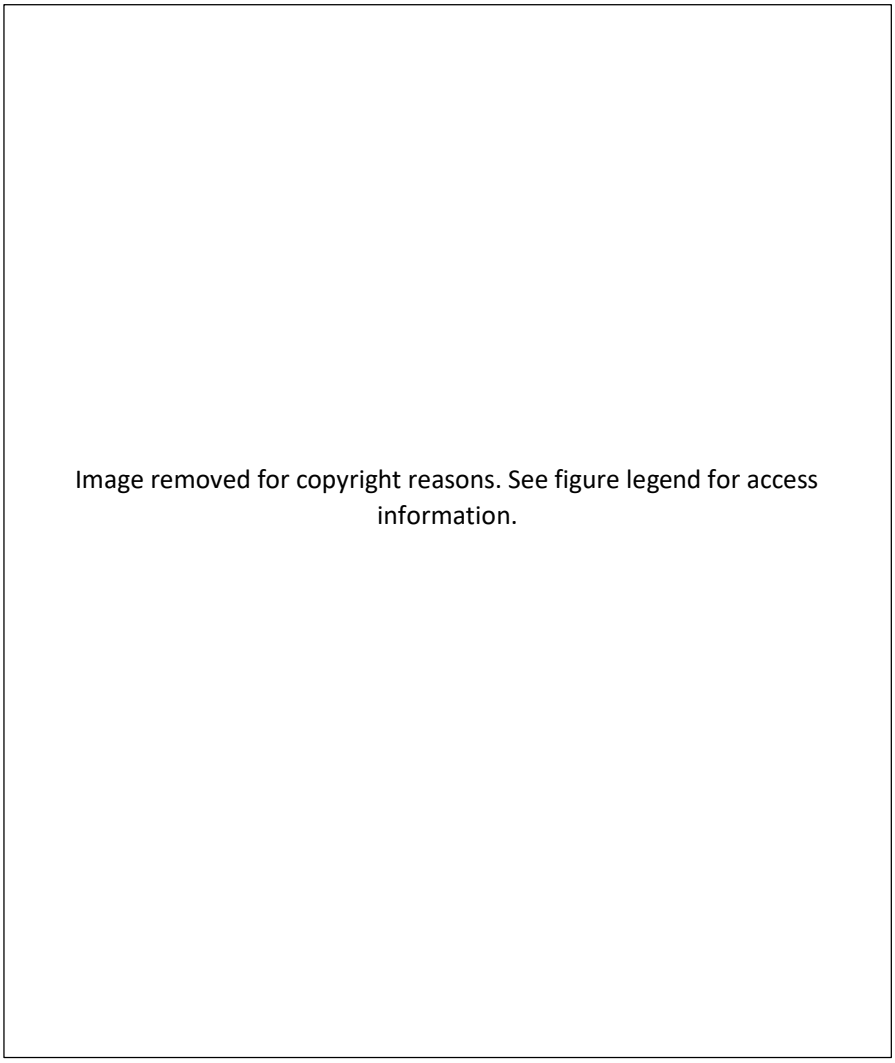


*Figure 2.20 Philips' Model of the Human Body (Female), W. S. Furneaux (London, c. 1910-1930). (Wh.5852, Whipple Museum of the History of Science, University of Cambridge)*

## Part 2: Analysing Material and Visual Changes

> "It is obvious that historians of philosophy or sculpture are concerned with books and statues not in so far as these books and sculptures exist materially, but in so far as the have a meaning."
>
> - Erwin Panofsky[231]

The models presented in this chapter are of particular interest because of the continued use of this generalised late-nineteenth century style of representation in medical teaching objects today. In part one, I demonstrated the development of this style. In the following section, I will analyse the potential impact and importance of this changing style of human representation. The move away from wax in normal anatomical modelling, whilst it continued to be used as a medium for moulages, marks the beginning of two separate but parallel streams of visual development in the history of anatomical modelling. However, here I argue that the material shift from wax to other media is not just a physical one, but also contributed to the epistemological positioning of these items. As such, this shift influenced the intellectual conversations that surrounded these new models and the meanings assigned to them. Materials such as plaster and papier-mâché lend themselves more readily to a generalised, rather than lifelike, view of the body through their inability to mimic the qualities of skin in the same way as wax. Although I agree with Harry Collins and James Secord that travel changes both meaning and knowledge, I argue that prioritising the generalisation of the human form limited the narratives that surrounded these later models.[232] Moreover, I argue that these are limitations which encouraged one medical discourse about the human body over an alternative. Here I explore the connection between materiality and knowledge creation with respect to anatomical models using methods from art history which analyse the physical form and meaning of an object simultaneously. Beginning with a formal analysis of the twentieth-century plaster anatomical models, this investigation will then draw direct comparisons with the Italian wax models of the eighteenth century.[233] Examining models from the early-twentieth century alongside those from the eighteenth century allows for comparison between the beginning and the end of this transitionary period. This will qualitatively demonstrate the differences between

[231] Panofsky, *Meaning in the Visual Arts*, 14.
[232] See Collins, *Changing Order: Replication and Induction in Scientific Practice*; Secord, 'Knowledge in Transit' and further discussion in the introductory chapter of this thesis.
[233] On comparison as a mode of discovery see Sylvan Barnet, *A Short Guide to Writing About Art*, 9th Edition (Prentice Hall, 2006), 135.

the two styles of anatomical model which ultimately differentiate them into two discrete styles. I will then consider the differing iconological symbolisms displayed therein and assess the epistemic consequences of the change in anatomical modelling style. I question both what these models meant within their temporal contexts as well as how their materiality contributed to this meaning. This will situate these models within the context of wider anatomical imagery, demonstrating a similar pattern of visual development within anatomical textbook images from the late eighteenth to the early twentieth centuries. Through this approach, I argue that the different styles of model had different epistemological status within the classroom, emphasising that the materiality of these objects had a significant impact on knowledge creation.

## Meaning in the Visual Arts: A method

There are two ways in which art historians might approach these models. The most traditional is a formal analysis of the style of works of art in chronological order to chart development over time. I have largely approached this topic in the first half of this chapter. However, I will do so again here to compare in a little more detail anatomical models at the beginning and end of the nineteenth century. The second method of approaching visual materials is iconological, assessing the meaning of works of art based on their content, subject matter, and context. Although this approach builds on the formal analysis of the first approach as well as on iconographical significance, and indeed cannot be completed without it, iconological analysis extends the work of art historians to an understanding of the wider milieu. Borrowing from Erwin Panofsky's foundational work on meaning in the visual arts, this section understands pre-iconographical/formal, iconographical, and iconological approaches in particular ways. The pre-iconographic approach constitutes a traditional formal analysis of the object itself considering pose, colouring, size and other elements individually. This art historical method truly demonstrates that "an analysis is, literally, a separating into parts in order to understand a whole."[234] Often seen as oppositional to Panofsky's approach to understanding meaning in the visual arts, a traditional stylistic art historical analysis of these models is necessary before and in order to address their iconographical and iconological meaning.[235] However, although Sylvan Barnet argues that style is revealed in form, this first step is only partially helpful in our analysis of meaning.[236] Both of Panofsky's iconographical and iconological analyses are needed to fully

[234] Barnet, 47.
[235] Emmanouil Kalkanis, *Erwin Panofsky's Meaning in the Visual Arts*, 1 edition (Macat Library, 2018), 17 and 37; Barnet, *A Short Guide to Writing About Art*, 52–53.
[236] Barnet, *A Short Guide to Writing About Art*, 118.

understand the meaning of an object. Iconographical symbolism is clearly displayed within the work itself, meaning that is obvious from the physical form of the piece. Whilst iconological symbolism must be inferred from the visual and social context which surrounds an object. The transition from iconographical to iconological is a shift from "identifying accepted conventional meanings to interpretation".[237] The iconographic significance of anatomical models is fairly obvious through their use as classroom teaching objects. As such, the bulk of this section focuses on iconological analysis, the final step in this art-historical process, revealing both cultural thoughts and basic social attitudes inferred from the 'underlying principles' of a work.[238]

Although dating from 1939, this approach is still used in critical theory debates across disciplines and provides a useful tool for the historian addressing meaning in visual objects.[239] Panofsky describes the art historian and the historian as having different primary materials or instruments of investigation; for the historian, documents are primary materials, and images or objects secondary documentation. Whereas for the art historian, the image is the primary material and the documents secondary.[240] As such, an art historical approach is the most appropriate starting point, given the treatment of anatomical models as the primary sources of this work, which historical analysis of documentation can then build upon. Moreover, Panofsky's approach, not relying solely on art history's traditional formal analysis, is particularly important given the aim of this thesis to explore the meaning of these anatomical models. As Philip Bell tells us, content analysis alone is "a necessary but not sufficient" methodology for interpreting meaning and significance.[241] This multifaceted method also goes some way towards addressing the limitations of the quantitative method of content analysis presented above. Quantitative content analysis, in the case of anatomical models, assigns numeric values to certain features within a group of models and then uses this data to produce infographics about the content of these model groups. This approach has been taken by Cornwall and Smith in their study of Steger models at the University of Otago and in figure 2.16 above (page 73). However, this approach has limitations in its delineating of discrete categories within groups of objects which display continuous variation. It can also be difficult to make reliable leaps from quantitative data to qualitative conclusions.[242] An art historical analysis of these models bridges the gap between

[237] Theo van Leeuwen and Carey Jewitt, eds., *The Handbook of Visual Analysis*, 1 edition (London ; Thousand Oaks Calif.: SAGE Publications Ltd, 2001), 115.
[238] Panofsky, *Meaning in the Visual Arts*, 55; van Leeuwen, 'Semiotics and Iconography', 100; Barnet, *A Short Guide to Writing About Art*, 51 and 243.
[239] Panofsky, *Studies in Iconology*; Kalkanis, *Erwin Panofsky's Meaning in the Visual Arts*, 12.
[240] Panofsky, *Meaning in the Visual Arts*, 33.
[241] van Leeuwen and Jewitt, *The Handbook of Visual Analysis*, 13.
[242] van Leeuwen and Jewitt, 24–25.

quantitative data and qualitative conclusions, elaborating beyond the numbers assigned to models in figure 2.16.

This method raises questions of intentionality, briefly addressed above in my consideration of models purchased over models offered for sale. However, Panofsky also divides visual materials by their 'intention' into two groups: the aesthetic and the practical. One is to be appreciated visually, and the other is a tool or a 'vehicle of communication'. Whilst Panofsky admits that these categories are more fluid than prescriptive, he still maintains that it is possible to place objects in one or other category using their primary or foremost 'intention'.[243] Anatomical models communicate *through* the appreciation of visual form, and as such confuse this delineation. Moreover, in the context of this work, an adherence to this schema means appreciating the intentions of model makers over the aims of the users of the objects, taking intention before reality. I recognise that artist's intention may limit the meaning of a work.[244] However, I also argue that the viewer does not innocently accept the image given by artist, or in this case manufacturer. Rather, humans accept an image within our own constructions of the world "in so far as it corresponds to our own observation of people, gestures, faces, institutions".[245] As such, this art historical analysis only begins but does not complete the investigation into the meaning and value assigned to objects. The historical work performed in later chapters will complete the contextualisation of these models within the nineteenth century milieu to reveal the iconographical significance of this new form, what Panofsky describes as "intrinsic meaning or content".[246]

## Pre-iconographical/formal analysis

Pre-iconographical analysis consists of a simple formal analysis; it addresses the physical and visual aspects of a work. There are a number of independent elements of a work of art to consider as part of a traditional formal analysis. These include, but are not limited to, "form, subject matter, genre, medium, colour, light, line, and size."[247] Whilst quality is a consideration of art historians, it is not something that I will quantify here, as Cornwall and Smith have done in their investigation of the Steger models at the University of Otago.[248] This is first and foremost

[243] Panofsky, *Meaning in the Visual Arts*, 35.
[244] Barnet, *A Short Guide to Writing About Art*, 23.
[245] Berger, *Ways of Seeing*, 14.
[246] Panofsky, *Meaning in the Visual Arts*, 55.
[247] Jonathan E. Schroeder, 'Critical Visual Analysis', in *Handbook of Qualitative Research Methods in Marketing*, ed. Russell W. Belk (Cheltenham, UK; Northampton, MA, USA: Edward Elgar, 2006), 304.
[248] Panofsky, *Meaning in the Visual Arts*, 38–39; Cornwall and Smith, 'Anatomical Models by F.J. Steger'.

because quality refers to the condition of the work of art in the present day, and it is therefore not a necessary avenue of investigation in historical study. I will instead focus on producing an ekphrasis of form, proportion, and representation of the human body without considering elements of damage that have occurred over time.[249] This formal exploration of anatomical models will answer the key question "*how* does the work mean?"[250] That is to say, it helps us to establish which elements of an object (colour, form, size, medium, etc.) create meaning.

Early-twentieth century and late-nineteenth century anatomical models in plaster, represented by figures 2.10, 2.11, and 2.13 (pages 64, 66, and 69), have a very distinctive form, recognisable to many today as the standard style of anatomical teaching model. Although these models offer different perspectives, from the front, the side, and of the head alone, their forms remain consistent in a number of ways. In the full torso models, the arms are cut off leaving roughly a third of the humerus/bicep/tricep section of the upper arm. Similarly, the legs are all cut off at the upper thigh. The neck and spine are all in a straight alignment. In contrast, the neck and spine of the anatomical Venus models, as well as models of the earlier nineteenth century by Auzoux and Deyrolle, appear arched and overextended. This is what one might call a neutral position, although in reality it bears resemblance to the posture of a cadaver, whilst the earlier models portray more natural and life-like positions. The heads of these three models also share a number of formal qualities. All models are bald, with prominent nose ridges, large foreheads, and unidentifiable features. Eyelids, where present, are closed. In contrast to early nineteenth century flayed models, these models only present organs internally where an incision has been made into the body, either through the chest cavity or in a side-on slice. In addition, these models are all life-sized, with just one size available.

Plaster and papier-mâché have their own material qualities and do not reproduce the same uncanny representation achieved by wax. Plaster does not retain a dewy effect when set, nor can it be coloured from within. Papier-mâché (mixed with cork and clay) remained malleable but appeared shiny from the varnish.[251] The difference between wax and these new materials can clearly be seen when comparing the models of Casciani and Son, who represent the brutal realism of early nineteenth century anatomy in plaster (see figures 2.6 and 2.7, pages 59 and 60), to similar models in wax. When we compare a Casciani and Son model with one by Joseph Towne in wax (see figure 2.14, page 70), the difference in realism is palpable. On the one hand,

[249] Barnet, *A Short Guide to Writing About Art*, 114.
[250] Emphasis added Barnet, 115.
[251] Maerker, 'Models and Materials in Europe 1650-1890'; Maerker, 'Dr. Auzoux's Papier-Mâché Models'; Maerker, 'Human Models'.

we are given the impression of a veneer of panicked sweat, and on the other a crumbly, chalky and dry depiction of an aged face. This comparison demonstrates more than the qualities of wax, it shows a practical reason for plaster and papier-mâché models to move away from this style; it would not be possible to compete with these wax models for business if realism was the comparison to be made. However, plaster and papier-mâché do have qualities that wax does not possess. They are both able to hold clear lines of bold colours side-by-side, they are both more robust and thus more suitable for handling, indeed Dr. Auzoux's papier-mâché models were fully deconstructible *anatomie clastiques*. This, and their comparative affordability, made plaster and papier-mâché much more suitable materials for didactic teaching models in a century where medical education was expanding rapidly within Europe. Standardisation is a necessary by-product of this move away from realism and mimetic likeness: as the creation of human likeness becomes impossible, so too does the true depiction of individuality (or at least perceived individuality). As Panofsky observed; "An artist might deliberately depart from surface realism- mimetic accuracy- in order to 'defamiliarize' or 'estrange' our customary perceptions… letting us see reality freshly."[252] It would have been impractical, and potentially commercially unviable, to use plaster to attempt the same feats of perceived individuality and mimesis that had already been achieved in wax. However, it would have been profitable to present a different styled product to market in plaster or papier-mâché which would offer the teacher already in possession of wax models a different perspective on the human body.

The colouring of these twentieth-century models is another feature of their type. These models use bright areas of colour with distinctive boundaries to delineate areas of the body, in contrast with earlier models painted in a realistic style which represent the internal organs less clearly. Most notably, the skin of these models is painted in a single tone, with no variation in the colouring to the face. It is important to note the specific colour chosen here. It is the same pale beige colour on all five models, conveying the idea of whiteness. Although this is the same across the full range of these models from the eighteenth to the twentieth centuries, the presentation of whiteness without any variations in skin tone denotes a slightly different and epistemologically important view of whiteness: whiteness as neutral. The focus in these modes is not on the skin, or the facial features, as is obvious from their comparative lack of detail. These features are therefore only present to provide context for the presentation of internal organs and structures. The same effect could have been achieved without painting these exterior

[252] As quoted by Barnet, *A Short Guide to Writing About Art*, 130.

surfaces, leaving them blank. The inclusion of the beige colouring suggests that whiteness was considered as the neutral default; both normal and unobtrusive to learning.

When we compare these late-nineteenth/early-twentieth century models with the famous Anatomical Venus model of the La Specola workshop (see figure 2.2, page 52), we see the stark contrast in style which has developed over the course of the nineteenth century. Although sharing the anatomical subject matter of these normal, full body, plaster and papier-mâché models, are very different from them in many respects. They are supine, rather than standing; reposing on a bed of silk, they are reminiscent of contemporary Italian art.[253] They are made from wax, completely from wax, unlike other wax models which use bone and metal support frameworks. Even the extremely delicate blood vessels on these models are in fact made entirely of wax with no supporting material, such as thread or wire.[254] They have their colours embedded within the wax itself, although only in the top layers of the wax added after casting. The wax also contains an as yet unidentified resin-like substance. A final layer of varnish gives the models their shiny, seemingly moist, appearance. Wax was largely used in eighteenth century models because of its mimetic likeness to skin. Not only does wax offer the texture of skin, appearing to retain its moisture when set, but teeth, hair, and nails can all be easily and seamlessly affixed without the need for glues.[255] Like the plaster models, these wax models do not depict one singular once-living human. However, unlike the plaster models, the anatomical Venus models did take their inspiration from the human form directly, from a combination of extant anatomical images and cadavers. Forming a composite of a number of women, in a style similar to that used by Albrecht Dürer in his artworks, modellers at La Specola worked directly from multiple cadavers posed to resemble the works of great anatomists. This reportedly caused problems with local medical schools who were also in need of cadavers at this time. As such, these models are amalgamated not aggregated images of the human body, and thus significantly different in their approach to the human form than nineteenth century models.

[253] Ebenstein, *The Anatomical Venus*, 28–29.
[254] Eleanor Crook, Hunterian Museum Conference workshop, Gordon Museum of Pathology conference demonstration. Eleanor Crook is a sculpture artist who works primarily in wax, currently resident at the Gordon Museum of Pathology at Guy's Hospital, London, and the Vrolik Museum, Amsterdam. She was commissioned to repair wax models at the La Specola museum in Florence in 2017. In her quest to restore them faithfully, she learned much about the wax composition, colouring methods, and construction techniques involved in producing these models and shared this information informally during workshop and demonstration sessions at a number of conferences.
[255] Ballestriero, 'Anatomical Models and Wax Venuses', 224; Alberti, 'Wax Bodies: Art and Anatomy in Victorian Medical Museums', 8.

## Iconographical and iconological analyses

The formal approach above is a necessary precursor to both iconographical and iconological approaches to visual materials. Building upon this formal analysis, iconographical analysis allows for comparison with surrounding works of art and cultural imagery in order to understand the immediately obvious visual significance of an object or piece. However, a solely iconographical approach investigates imagery and symbolism, understanding only the practical meaning of an object. Whilst his iconological approach includes "cultural symptoms" in order to understand the "intrinsic meaning" of the same object.[256] As such, an iconological analysis of these models is also important because it offers us more depth than formal comparisons and iconographical analyses. However, this section is necessarily short as a full iconological analysis is not possible without further investigation, conducted in chapters three and four.

Much scholarship has already considered the Anatomical Venus models (see figure 2.2, page 52) iconographically.[257] Contemporary religious texts and works of art have allowed scholars to iconographically understand that the pose and facial expressions of these models represent ecstasy, as is displayed in religious iconography of the period.[258] However, without an iconological analysis which includes reference to known social attitudes we cannot understand what this ecstasy implies. It could be a symbol of sexual freedom and an acknowledgement of the right of women to female pleasure. However, within the eighteenth-century context this interpretation is highly unlikely. The Venus's presentation of female as sexualised and, importantly, pregnant is part of a wider narrative about the role of women in society within this context.[259] Idealised representations of femininity cyclically contribute towards and are inspired by social constructions of womanhood, constructions that are arguably uniquely western. As John Berger notes, women are usually portrayed as passively sexual in western art, noting both that the nudity is never an expression of the woman's feelings but "a sign of submission to the owner's feelings or demands. (The owner of both woman and painting)". In other non-western artistic traditions nakedness is never supine in the same way, rather it demonstrates active sexual love on the part of both man and woman (thus demonstrating heteronormativity but not female submissiveness).[260] We therefore through iconological analysis understand these models

[256] Panofsky, *Studies in Iconology*, 3, 5, and 15.
[257] Bates, 'Anatomical Venuses: The Aesthetics of Anatomical Modelling in 18th- and 19th-Century Europe'; Ebenstein, *The Anatomical Venus*; Ballestriero, 'Anatomical Models and Wax Venuses'; de Ceglia, 'The Importance of Being Florentine'; Maerker, 'Florentine Anatomical Models and the Challenge of Medical Authority in Late-Eighteenth-Century Vienna'; Jordanova, *Sexual Visions*.
[258] Jordanova, *Sexual Visions*, 45; Ebenstein, *The Anatomical Venus*, 178–200.
[259] Jordanova, *Sexual Visions*, 43–65.
[260] Berger, *Ways of Seeing*, 52.

as images of female submission and male domination over the female form. Indeed, these Venus models stand in stark contrast to the depictions of male or unsexed wax models in the same collections.[261] Consequently, assumptions about the childbearing and sexual roles of women, as well as the anatomical basis for this status quo, are understood from the form and display context of the anatomical Venus models. As such, an iconological analysis adds much to our understanding of the meaning of these models, revealing their "intrinsic meanings".[262]

Whilst the Florentine models have been considered in this way by numerous scholars, the lack of focus on later anatomical models within scholarship has necessarily meant a lack of iconographical analysis of these late-nineteenth/early-twentieth century objects. Iconographically, as discussed above, newer anatomical models can also be visually contextualised within changing modes of anatomical depiction and within changing depictions of the human form within works of art, both moving towards a more abstract or generalised depiction of the body.[263] However, when we iconographically contextualise these models further we also understand them to be part of the wider movement towards scientific professionalisation. A. W. Bates, Chris Dunton, Elizabeth Stephens, Anne Fausto-Sterling, and Richard Altick, amongst many others, have researched the rise of public anatomical museums and freak shows in Britain during the nineteenth century.[264] A. W. Bates, in particular, has discussed the response to these shows from the medical profession as they attempted to distance themselves as a discipline from spectacle and sensationalism. As such, the visual culture of these shows presents a contrasting visual context in which to analyse contemporary anatomical models. When we compare and contrast anatomical models with the sensationalisation of the images used to advertise and document these shows, such as drawings of Sara Baartman ("The Hottentot Venus") or Julia Pastrana (a "bearded lady"), anatomical models appear comparatively staid and reserved.[265] Within this comparison, the anatomical

[261] Jordanova, *Sexual Visions*, 44–45.
[262] Kalkanis, *Erwin Panofsky's Meaning in the Visual Arts*, 12.
[263] See Part 1, 'Analysis' section.
[264] Bates, 'Dr Kahn's Museum'; Bates, '"Indecent and Demoralising Representations"'; Bates, 'Anatomical Venuses: The Aesthetics of Anatomical Modelling in 18th- and 19th-Century Europe'; Chris Dunton, 'Sara Baartman and the Ethics of Representation', *Research in African Literatures* 46, no. 2 (2015): 32–51; Stephens, *Anatomy as Spectacle*; Fausto-Sterling, 'Gender, Race, and Nation'; Altick, *The Shows of London*; also Robert Bogdan, *Freak Show: Presenting Human Oddities for Amusement and Profit*, New edition (Chicago: University of Chicago Press, 1990); Rosemarie Garland Thomson, ed., *Freakery: Cultural Spectacles of the Extraordinary Body* (New York: NYU Press, 1996); Marlene Tromp, ed., *Victorian Freaks: The Social Context of Freakery in Britain*, Reprint edition (Columbus: The Ohio State University Press, 2015); Janet Browne and Sharon Messenger, 'Victorian Spectacle: Julia Pastrana, the Bearded and Hairy Female', *Endeavour* 27, no. 4 (December 2003): 155–59 amongst many other scholars.
[265] Anne Fausto-Sterling has raised an important point about the inclusion of images of the presentation

models become part of the narrative of professionalisation and the professional distancing of medicine from these shows, with their generalisation appearing scholarly and "disinterested" rather than sensational.[266] Specifically, nineteenth century anatomical models become images of sensible normality in contrast to perceived and sensationalised abnormality.

However, with an iconological approach we can begin to understand some of the less obvious inferences that can be made from these objects. Using texts such as Dr. Auzoux's published anatomical lectures, we can understand these objects as teaching tools designed to illustrate lectures and intended for guided study.[267] However, this obvious iconographical intended purpose as educational instruments suggests a great deal more about the meaning of these objects. The Florentine models' educational purpose was the presentation of perfection to the public, demonstrating the beauty of nature as God's creation, late-nineteenth and early-twentieth century models had no such stated purpose.[268] This raises the question of artist's intention, which in the case of these models requires no mean feat of inference. Comparison is again a useful tool here. As outlined above, wax models in the Florentine style possessed qualities starkly in contrast to those of the plaster models of the twentieth century. However, whilst these two styles of models address the same subject matter, they do so in different ways. Whilst the eighteenth-century models were designed to represent the *ideal* body, overtly engaging with the concept of idealisation, the nineteenth-century models appear designed merely to represent *the* body. Anatomical Venus models are highly synthesised representations of the human form; using over 300 different corpses in their creation they follow Albrecht Dürer's construction of female beauty, taking sections of multiple women and creating one image of perfection.[269] However, through their faithfulness to life, these models also depict one single cohesive, albeit ideal, mimetic body; seemingly both identifiable and individual. Conversely, when the realism used to create the illusion of mimetic likeness is removed, so too is the model's ability to represent 'one' singular and individual human. As such, late-nineteenth century models which generalise the human form in less realistic ways are only representative

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of individuals in freak shows where not absolutely necessary. As such, I have not included any images in order to limit the reproduction of materials designed to other and sensationalise these individuals. However, interested readers may find copies of some of these images in some of the texts referenced above.

[266] John Goodsir was particularly praised for his 'disinterestednesss' in 'The Late Professor John Goodsir', 308.

[267] Louis Thomas Jérôme Auzoux, *Leçons Élémentaires d'anatomie et de Physiologie, Ou Description Succincte Des Phénomènes Physiques de La Vie Dans l'homme et Les Différentes Classes d'animaux, à l'aide de l'anatomie Clastique* (Paris: J. B. Baillière, 1839).

[268] Maerker, *Model Experts*, 84.

[269] As explored by Berger, *Ways of Seeing*, 62.

of all humans; they become exclusively a depiction of *the* human body, not an *individual* human body. As such, we can conclude that the purpose of these later models was to depict the definitive human body and exclude elements of individuality. This is particularly problematic when we consider not only that this depiction of the definitive human body is always white and slim, and often adult and male.

This generalisation of the human body which occurs within these later models is often considered to be a departure from idealisation because of its departure from ideals of beauty associated with high-art realism. However, within an art-historical context idealism is instead contrasted with realism; as a piece becomes more realistic it is seen to be less ideal, and vice versa. This is in line with Aristotle's two contrasting motivations for the production of art; the desire to mimic life, and the desire to present an ideal.[270] Although Barnet recognises that there will be degrees of realism and idealisation in every work of art, within this duality a work will necessarily contain more of one than the other.[271] On this polarised scale, the new style of anatomical models, as the less realistic of the two, are the more ideal representation of the body.[272] As such, we can consider the later models not as void of an ideal but perhaps as more subtle in their presentation of their ideal. I argue that nineteenth and twentieth century models were engaging in idealisation by choosing to present a certain version of humanity as the generalised norm.

The fact that these later anatomical models depict generalised anatomy and *cannot* also be individual representations of the human body is a key epistemological point to make. It demonstrates the possibility of embedding limitations for knowledge production within material objects. This is evident in both the theoretical and the practical production of knowledge, particularly within a classroom setting. In this context, the new style of anatomical models both cannot be interpreted as a depiction of an individual and therefore cannot be used as a depiction of an individual. It has been both philosophically argued that no tacit knowledge can be transferred between locations using papers and objects, and historically argued that without paperwork, models, and other objects often fall victim to vastly contradictory interpretations.[273] However, these models are an example of how the form of an object might limit the knowledge produced around that object in any location. As such, whilst I agree that knowledge arguably

[270] Barnet, *A Short Guide to Writing About Art*, 127.
[271] Barnet, 132–34.
[272] This position is unusual within the history of anatomical modelling more generally which has examined the idealisation and sexualisation of the body within the anatomical Venus models over the less dramatically posed and styled models of the nineteenth century.
[273] Collins, *Changing Order: Replication and Induction in Scientific Practice*.

cannot be materially attached to items, I argue that there are interpretive limitations embedded within material items which move with them as they travel. As in the case of these anatomical models, if we can deduce the embedded limitations of an object, it can aid the historian greatly in our search for the meaning of the object within any specific context.

One of these embedded limitations could be contained in the chosen skin colouration for these nineteenth-century generalised models of normal human anatomy. In all of these cases, white skin is presented as the generalised norm. Iconographically speaking, we can contextualise this within the presentation of both Blackness and Whiteness in artistic works. As John Berger demonstrates in a visual essay, Black people have been depicted in what we might call works of "high art".[274] However, they are always depicted as subservient, slaves, or in a supporting role. Similarly, as above, we can contrast these models iconographically with racialised depictions of persons displayed for public entertainment like Sara Baartman.[275] Both of these iconographical phenomena begin to suggest anatomical models as ideal depictions of whiteness as the normal body. However, this argument does not have much weight until we consider these anatomical models iconologically. The promotion of whiteness over other skin colours can be seen to mirror a social tendency in the nineteenth century towards ideas of racial hierarchy in which whiteness was the most desirable racial characteristic. These inferences are given even more weight when we consider the fact that in many cases lecturers would not see the models they were ordering as they purchased them. Whilst images are now considered vital to advertising, the advertisements in medical catalogues for articulated skeletons and models did not often have images attached. As Ruth Richardson has discussed in her work on print culture, images were often difficult and costly to include at this time.[276] Can we therefore assume that audiences would have known what it was that they were ordering without images? If so, this would suggest a wide acceptance of this version of the normal body in relation to social concepts which idealised whiteness. This is a contentious theory that I will return to in chapters five and six.

## Conclusion

This chapter began my search for the meaning assigned to anatomical models in the late-nineteenth century with the models themselves; material foundational for further chapters in

[274] Berger, *Ways of Seeing*, 114–17; for a definition of the term 'high art' see Matthew Arnold, *Culture and Anarchy*, 1869.
[275] Sander L. Gilman, 'Black Bodies, White Bodies: Toward an Iconography of Female Sexuality in Late Nineteenth-Century Art, Medicine, and Literature', *Critical Inquiry* 12, no. 1 (1985): 204–42.
[276] Richardson, *The Making of Mr Gray's Anatomy*, 84.

this thesis. As such, this chapter began by describing the various models of normal human anatomy to be found within British anatomical classrooms during the nineteenth century. Considering these models in chronological order, I demonstrated that it was possible to see an uneven development of modelling style with a certain tendency towards generalisation in plaster and away from specificity in wax. Modellers like Dr. Louis Jerome Auzoux developed both the notion of demountable anatomies and a generalisation of the human body, whilst Casciani & Son introduced plaster as a modelling material. Other modellers then grappled with these new styles and materials in different combinations until finally settling on a coherent style and material for representation which later became reproduced in plastic. This trial and error methodology within the discipline is most clearly displayed in the table (figure 2.19, page 78) which numerically indicates the fluctuation of modellers between these styles and materials. Ultimately, there is evidence of a complete shift in style and medium of representing the human body within this period. At the beginning of the nineteenth century models in wax, sometimes overtly sexualised, were presented as images of human perfection. In contrast, by the beginning of the twentieth century, I have demonstrated that models of normal anatomy had removed themselves in form, medium, colour, line, and genre from these earlier models.

There are two possible explanations for this change in the style of anatomical modelling. Firstly, this stylistic shift could be linked to the process of standardisation and increasingly mechanised production methods of nineteenth-century Europe. This is embodied in the models by a shift in materiality away from wax to materials which offer the greater prospect of quick and exact reproduction, including plaster and papier-mâché. These later models were also more durable to technological innovation over time. While wax pathological moulages and models were eventually displaced from use within medical education by the advent of photography, generalised representations of the normal human body were unable to be replaced by technological advancements such as photography or x-rays. As such, it may be the generalisation offered by the new style of normal anatomical representation which cemented their place within modern anatomical education. Alternatively, this shift in style may be related to the process of medical professionalisation during the nineteenth century. As discussed by Ruth Richardson in her work on anatomical images within the *Gray's Anatomy* textbooks, anatomical imagery was moving away from brutal depictions of dissection towards more palatable ones, sterilised by the removal of hooks and dissection accoutrements. With their change in style, these late-nineteenth/early-twentieth century models can be seen to deliberately suppress the sensationalism of earlier models in favour of a similar notion of scientific objectivity. This is just one part of the move away from the medical sensationalism offered in public Anatomy

Museums, shows, and fairgrounds.[277] As such, the abstracted and restrained form of newer anatomical models may also have helped cement their place within professional medical education as medical education expanded during the nineteenth century.

The second half of this chapter then considers the wider significance of this change in style, drawing together knowledge about concurrent professionalisation, industrialisation, and visual development to begin to understand the intrinsic meaning of this newer style of model. I addressed both the possibility of embedded meaning as well as the impact of changing materiality on the creation of meaning. Meanwhile, using Erwin Panofsky's iconological approach to understanding visual materials, I have begun to consider not just the physical form of these models but also their interplay with wider texts and social movements. In doing so, we can begin to infer the relationship between these models and attitudes towards racial difference, as well as the epistemological role of these objects within the classroom. Panofsky maintains that we can study the balance of 'idea' and 'form' to access 'content'.[278] Therefore, in cases where considerations of 'form' have been considered secondary, we must assume that 'idea' was more prominent to maintain this balance. In the case of these anatomical models, artistic and aesthetic qualities are belittled, revealing their connection to narratives of professionalisation, standardisation, and an attempted removal of subjectivity.

I have demonstrated here that these models have developed to be general but no longer specific. Although the impact of form upon interpretation does not amount to embedded meaning, I argue that form clearly limits the meaning created around objects. Understanding the limitations of generalisation influences our conception of the role and meaning of models within the classroom. Whole body anatomical models have traditionally been perceived by historians of anatomy teaching as replacements for cadavers in times of shortage.[279] However, assessing the limitations of interpretation embedded within these standardised models shows that this cannot be the case. These models are both generalised and normal; it is not possible for them to stand in for cadavers which are both individual and, by definition, pathological. As such, these new style models of normal anatomy are shown to have had a more distinct role within the nineteenth century anatomical classroom: a role I will explore in the following

[277] See, for example, Bates, '"Indecent and Demoralising Representations"'; Bates, 'Dr Kahn's Museum'; and Kathryn A. Hoffmann, 'Sleeping Beauties in the Fairground', *Early Popular Visual Culture* 4, no. 2 (1 July 2006): 139–59, https://doi.org/10.1080/17460650600793557.
[278] Panofsky, *Meaning in the Visual Arts*, 37.
[279] These contemporaneously perceived shortages apply to some particular types of cadaver over others, as discussed by Elizabeth Hurren, which these models also categorically do not represent. This will be discussed further in other chapters. Hurren, 'A Pauper Dead-House', 83–84.

chapter. Meanwhile, consideration of the persistent whiteness of skin in these models leads us to consider their potential meaning within the context of racism, specifically scientific racism within the nineteenth century. Here, I am only able to infer a connection. However, this chapter is only the beginning of a truly iconological approach to these models. More contextual material found in the spaces, theories and use of these models, is required to fully understand the iconological significance and as such intrinsic meanings of these items. As such further elements of the iconological approach, as understood by Panofsky, is presented in the following two chapters which aim to spatially and intellectually historicise these models and offer a better understanding of "the essential tendencies of the human mind" which create intrinsic meaning.[280]

[280] Panofsky, *Studies in Iconology*, 15.

# Chapter 3 : Models in the Classroom

The changing nature and style of anatomical models themselves was just one factor in determining the role that these models played in the nineteenth century British anatomical classroom. This chapter will focus on the material context that physically surrounded these models, assessing the spaces and items around them. I will trace the pedagogy of anatomical teaching in the emerging medical schools of British universities during the late nineteenth century. This will establish not only the different teaching spaces, but also their purpose within the curriculum and the amount of time that would be spent in each locale during a normal anatomy course. Within these spaces, I will consider the practicalities of models and the other resources which surrounded them, considering how and where they were kept, who would have access to them, and how often they were used for teaching. As such, this chapter necessarily engages with the age-old struggle of educators to balance practicality with perfection. Like the conversations about race in chapter four, general full-body anatomical models were not present in the classroom every day. In questioning how models were used and what they were used for, I continue to establish the role of these models in the classroom, demonstrating their distinct function. Through comparison with the materials which cohabited these spaces with models, I argue that the new generalised models of normal anatomy were no longer "uncomfortably as well as strategically placed between prepared body parts… and drawings".[281] This position, I argue, was reserved for models taken 'from life' which were gradually phased out during the course of the century (see chapter two). The new style of anatomical model instead formed a foundation on which other materials could build and expand.

This spatial analysis of the nineteenth century British anatomical classroom borrows methods from archaeological material culture studies, considering one stratification of the anatomical classroom. Archaeological material culture studies have demonstrated the importance of this more immediate and spatial contextualisation in the analysis of objects.[282] Using an archaeological approach, the spatial context of an object becomes as important as the social context that surrounds it. This spatial context brings us closer to the everyday use of objects,

[281] Hopwood, 'Artist versus Anatomist', 279.
[282] See Hodder, *Theory and Practice in Archaeology*; Hodder and Orton, *Spatial Analysis in Archaeology*; Anne Gerritsen and Giorgio Riello, eds., *The Global Lives of Things: The Material Culture of Connections in the Early Modern World* (London and New York: Routledge, 2015); and Anne Gerritsen and Giorgio Riello, eds., *Writing Material Culture History*, Writing History Y (London: Bloomsbury Academic, 2015).

allowing us to extrapolate some of the meaning and value assigned to them.[283] In particular, David Gaimster has demonstrated the hidden narratives that an archaeological approach can reveal and the historiography that such an approach can challenge. In his work upon the archaeology of everyday life in the era of print, he demonstrates the disconnect between the solely practical items advertised for sale in printed ephemera and the decorative items found within the archaeological record. In this chapter, I replicate Gaimster's archaeological approach to the situation of models, analysing what is found in the classrooms as opposed to what was available for purchase during this period.[284] In doing so, I explore images, both visual and textual, of British anatomical classroom in the late-nineteenth century, examining the role and placement of the anatomical models within that space. Images from the British institutions that form the focus of this study are further amplified by others from Britain, Europe, and America that serve as comparisons. Some are images that have previously been used in works by Nick Hopwood, Anna Maerker, and Elizabeth Hurren, which will be reanalysed with the aim of defining the role of the anatomical model in nineteenth-century classroom life. Whilst others are purely fictional representations of the anatomical spaces, these accounts provide a more general perspective on the anatomical spaces described. Each serves to illustrate different aspects of object use within the various classroom spaces identified here. Once the visual resources have been exhausted, a consideration of the epistemic and didactic roles of other materials within the classroom setting can help us to define more clearly the separate role of models.

## Anatomical classroom spaces

The anatomical classroom at late-nineteenth and early-twentieth century British universities was typically divided into four separate parts; the lecture theatre, the dissection room, intermediary spaces, and the museum. The multiple anatomical teaching and working spaces would usually have contained a combination of one or more of models, artistic illustrations, diagrams, specimens, textbooks, and museum artefacts. The range of resources available was diverse and understanding them fully is key to understanding the unique role occupied by models in this situation. This chapter will address the roles of all the objects in the anatomical

[283] See, for example, Tara Hamling and Catherine Richardson, *Everyday Objects: Medieval and Early Modern Material Culture and Its Meanings* (Farnham and Burlington: Ashgate, 2010).
[284] Gaimster, 'Material Culture, Archaeology and Defining Modernity: Case Studies in Ceramic Research'; Gaimster, 'Archaeology of an Age of Print?'; Also O'Connor, 'Anthropology, Archaeology, History and the Material Culture of Lycra'.

classroom setting, looking specifically at the added value offered by models which justified their relatively high purchase prices. Models have traditionally been portrayed as objects to fill the gap left by the shortage of bodies in the historical literature.[285] However, I argue that this role is linked only to the previous style of anatomical modelling which took inspiration directly from life. An inspection of the role of the new style of anatomical models in conjunction with other classroom materials shows us that these new models had a much more secure position within anatomical teaching. There were three different roles that resources in the anatomical classroom could play; they could be functional and show the processes of the human body, like diagrams, they could be exemplar and give an example of a specific malady or special dissection case, and they could be general depictions of 'the' healthy body. An archaeological approach to the anatomical classroom elucidates the different roles of each of the classroom resources available in both two and three dimensions, showing that the new normative style of anatomical models fulfilled a general and foundational role as depictions of 'the' body. As such, I theorise that they contributed to the normalisation of whiteness in nineteenth century British anatomical teaching.

Much of the imagery presented here is not new. However, its collation connects spaces which are commonly treated individually within scholarship on medical education or anatomy. In doing so, I create a holistic model of the pedagogy of late-nineteenth century British anatomical study. This reanalysis of individual spaces as part of a connected pedagogy facilitates the situation of anatomical models within the plurality of classroom spaces, identifying the boundaries of their role in anatomical education. The role presented here is considerably more complex than the two different spaces that anatomical models currently occupy within the historical literature. Scholars of anatomical imagery and representation assign models a similar role to images in that they clean up the chaos of the real body or cadaver, making it easier for students to learn the different internal parts and making anatomy more palatable for members of the public.[286] Scholars of the history of anatomy present anatomical models as a stop-gap used to fill gaps in a tenuous body supply.[287] However, by analysing these images of the anatomical classroom, this section will show that the new style of anatomical models at the end of the nineteenth century primarily occupied neither of these spaces in the anatomical education system, but rather were used to represent the normal and idealised body. Whilst they may have been used to augment

[285] On cadaver supply for nineteenth-century anatomical teaching see Richardson, *Death, Dissection and the Destitute*; Sappol, *A Traffic of Dead Bodies*; Hurren, 'A Pauper Dead-House'; Hurren, 'Whose Body Is It Anyway?'; Hurren, *Dying for Victorian Medicine*.
[286] Richardson, *The Making of Mr Gray's Anatomy*, 226–28.
[287] Hurren, *Dying for Victorian Medicine*, 232.

the clarity of anatomical illustrations and diagrams in clarifying the internal parts of the body, other classroom items can be seen to occupy this space. Meanwhile the biggest deficiencies in the body supplies to British medical schools were left categorically un-addressed by these anatomical models. As I will demonstrate in this chapter, this was a role filled instead by specimens.

This section uses three kinds of sources: photographs, building plans, and written descriptions. Photographs of the interior of dissection rooms are most commonly available, although unfortunately images inside these anatomical classrooms at Oxford and Liverpool universities have either not survived or were never produced. This is possibly because of lighting issues in other anatomical spaces, which were solved in light and airy dissection rooms built specifically for purpose.[288] However, images from other institutions across Britain, Europe, and America are available for further comparison. These further images can add to our understanding of the nineteenth century dissection room and in some cases provide comparisons to the British context. These photographs are corroborated and embellished by building plans which illustrate the relative location of rooms, and in some cases the placement of interior furniture. However, visual images are not the only source of historical information about the layout and interior of the nineteenth century anatomical classroom. Information about lecture theatres and laboratories also comes to us through written descriptions, as well as drawings, from the period. One of the largest textual "images" is a description of William Turner's final anatomical lecture at Edinburgh as remembered some years later by a student in the original audience. Meanwhile, another describes both a lecture theatre and a laboratory written by H. G. Wells in order to set the scene of one of his short stories, 'A Slip Under the Microscope'. Both sources offer something different to the historian- one focuses on the physical act as well as the space of anatomical lectures, whilst the other focusses more heavily on the anatomical laboratory and the interactions of students therein. These descriptions corroborate one another as well as adding depth and life to the static and staged pictures of anatomical study that images provide. These textual descriptions capture much more than the snapshot represented in visual images, expanding the single image into a three-dimensional entity. These descriptions, although subject to their own different audiences, are at least representations of subjects who supposedly do not know they are being thus depicted. In this respect, it is particularly interesting to compare the first description of a lecture given by Sir William Turner to a carefully staged image of an empty

[288] Anon., 'Human Anatomy at Oxford'.

lecture theatre. These sources, when combined, provide a more complete picture of anatomical pedagogy in Britain at the end of the nineteenth century and the role of models within it.

## The lecture theatre

The former medical student J. P. S. Jamieson typed his recollections of or notes from "Sir William Turner's Last Anatomy Lecture" in March 1956, 53 years after it was given. Unsurprisingly, Jamieson failed to recall the detailed content of the lecture. However, his recollections of space, the positioning of students, and the objects used offer an insight into the operation of a lecture theatre setting with respect to models. Particularly, the items that Jamieson recalls are important because they evidently made an impact on Jamieson at the time of the lecture, considering that Jamieson's recollection was written so long after the original event.[289] As a result of the temporal distance for the original lecture, this recollection provides Jamieson's general impression of the anatomical classroom. In Jamieson's words: "the anatomical theatre looked exactly as for any other lecture".[290]

Jamieson's view of the anatomical lecture theatre comprises of familiar elements; specimens, models, and diagrams, alongside a synopsis of the lecture on the blackboard.[291] It is however Jamieson's description of the use of these objects by Turner which attracted my attention. Jamieson describes how Turner attempted to allow everyone in the room to view the objects he was using to illustrate his points by "holding high" and "swaying round to all parts of the amphitheatre [sic.]", as well as using a pointer or probe to make simultaneous reference to diagrams on a blackboard.[292] As such we remain unclear as to the size or nature of any models used. Evidently those that Turner handled in this instance must have been reasonably small and easy to lift. However, it is clear that Turner also used a pointer which could have been used to demonstrate with larger, more static models. Importantly, Jamieson's memory was hazy when specifying whether Turner used a smaller model or a specimen for these lecture demonstrations.[293] This uncertainty suggests that these two types of object were regularly used interchangeably in the lecture setting, bringing into question the need for both types of objects. If used interchangeably with specimens in lectures, these models could easily have been

[289] For further discussion of the significance of memory and forgetting in a medical context see Arnold-Forster, '"A Small Cemetery"'.
[290] J. P. S. Jamieson, 'Sir William Turner's Last Anatomy Lecture (1903)', 3 April 1956, 2, EUA IN1/ACU/A2/19/7, Edinburgh University Archives.
[291] Jamieson, 2.
[292] Jamieson, 'Turner's Last Anatomy Lecture'.
[293] Jamieson, 4–5.

replaced by preserved flesh materials which held a much higher epistemic status. The continued need for both indicates that the two, whist used for the same didactic role, demonstrated different phenomena. With new anatomical models confined solely to representations of the general body, specimens would have demonstrated deviation from this norm.

Turning to images and plans of anatomical lecture theatres, there is more concrete evidence of the types of models and other items present within this space. The first materials present in this context were those stored within these spaces. In figure 3.1, plans of the Christ Church College anatomical school in Oxford, there is evidence that materials were stored within lecturing spaces, as well as used for demonstration. Here two proposed storage spaces indicate the presence of wet preparations and osteological collections within the anatomical lecture theatre space. Meanwhile further storage labelled 'cases' suggests more material owned by the Lee's Trustees, sponsors of the anatomical chair at Christ Church, would have been stored within this space. This may have included a number of wax models or ethnological specimens which formed part of the Christ Church collections.[294] The second materials present within these spaces, as described by Jamieson, were those used during the lecture for demonstration. Unfortunately, there are no photographs of the anatomical lecture rooms in use within the university archives at either Oxford, Cambridge, Liverpool, Edinburgh, or UCL. However, other contemporary images of anatomical lecture theatres at the Hunterian Museum in London and the Freiburg Gynaecological Clinic offer an insight into these spaces as they were used during lectures (see figures 3.2 and 3.3, pages 104 and 105). Figure 3.2, by Robert Blemmel Schnebbelie, shows how lectures were illustrated by specimens on the table in front of the lecturer, as well as by illustrations, diagrams, models, and skeletons. This representation of the anatomical lecture theatre is corroborated by figure 3.3, which although from continental Europe and specifically gynaecological shows the same presentation of materials. Here we can see the use of embryological models in conjunction with other resources in a lecture theatre setting at the end of the nineteenth century. The models are on a table at the front of the lecture theatre, next to which stands a full-body normal skeleton, and the wall behind where the lecturer would have stood is adorned with diagrams and drawings, as well as a blackboard, on which there are yet again more diagrams. Pictures partially covering doorways demonstrate both the busy nature of the anatomical classroom as well as the practicality of spatial constraints. These images make it

[294] 'Anatomy School: Papers on the Creation and Administration of the Anatomy School', 221–22, 242, 430, 474, 483, 508, 568.

apparent that models of normal anatomy would have been contrasted with specimens, drawings, diagrams, and bones within the lecture theatre.

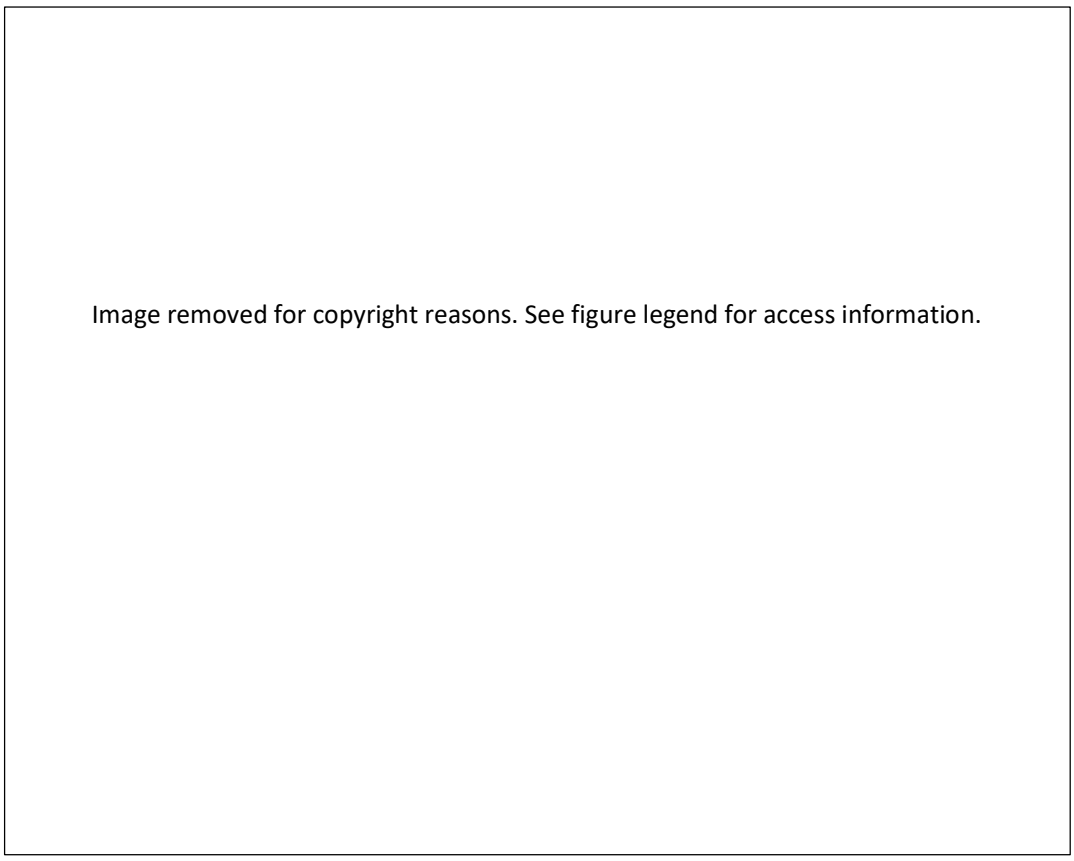


*Figure 3.1 'Plan of the lecture room at the Anatomy School (in its present state) with proposed alterations' (c.1853). Illustrates the proposed storage of wet preparations and osteological material within the Christ Church College anatomical lecture room, as well as further cases for storage. (Maps ChCh 13, Christ Church College Archive, Oxford)*

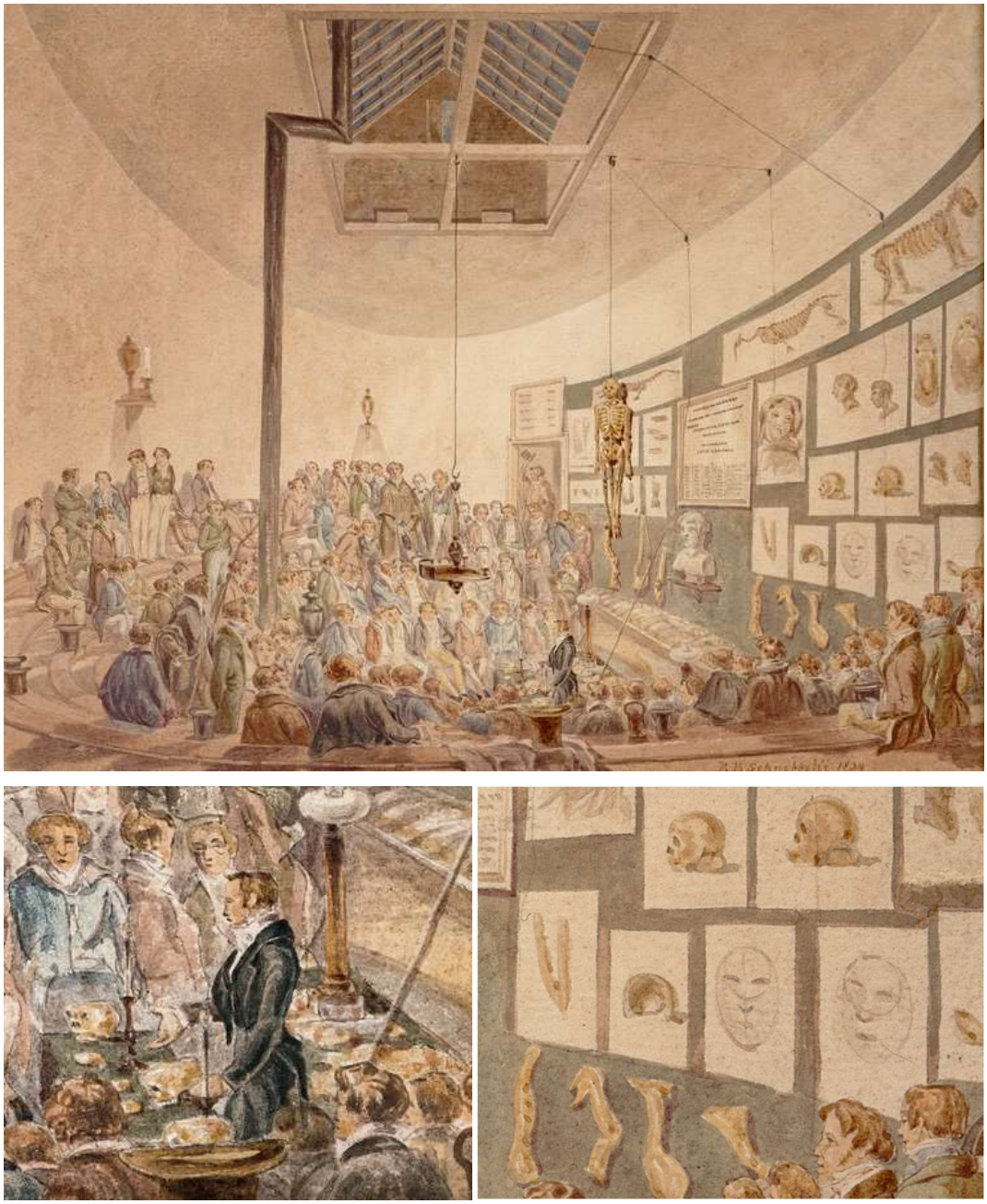

*Figure 3.2 'A lecture at the Hunterian Anatomy School, Great Windmill Street, London', by Robert Blemmel Schnebbelie (Watercolour, 1839). (Wellcome Collection Images, CC BY)*


*Figure 3.3 The Freiburg gynaecological clinic (18th February 1893). In this image, generalised embryological models by Adolf Zeigler were removed from storage cabinets and placed at the front of the classroom in preparation for teaching. (D49/991, Universitätsarchiv Freiburg; Embryos in Wax, Nick Hopwood (Cambridge, 2002), p. 183)*

The storage and presentation of these items brings to the fore questions about accessibility of models within the lecture theatre. In figure 3.1 (page 103), there are two different types of storage proposed: a case with a glass front for the osteological materials and shelves for the wet preparations. Here the preservation of teaching items behind glass, either in cases or in jars, discussed by Hopwood is evident. Indeed, the distinction between the two modes of storage suggests that further areas labels 'cases' in this figure would also have had doors or glass fronts. This plan also gives us no indication of the height of such shelves and cabinets which could have played a large role in the accessibility of the materials contained within. In figure 3.4 (page 106), for example, we see cabinets placed high up on the wall, which would have limited accessibility even further. Jamieson's description of Turner's use of objects, discussed above, goes some way to assuaging Nick Hopwood's concern that anatomical students might have been unable to see models clearly through glass cases in lecture theatres as they were clearly removed from storage and handled directly by the lecturer.[295] As in figures 3.2 and 3.3, models and specimens used for each lecture would have been removed from storage and placed at the front of the room.

[295] Hopwood, *Embryos in Wax*, 35.

However, the clarity with which these models would have been seen by students at the back of a full lecture theatre is still questionable. As can be seen in figure 3.5, lecture theatres were large impersonal spaces which would have put distance between students and models regardless of Turner's "swaying". It would have been necessary for students to wait after the lecture if they were to view these items first-hand. Indeed, this very manner of students accessing the lecture materials is described in in H. G. Wells' fictional account of an anatomical course in his short story 'A Slip Under the Microscope' (1896). Wells describes how students would dawdle in the lecture room to finish "copying the blackboard diagrams before they were washed off, or examining the special specimens [the professor] had produced to illustrate the day's teaching."[296] This suggests that students would have had close-up access to both specimens and models in the lecture theatre setting.


*Figure 3.4 Lecture hall of Vienna's Second University Skin Clinic (pre-1904). This image demonstrates possible placement of storage cabinets within a lecture theatre which, whilst allowing students to view materials at any time from a distance, would have made direct accessibility more difficult. (Institute for the History of Medicine, University of Vienna; Embryos in Wax, Nick Hopwood (Cambridge, 2002), p. 222)*

[296] Wells, *A Slip Under the Microscope*, 29.

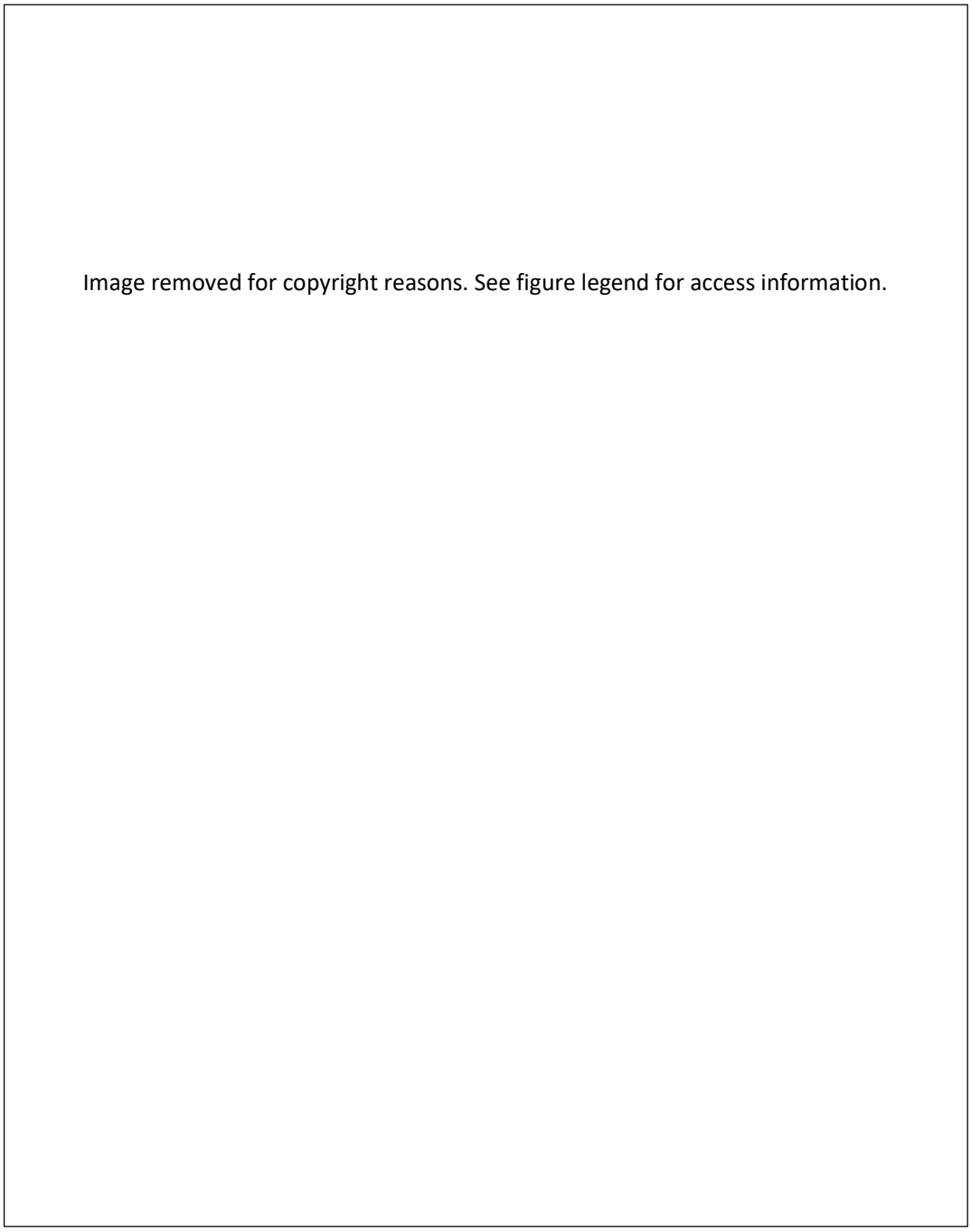


*Figure 3.5 Photograph of 'Old Lecture Theatre, Guy's Hospital' (Messrs Pal[mer Clarke], c.1890s). This image demonstrates the distance between students in the uppermost seats and the lecturer. (MS Add.7620/1/4.3, Cambridge University Library, Department of Manuscripts and University Archives, Cambridge)*

## The dissection room

The dissection room is the second key component of the late-nineteenth century British anatomical classroom. Whilst both lectures and demonstrations would occur daily for one hour during a normal course of anatomical classes, students would arguably have spent more time in the dissection room than the lecture theatre. These rooms would have been open for many hours during the day, and students would have been able to use the dissection rooms freely during these hours under the supervision of demonstrators.[297] This room has been widely addressed in literature on anatomical history through its relationship with the body trade.[298] However, here I am interested in the relationship between models and cadavers within this space.

The presence of models within images of dissection room spaces is, relative to the other anatomical teaching spaces, quite rare. However, there are two cases where models, or similar items, have been captured in images of nineteenth century British dissection rooms. Firstly, at the University of Oxford an image of the post-1892 dissection room appears to show the presence of two full-body models or statues within the room, one in the foreground and one in an archway in the background (see figure 3.6). The figure in the foreground has its back turned, making it is difficult to tell whether this figure is anatomical or decorative. However, I have assumed that it is a statue not a model both because this figure does not match any of the anatomical models known to be owned by the University of Oxford at this time, and because of its spatial proximity to other statues (see figure 3.7, page 110). However, the object in the background of figure 3.6 could be the Auzoux model purchased by the Lee's Reader of Anatomy at Christ Church College in 1833 and later transferred to the museum under Arthur Thomson in 1894.[299] This model sits in this space alongside statues, an articulated skeleton and diagrams drawn on blackboards around the room, as well as cadavers and smaller osteological items. These are items also found within the dissection room at University College London, suggesting that this would have been the common material context of models within this space (see figure 3.8, page 110). The skeleton and diagrams share with the model the representation of the normal healthy body, juxtaposed against the (necessarily) pathological cadavers. Within this context, the model offers flesh to the skeleton, three-dimensionality to the diagrams, and life to

[297] *University College London Calendar Session 1890-91* (London: Taylor and Francis, 1890), 133–34.
[298] See, for example, Hurren, *Dying for Victorian Medicine*; MacDonald, 'A Body Buried Is a Body Wasted: The Spoils of Human Dissection'.
[299] I have arrived at this theory through a comparison of the outline of the object in the background of figure 3.6 with known poses of Auzoux models (see figure 2.5, page 62). See, 'Anatomy School: Papers on the Creation and Administration of the Anatomy School', 240–42, 483.

the cadavers. With this last point I do not mean to say that the Auzoux models are life-like, as in the case of the eighteenth-century wax models, also donated to the department in 1894 but not visible in any of the images (including figure 3.21, page 126, of the museum) and therefore presumably not on display. Rather, in comparison to Goodsir's cast of a dead body, visible in the central hall of the department in figure 3.7 (page 110), these models offered a three-dimensional image of the parts of a healthy living body, rather than a pathological dead body. This is not an uncomfortable role, but one which gives dimension and functionality to the accompanying materials.


*Figure 3.6 Image of the Human Anatomy Dissection Room at the University of Oxford (c. 1906). The image depicts two anatomical models or statues, one in the foreground and one in an archway at the back of the room, as well as a full articulated skeleton. Persons can also be seen performing dissections, as well as looking at smaller materials. ('The Oxford Medical School', British Medical Journal, 1: 2373, p. 1485)*


*Figure 3.7 Central Hall of the Department of Human Anatomy at the University of Oxford (c. 1906). Demonstrates the use of decorative statues within the department described as showing "types of the human form", as well as "a cast of the dead body made by Goodsir". ('The Oxford Medical School',* British Medical Journal, *1: 2373, image; p. 1483, quotes; p. 1486)*


*Figure 3.8 'Photographs of dissecting room of University College London' (c. 1918). These images demonstrate the inclusion of similar blackboards for diagrams and a similarly articulated skeleton (far background, left image). (MS ADD 282/G/6, University College London, UCL Archives, UCL Special Collections, London)*

However, like the images of the dissection room at University College London (figure 3.8), the majority of images taken of the nineteenth century British dissection room do not contain models (see figures 3.9, 3.10, and 3.11, pages 112 and 113). It is unclear whether this is because models were not present in these spaces or whether they simply were not visible at the angle from which the photographs were taken. However, what is clear, is that models were not considered as important as the cadavers. In the dissection room space, the general model lost out to the specificity and unique qualities of the cadaver for teaching. This is because the cadaver has a greater claim to authenticity in the anatomical classroom than any other teaching material.[300] As such, the focus of these images is either on students working on cadavers or on the cadavers themselves. There does not appear to be space, nor indeed desire from the students, to remove objects from cabinets in the room (or elsewhere) and study them in more detail in the dissection room; at least, not whilst the cadavers were present. However, these images do show a prevalence of one resource in particular within these spaces: the diagram. Diagrams, which occupy the same didactic space as models but in two dimensions, would have been used in a similar way to models within these spaces. The prevalence of diagrams within these spaces indicates that they would have been heavily used. In this case, they would have been able to elucidate facets of the real and dead body which were unclear in the flesh. The similarities in the role of models and diagrams strengthens the claim that models would have been used as three-dimensional juxtapositions to the dead body when used within these spaces; as examples of the ideal from which to understand the individual.

In the British context, models of normal human anatomy performed a fundamentally different role to cadavers, acting as three-dimensional diagrams. This difference was both epistemic and practical. Not only did they represent a generalised normal healthy body, whilst cadavers the dead and individual body, but these adult white male models did not fill any perceived gap in cadaver supply (see chapter four). Stephen Kenny's 'Specimens calculated to shock the soundest sleeper', contains a similar image of an American dissection room which is pertinent to the consideration of models alongside perceived racial anatomical differences within this thesis (see figure 3.12, page 114).[301] Black bodies were much more common in the American anatomical classroom as a result of the socially enforced relative poverty of Black communities which meant they were less able to protect their dead from grave robbers.[302] Figure 3.12 illustrates the reality of this statement, as all of the cadavers present are Black. Meanwhile, in this space we can see

[300] Hopwood, 'Artist versus Anatomist', 279.
[301] Kenny, 'Specimens Calculated to Shock the Soundest Sleeper', 169.
[302] Sappol, *A Traffic of Dead Bodies*, 107.

an array of cupboards at the back of the classroom which appear to contain at least specimens if not also small models. In this context, white male models would indeed have filled a gap in the cadaver supply. As such, in these dissections rooms anatomical models were able to occupy a different epistemological and didactic space. This comparison with the American dissection room illustrates the importance of spatial and material context in our understanding of the role of objects. However, whilst this image is not representative of European anatomical classrooms at this time, it does present an example of the layout of the dissection classroom in which again the role of models and specimens is clearly either secondary to or different from that of the cadavers for which these spaces were intended.

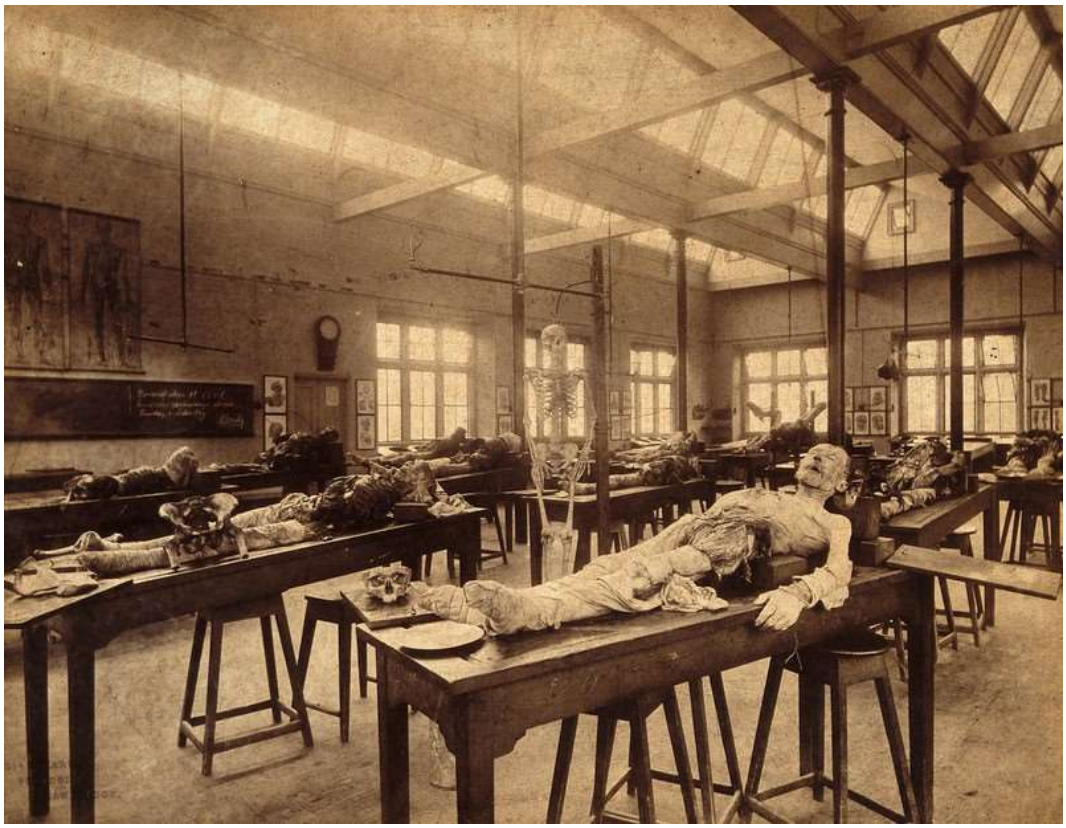

*Figure 3.9 The interior of the Department of Anatomy at Cambridge University (Stearn Photos (Cambridge), 1888/1893). (Wellcome Collection Images, CC BY)*

*Figure 3.10 The interior of a dissecting room in Edinburgh, with half-covered cadavers on benches (1889). (Wellcome Collection Images, CC BY)*


*Figure 3.11 The Dissection Room, Medical School, Newcastle upon Tyne (J. B. Walters, n.d.) (Wellcome Collection Images, CC BY)*


*Figure 3.12 Interior view of anatomy class, Josephine Hutchinson Memorial Building, Tulane University, New Orleans. "The photograph depicts a deeply racialized context of anatomical practice. A disproportionate number of the cadavers used were African American and the dissectors were exclusively white males." (MA2027, Rudolph Matas Library of the Health Sciences, Tulane University; 'Specimens Calculated to Shock the Soundest Sleeper', Stephen Kenny, in Wils et al, Bodies Beyond Borders (Leuven, 2017), p. 169)*

## The not-so-anatomical laboratory

H. G. Wells, in his aforementioned short story 'A Slip Under the Microscope', vividly described the traditional laboratory space associated with anatomical study. He paints a picture of a somewhat dim and cluttered classroom on a rainy and dull day, with the natural light low and the air yellow from the light of green-shaded gas lamps. In Wells' anatomical classroom, every surface contains an anatomical resource. Specimen jars stood on the student desks whilst bleached specimens lined the walls. These were "surmounted by a row of beautifully executed anatomical drawings", whilst even the doors of Wells' laboratory are panelled with blackboards use for diagrams.[303] Here we can see Wells' emphasis on the visual nature of anatomical study, with constant references to examples and illustrations used by students, as well as showing the variety of teaching materials used in every day study. Notably he does not mention models, perhaps echoing Jamieson in conflating models with specimens, or perhaps attempting to provide a more gruesome setting for his readers. Wells may also have been describing a class in which models were not needed. Whilst obviously a literary setting, this description of an anatomical laboratory is not a completely unreliable source. As Philip Ball notes, Wells was

[303] Wells, *A Slip Under the Microscope*, 27.

extremely literate in nineteenth century science, as we can see reflected in several his other works, and indeed close friends with Julian Huxley.[304] Moreover, a substantial section of Wells' middle- and upper-class readership would have seen or heard about these spaces and would not have been easily deceived. Indeed, Wells' aim in this tale is to encourage the reader to think about the subtleties of morality in daily deeds, which could only be successful in a realistic setting. The imagined aspects of a story must be grounded in the real or believable in order to make the story credible and Wells is known for using accepted scientific knowledge as the basis for technologies in some of his wilder fantasy novels.[305]

This description of the laboratory space is supported by images such as figure 3.13 (page 117) from University College London. Held at UCL's Grant Museum, these images show the special constraints of a traditional laboratory space. These images of E. Ray Lankester's long course in Zoology, 1887, show again the use of space in these classrooms, the types of models that might have been used, and the ways in which they were used. As a space in which the students would have spent a large amount of their practical time, this space is adorned fully both with a large amount of anatomical teaching material as well as a large number of desks, to provide space for as many students as possible. As such, these images point towards the vast expansion of British medical education in the late nineteenth century. Models are shown sitting on the centre of some of these desk spaces alongside specimens, osteological preparations, and microscopes. This demonstrates the proximity with which the students were able to work with the models in this setting, but also hints at the potentially limited amount of time they would have to study from them, as without storage space within the classroom they would have had to be removed elsewhere after use. This issue of space, one which was in no way confined to the growing medical school at UCL, would also necessarily limit which models could be used in the laboratory setting.[306] In these images we see wax models of proglottids of liver fluke (parasite eggs) pressed between plates of glass are being used within the classroom. However, large life-sized models of the human body would have been impractical within these spaces, as well as commanding a costly purchasing price. It is perhaps because of space considerations, problematic partially as a result of expansion, that we see fewer of the full-body models in British institutions than we might otherwise expect.

[304] Philip Ball, *Invisible: The Dangerous Allure of the Unseen* (Random House, 2014), 168–83.
[305] Ball, 179.
[306] See documentation on the expansion of the medical school at Oxford and the expansion of the anatomical museum at Edinburgh amongst many more.

However, the laboratory spaces depicted and described here are those from chemistry and comparative anatomy, with Wells' students also studying comparative, not human, anatomy. In fact, whilst the laboratory was a fixture of *medical* teaching during the nineteenth century, it is a contested space in the history of *anatomical* teaching. Whilst subjects like comparative anatomy or physiology required a dedicated laboratory space, the bulk of the practical work for human anatomy was able to be performed in the dissection room. As these disciplines gradually became separate from human anatomy during the nineteenth century, and gained teaching spaces of their own, human anatomy lost its laboratory spaces (see figures 3.14 and 3.15, pages 118 and 119). However, the pedagogical approach to teaching human anatomy still retained the need for a space to bridge the gap between the lecture room and the dissection room. The subject still required spaces in which student interaction with objects could be, as Nick Hopwood has suggested, mediated.[307] Demonstrations, which students were required to attend, and the guided study of specimens, models, and textbooks still played a significant role in the anatomical curriculum. These intermediary laboratory-esque spaces for the study of human anatomy existed instead in a different format. At the University of Oxford there are three different spaces which fulfil this intermediary role between lecture and dissection room. Firstly, these laboratory spaces for human anatomy could be subsumed into the dissection room as in the case of the new 1892 buildings for human anatomy. Here the dissection room was equipped with six dissection tables as well as six "ordinary wooden tables".[308] Secondly, the addition of a microscopy space within these buildings can also be considered as part of these intermediary spaces in which lecturers would mediate the practice of students but not lecture. Finally, desks or countertops within a museum space could have provided space for student study of specimens and models as in the case of the Christ Church College, Oxford, anatomy buildings (see figure 3.16, page 119). In other cases, such as the Liverpool Medical Institute (later subsumed into the University of Liverpool), we find general classroom areas connected with the anatomical rooms which may have been used instead of a laboratory (see figure 3.17, page 120). Whilst the guidance of lecturers outside of the lectures and dissection was undoubtedly still important to the pedagogy of anatomy teaching in the late-nineteenth century, it takes on a very different format to that of wider areas of medical education. It was however, in these more informal spaces of learning that lecturers may have been more likely to share theories with students that went beyond the usual remit of an anatomical lecture or dissection, such as theories of racial anatomical difference.

[307] Hopwood, *Embryos in Wax*, 184.
[308] Anon., 'Human Anatomy at Oxford', 902.



*Figure 3.13 Images of 'Lankester's long course 1887'. These images demonstrate the placement of models within a laboratory space demonstrating the impracticality of large models within these kinds of spaces. (UCL Grant Museum of Zoology, London)*



*Figure 3.14 Plans of the Oxford University Museum complex (Top; c.1872, Bottom; 1899). Illustrate the division over time of anatomy, comparative anatomy, physiology, zoology, and anthropology into separate disciplines with separate teaching spaces. (Top; MU/4/3/15, Bottom; MU 4/19, University of Oxford Special Collections, Bodleian Library, Oxford)*


*Figure 3.15 Plans of University College London (1890). Illustrating the presence of the anatomical department and the anatomical theatre, with no designated laboratory space, next to the Birkbeck laboratory for chemistry. (University College London Calendar Session 1890-1891, UCL Library Services Digital Collections)*


*Figure 3.16 Anatomy School (c.1840). Interior depicts the museum space which included countertop spaces possibly used for student study (P.TOP.MISC.49 [Maps ChCh 13], Christ Church College Archive, Oxford)*

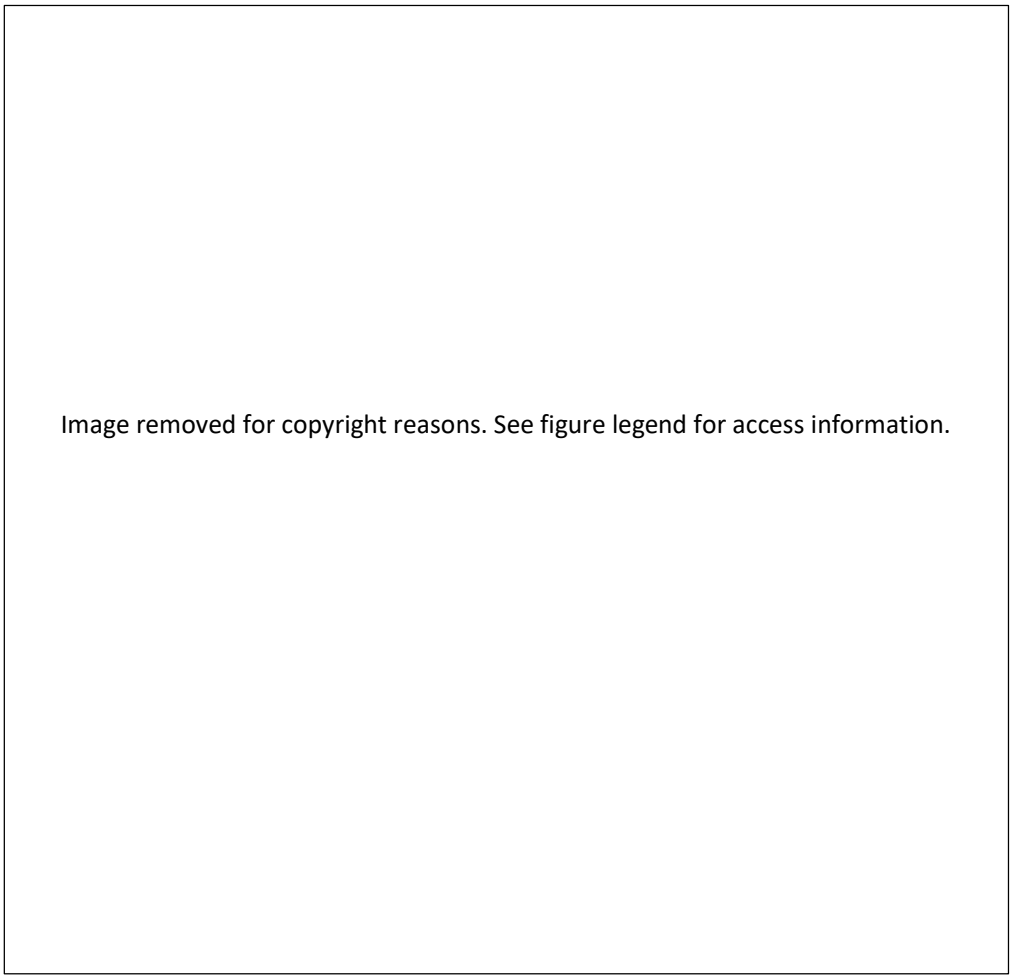


*Figure 3.17 The "Adamson Map" (c.1868). Illustrates the addition of laboratories for chemistry and physiology, with a general class room space next to the anatomical rooms at the Liverpool Royal Institute School of Medicine (Later the University of Liverpool Medical Department). This plan also demonstrates the closeness of the museum, lecture theatre, and dissection room which would have facilitated the easy flow of objects between the spaces. (S3115, University of Liverpool Special Collections and Archives, Liverpool)*

These rooms present a challenge in the construction of a universal anatomical pedagogy for late-nineteenth century British universities. However, whilst each institution may have differed in their provision of this teaching space, these spaces present only one new context of model use. Museum, dissection room, and lecture theatre spaces share a number of characteristics with the laboratory described by H.G. Wells. In the museum, we find models, specimens, and bones in the lining the walls in the same way as those described by Wells. While the dissection room and the lecture theatre are alternative homes for the diagrams, illustrations, and blackboard annotations which cover the walls. Placing an emphasis on the quantity of these items described by Wells and evident in figure 3.14 (page 118), these spaces contextualise models in the same way, with vast quantities of material surrounding them. However, there is some evidence to

suggest that microscopy spaces did not contain items at this volume. In figure 3.18, a zoology laboratory in Manchester, we see a calmer laboratory space in which models are placed neatly on a central table. Ideologically, this image strengthens the assumption that the purchasing academic agreed with the theories displayed within the series itself as the lecturer chose not to reorder the collection or use select pieces but rather displayed the entire product. Meanwhile practically, the surrounding students all have clear unencumbered access to these embryological models and the classroom is relatively uncluttered. Here there is no glass or distance separating student and model, allowing them to fully benefit from the three dimensionalities of the models. The stands on which this model set sit may have been designed to limit the amount of physical contact with the wax during their rigorous use and prevent degradation of the works. Hopwood claims that the interactions in the classroom would have been mediated by lecturers.[309] Whilst I argue that this was ideologically the case, practically however we can see the evidence of extensive and prolonged use and physical contact in this image and with the models in some surviving collections- notably those at Oxford which are faded and worn, as well as the collections at Edinburgh and UCL which are still used as teaching collections to this day.


*Figure 3.18 Zoological laboratory, Owens College, Manchester (c.1900). Demonstrates the central uncluttered placement of models within microscope rooms and the unhindered access of students to these models. (John Rylands University Library, Manchester; Embryos in Wax, Nick Hopwood (Cambridge, 2002), p. 184)*

[309] Hopwood, *Embryos in Wax*, 184.

## Wider resources: the anatomical museum

The final space of any nineteenth century British anatomy course was the anatomical museum. This space could have been used as an intermediary space between the lecture theatre and the dissection room, as in figure 3.16 above, but is most important for its combination of all the different teaching resources within one space. It is within this museum setting, within the spatial and material context of all the various anatomical teaching resources, which we can best begin to appreciate the role of models of normal anatomy. This is a role which agrees with model use in other classrooms, but which can only be identified by examining models amongst the other resources as a collective in the museum space. The museum space is important because of the purpose of the displays within these museums. These displays were designed to demonstrate universal norms and contrast them with variations from the norm, as well as presenting the development and seriation of objects. In particular, the osteological collections within these spaces were often arranged to demonstrate a racial hierarchy. Concurrently, through identifying the role of other objects, I identify the gap between these materials which models would have occupied. As Nick Hopwood states, these models are perceived to sit "uncomfortably" between body parts and drawings. I will specify here this unique role which models of normal anatomy played within the classroom in conjunction to other materials. In doing so, I demonstrate why models were perceived to be both useful and necessary within the late-nineteenth century British anatomical classroom, as well as the narrative they contributed towards within the anatomical museum.

### *The space*

Anatomical Museums were a universal space in late-nineteenth century British medical education. Figures 3.19, 3.20, 3.17, and 3.15 (pages 123, 124, 120, and 119) demonstrate the inclusion of museum spaces for anatomical materials within the departments of Oxford, Cambridge, Liverpool, and University College London, whilst the University of Edinburgh Anatomical Museum continues to exist in part of its nineteenth century lodgings today.[310] Although use of these spaces was not timetabled into the anatomy course, their universality indicates that they must have been perceived as useful resources for students. Indeed, in early iterations of the Oxford Museum, when space was at a particular premium, medicine, both normal and abnormal, occupied four cases within the court of the museum.[311] This trend

[310] https://www.ed.ac.uk/biomedical-sciences/anatomy/anatomical-museum

[311] Henry Wentworth Acland, 'The Medical Department in the Court of the Museum', nd, MU3/39, University of Oxford Special Collections, Bodleian Library.

continues to the modern day: University College London still has space today for museums of anatomy and pathology for student use, as well as the more famous and public Grant Museum of Zoology, despite the premium on space in central London. As such, whilst not timetabled, we can assume, as described in the University College London Calendar for 1890-1, that anatomy students spent a considerable amount of time studying the resources within these spaces, in a similar manner to the use of dissection rooms out of class hours.[312]

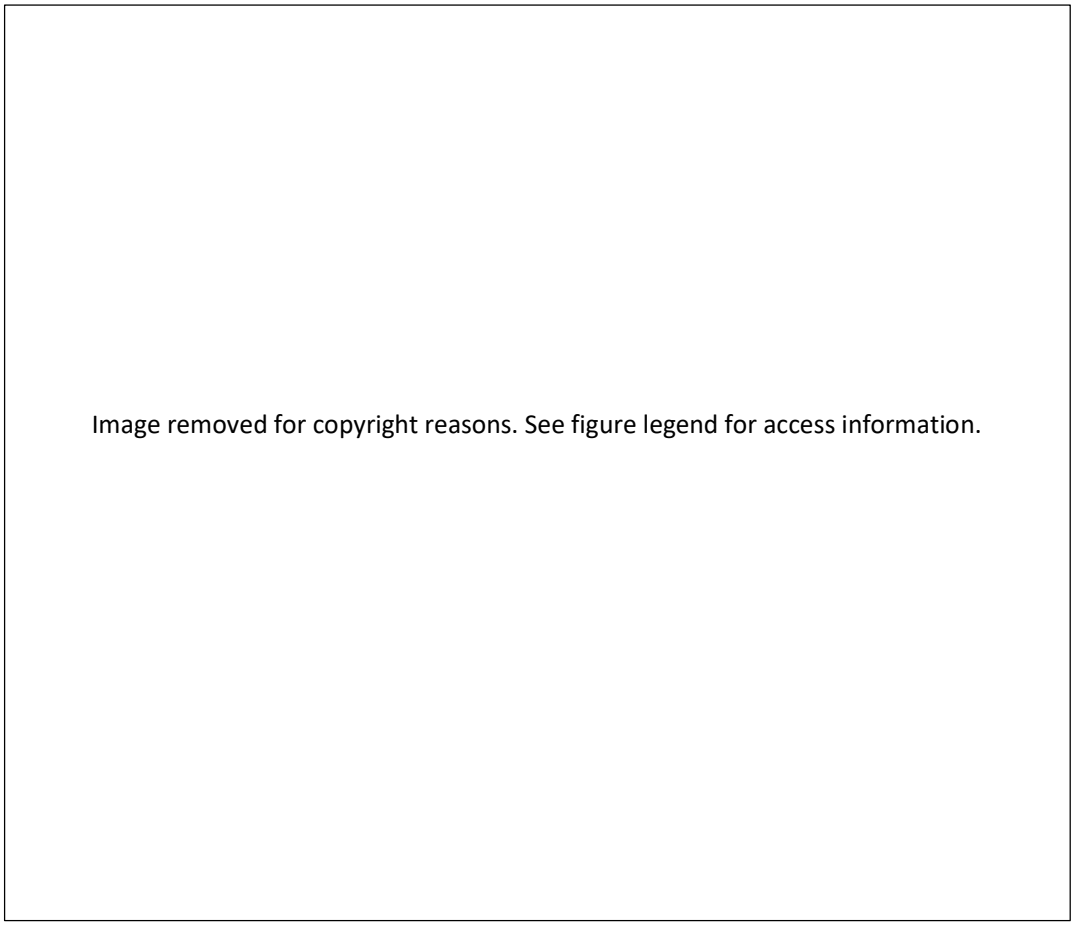


*Figure 3.19 Plan of the Ground Floor of the Human Anatomy Department at the University of Oxford (1893). ('Human Anatomy At Oxford', British Medical Journal, October 21st 1893, p. 902)*

[312] The Museum of Anatomy and Pathology at UCL was described as '...constantly used by Students, being one of their chief means of learning Anatomy and Pathology.' in *University College London Calendar Session 1890-91*, 123.

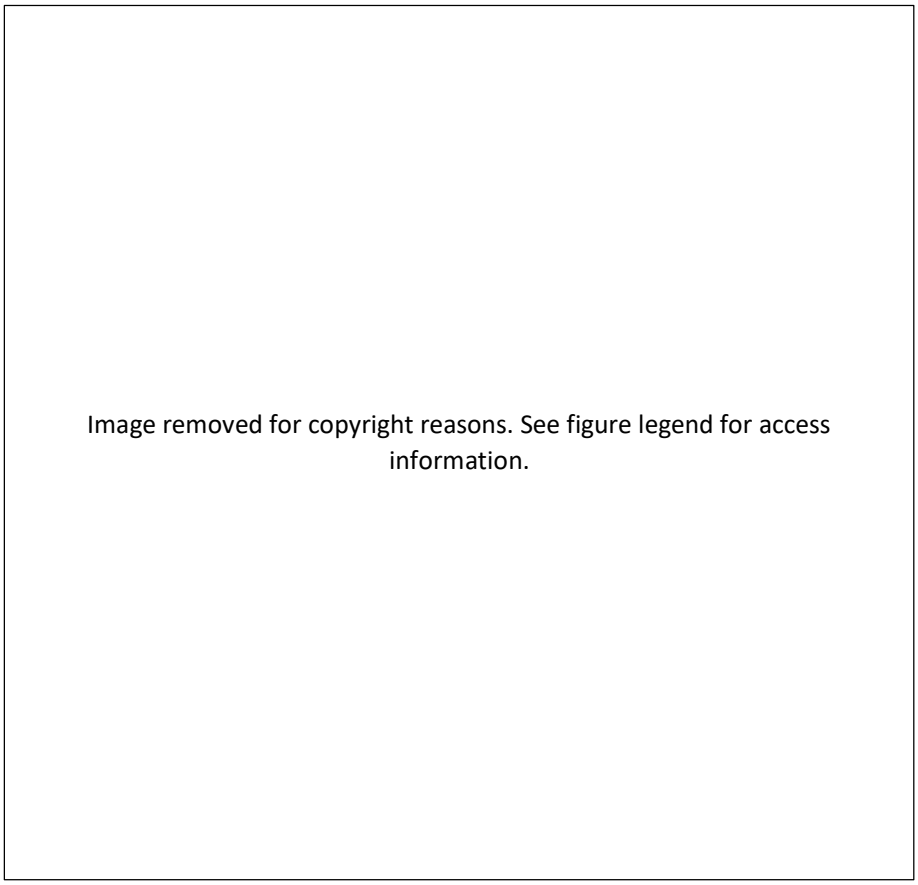


*Figure 3.20 Ground plan of site and buildings for 'Museums of Natural Sciences' (c.1884). Illustrates the presence of a dedicated museum of human anatomy. (University/P.XVIII.9, Cambridge University Library, Department of Manuscripts and University Archives, Cambridge)*

These spaces contained the full range of anatomical teaching materials including models, wet and dry specimens, osteological collections, diagrams, and illustrations. At University College London the anatomical section of the Museum of Anatomy and Pathology contained:

> "… 86 special dissections, illustrating the anatomy of all parts of the body, and explained by a series of water-colour drawings. In addition there are also spirit-preparations of all the joints and ligaments; the original dried preparations of the arteries by Richard Quain; and a large Osteological Collection, comprising, among other things, all the bones with the muscular attachments accurately marked out, and special preparations to show the articulations of each of the Cranial bones, and also many specimens of the growth, development, and variations in the skeleton. The anatomy of the various organs and tissues is illustrated by nearly 500 specimens in spirit, many of which are injected to show the distribution of the blood-vessels" and "The wax models have been made principally by Tuson."[313]

[313] Tuson is a currently unknown modeller, not mentioned elsewhere in literature about wax modellers. *University College London Calendar Session 1890-91*, 123.

This textual description is reflected in figure 3.21 (page 126) of the Anatomy Museum at the University of Oxford which demonstrates the ways in which the didactic displays of variation and explanations would have practically been laid out. These items formed the material context of model use and presentation within this spatial context. Osteological collections in these museums often included large collections of skulls, sometimes organised into separate bone rooms as at Edinburgh and Oxford (see figures 3.21, 6.4, and 6.5, pages 126, 215, and 216), but which could also be subsumed into the wider collection of materials. These were usually organised ethnographically and geographically and designed to illustrate the different "types of the human form."[314] These osteological collections, as well as specimens, diagrams, and illustrations could show either normal or abnormal anatomy. However, the models present in these spaces only represented normal anatomy and specifically one type of human form. This distinction is as vital to the understanding of the role of models within the anatomical curriculum given the aims of and narratives presented within these spaces. Their representation of only normal anatomy positions models within this context as a basis of normality on which to build with specimens and other illustrative items.

The narratives with which these materials were displayed adds another layer to our consideration of the role of models of normal human anatomy within the museum space. As is stated in the above description of the UCL Museum of Anatomy and Pathology, the collections in anatomical museums would have been arranged specifically to demonstrate variation within the human form. Osteological collections would have demonstrated the nature of some human variation as ethnographic and geographic. Meanwhile embryological models and displays demonstrating ontogeny (see figure 3.18, page 121) introduced narratives about development and progression within these spaces. These narratives of progression would have been strengthened by the inclusion of animal materials within these spaces which were designed to encourage comparison and the consideration of hierarchy within nature. Whilst institutions like Oxford, Cambridge, and University College London had dedicated museums of human anatomy (see figures 3.19. 3.20, and 3.21, pages 123, 124, and 126), Liverpool and Edinburgh had more general museum spaces (see figures 3.22 and 3.23, pages 127 and 128).[315] These general museums contained zoological, pathological and comparative materials as well as material for human anatomy, expanding the scope and narrative of the museum space in which models of normal human anatomy were positioned. These included, for example, articulated skeletons of

[314] 'The Oxford Medical School', 1486.
[315] Although not evident in the plans of UCL buildings, details of the separate UCL anatomy museum can be found in *University College London Calendar Session 1890-91*, 123.

large mammals, phrenological collections, pathological collections, and examples of taxidermy (see figures 3.22 and 3.23, pages 127 and 128). Within this theoretical context, I argue that models of normal anatomy are raised from basic images of normality on which to build discussions of variation, to examples of the pinnacle of the animal kingdom. This role of models of normal anatomy as depictions of the ideal human, mammal, and animal is only strengthened when considering the contemporary theories of late-nineteenth century anatomists about racial anatomical difference, as explored in chapter four.


*Figure 3.21 Museum of Human Anatomy at the University of Oxford (1906). Illustrates the variety of material present within these spaces, as well as the arrangement of items in series and for comparison. ('The Oxford Medical School', British Medical Journal, 1: 2373, p. 1485)*



*Figure 3.22 The Anatomy Museum in Teviot Place, Edinburgh (Top; c.1900, Bottom; c.1940s). Illustrates the range of zoological and comparative materials present within the museum. (University of Edinburgh Anatomical Collections, Edinburgh; 'A History of Edinburgh's Medical Museums', Samuel J. M. M. Alberti, Journal of the Royal College of Physicians Edinburgh, 46:3 (2016), pp. 187-97)*


*Figure 3.23 Interior of the Anatomy Museum, Whelan Building, University of Liverpool (n.d.- post-1904). Depicts the articulated skeleton of an elephant which dominated the University of Liverpool museum space, as well as the presence of work desks for student use on the mezzanine level. (D361/1/1, University of Liverpool Special Collections and Archives, Liverpool)*

### *Diagrams*

To augment this discussion of the anatomical museum as a classroom space, the roles of other classroom resources can be analysed in order to delineate the role left to play by the new style of anatomical model. It is here that we can see resources fulfilling either the exemplar or general role, in both two and three dimensions. Beginning with diagrams, it is immediately evident that these images are generalisations of the body, designed to be widely representative. However, there are two important aspects of these generalised images which are important in contextualising models beside them: the consistency of colour scheming and the use of standardised outlines. In the diagrams drawn in notebooks of students and anatomical practitioners alike there is consistency in the use of red to represent muscle tissue and arteries, blue to represent veins, and yellow to represent nerve strands, as well as other colours in line with the colour schemes used in anatomical models and textbook illustrations of the time (see figure 3.24, page 132). This helps them to learn the positioning of structures inside the body so that they are easier to locate inside the chaos of the real human cadaver, and later the live

body.[316] This is illustrated in the diagrams with which H. Dixon, student at the University of Edinburgh, painstakingly embellished his anatomical notes, both within the text and on the facing pages (see figure 3.24, page 132).[317] The colour and detail within some of these diagrams adds weight to H. G. Wells' literary claim that students would stay behind after lectures to copy detailed diagrams from the whiteboard. While these illustrations and diagrams show us two things about the student experience of medical anatomy teaching. Firstly, they show the prevalence of colour scheming in the teaching of the internal structures of the body, even at this early stage in the teaching of medical anatomy. Secondly, the two different types of added image, in-text and facing text, serve to illustrate the differing ways in which students recorded visual information about the body. On the one hand students made prolonged and detailed diagrams, whilst on the other they added rushed annotations (see figure 3.24, page 132).

In these images we can see a clear use of colour to represent certain aspects of the internal human body. Although both student and teacher are aware that the inside of a cadaver or live human body will not neatly conform to this strict colour delineation or indeed the diagrammatic form, the creation of "maps" of the body in bright primary colours is a technique still used in anatomical teaching today.[318] It is here that we can see visual similarities between diagram and model, helping to delineate the role of the model in the classroom. Indeed, the inclusion of this colour scheming becomes part of the wider process of standardisation within anatomical teaching materials in the late-nineteenth century.[319] The colouring shared by these two teaching formats re-contextualises the anatomical model not as a replacement for cadavers within the classroom but as a three-dimensional representation of this diagrammatic colour scheme of the body: a three-dimensional and functional tool. Importantly, these are colour schemes still used by modern day medical students to clearly differentiate the different aspects of an anatomical image in a way that is not evident in the real body. Indeed, there is a large industry providing colouring books for university level anatomical students.[320]

It is also important to note a continuity in body shaping within diagrams in the late-nineteenth century anatomical classroom, as can be seen in figure 3.25 (page 133) taken from the anatomical department records at the University of Liverpool. In these images we can see the

[316] Deblon, 'Imitating Anatomy', 118.
[317] J. Herbert Dixon, 'Anatomy Lectures by Dr MacDonald Brown', c 1894, EUA IN1/ACU/A2/19/29, Edinburgh University Archives.
[318] See, for example, Elson Wynn and Lawrence M. Kapit, *The Anatomy Coloring Book*, Third Edition (San Francisco: Benjamin Cummings Publishing Company, 2002).
[319] Samuel J. M. M. Alberti, 'Medical Models in Britain, 1750-1920', in *Designing Bodies: Models of Anatomy, from Wax to Plastics*, ed. Elizabeth Hallam (London: Royal College of Surgeons, 2015), 62–77.
[320] E.g. Wynn and Kapit, *The Anatomy Coloring Book*.

use of some method of ink copying to reproduce exactly the same body shape in multiple sets of case notes. These images are identical, and as such reinforce not only the concept of a vaguely constructed generalised body but in reproducing identical copies of the same image held it up as the normative standard.[321] Here there is again a repetition of the generalisation occurring more widely within anatomy at this time. This production of a normal and general depiction of the human body goes hand in hand with the production of generalised anatomical models by makers such as Dr Auzoux. However, using this "blank" image (see figure 3.25, page 133) as normative is problematic for several reasons. As a result of how humans perceive colour and the lack of colour in images, I argue that these blank outlines represent the white body, mirroring the three-dimensional representation of the white body as the normative body that we see in anatomical models.

Research into the topic of colour learning and vision lends strength to the argument that blankness represents whiteness within these images. In particular, the work of Edwin Land on the topic of "color worlds [sic.]" in 1959 is relevant to this discussion of colours and race in learning and teaching. Land investigates the images that we see in black and white photographs when only certain other colours are provided.[322] Land's shows us that beams of two colours of light, when shone through black and white photograph transparencies, provide us with a coloured picture. The combination of red, blue, and yellow wavelengths should provide the spectrum of colours for the brain to completely colour an image.[323] This leads one to consider the colours that are invoked in the white spaces around the red, blue and yellow colours used by anatomists to indicate veins, muscles, and nerves. It could be argued that the blank outline body shape that I have shown to be so common in student notes of this period, and indeed which continue into the modern day, is given a white skin tone when the other parts are coloured in red, yellow, and blue.[324] In Land's images, the more shaded areas appear as darker colours in the final projected image.[325] In anatomical imagery, as Ruth Richardson notes, the shading of images played a "crucial role in their effectiveness."[326] As such, the absence of shading in the body shapes and diagrams used by students and teachers in anatomical settings cannot be taken for granted and indeed can be seen to invoke a lighter skin tone in this world of colours that Land portrays.

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[321] Richardson, *The Making of Mr Gray's Anatomy*.
[322] Edwin H. Land, 'Experiments in Color Vision', *Scientific American* 200, no. 5 (May 1959): 84–99.
[323] Land, 90.
[324] Wynn and Kapit, *The Anatomy Coloring Book*.
[325] Land, 'Experiments in Color Vision', 85–87.
[326] Richardson, *The Making of Mr Gray's Anatomy*, 140.

Figures 3.24 and 3.25 (pages 132 and 133), when considered in the context of anatomical models and textbooks (discussed below) in the same classroom space, show the culture of generalisation and normalisation which permeated the anatomical classroom and surrounded the anatomical models.[327] This stratified excavation of the nineteenth century British anatomical classroom thus shows us that these models would not have been used as examples of the individual body, but as a representative of all bodies. This is not particularly startling. However, when we consider the fact that this supposedly all-encompassing image was of the white male body, we begin to see the influences of Victorian society on an otherwise seemingly objective modern-day classroom object. Although these images are colourless to begin with, students and teachers alike give them the white skin tone by neglecting to shade the empty spaces. Whether this is a conscious act, or merely a timesaving exercise is unclear. However, considering the time spent on and detail given to many diagrams, it would appear that time was less of an issue than accuracy; and accuracy in normative terms was given to mean whiteness. These drawing habits either support the anatomical model's presentation of a normative white body or permit it by not challenging or questioning the idea of white superiority put across in other mediums (such as models) within the anatomical classroom.

[327] Deblon, 'Imitating Anatomy', 118; Richardson, *The Making of Mr Gray's Anatomy*.


*Figure 3.24 Diagrams from notes on Anatomy Lectures by Dr MacDonald Brown taken by H. Dixon (1894). These diagrams illustrate the consistent use of colour to represent certain elements of body. (EUA IN1/ACU/A2/19/29, Edinburgh University Archives, Edinburgh)*

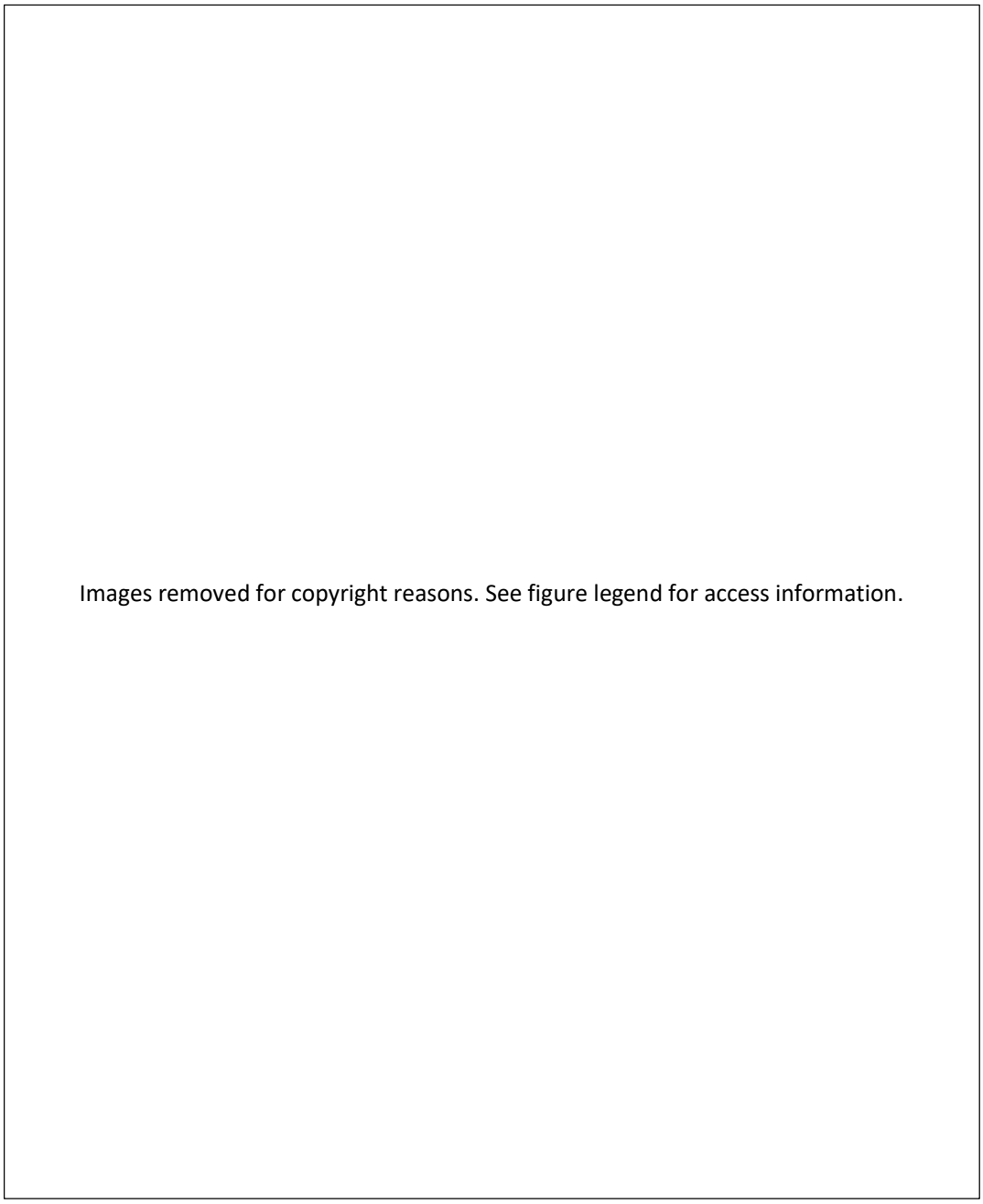


*Figure 3.25 Images demonstrating the replication of figure outlines within case notes made by Prof. John Hay at the University of Liverpool. (D98/3, University of Liverpool Special Collections and Archives, Liverpool)*

### *Illustrations*

At the other end of the two-dimensional didactic spectrum, illustrations present depictions of specific cases. The drawings 'from life' in anatomical textbooks and artworks acted primarily as examples of certain cases or diseases, although like diagrams they could also have been discussed in a general representative manner. Anatomical students of the nineteenth century were most certainly required to purchase their own textbook if they wanted to successfully complete the anatomical course, as is demonstrated by the plethora of textbook advertisements within the University College London annual calendars.[328] Gray's, Quain's, and Cunningham's anatomies were particularly popular, however although the choice for many was made with respect to price, each textbook had something slightly different to offer the student.[329] These two-dimensional resources could act as both examples and general visions of the body, or at least examples which are designed to be extrapolated from via their positioning. Many of these illustrations and illustrative styles have a long history, linking them to a previous style of anatomical representation encapsulated in the anatomical Venus. However, some individuals like Henry Vandyke Carter began to change this visceral representation of the body in two dimensions and remove traces of the dead self from the imagery.[330] This brought anatomical illustration closer to generalisation, and thus models, allowing them to be used more convincingly in a secondary general manner. However, this new style still aimed for accuracy from 'life', with its key claim to epistemic authority stemming from the quality and quantity of fresh dissections performed to make each collection of images. Within the context of these images within the anatomical classroom, models appear more diagrammatic, general, and foundational: a basis on which illustrations build and develop.

As discussed earlier, Ruth Richardson has analysed the sterilisation of anatomical textbook imagery in her investigation of the origins and development of *Gray's Anatomy*. As Richardson noted, the removal of traces of dissection as well as personalities from the drawings, where possible, reflects the move away from realism in anatomical modelling (see figure 3.26, page 136).[331] What Richardson does not discuss is that the bodily representations made by Carter are unquestionably white and male. As other areas of his images show, shading could be achieved in this medium where the artist deemed necessary. In the absence of shading, as discussed above, the mind will assume whiteness, and indeed I propose that this portrayal was deliberate.

[328] *University College London Calendar Session 1890-91*.
[329] Richardson, *The Making of Mr Gray's Anatomy*, 113.
[330] Richardson, 226.
[331] Richardson, 226.

In this setting we can see textbook images as occupying a similar didactic and epistemic space to generalised anatomical models, with the images gradually taking on a "greater universality" in their presentation.[332]

However, despite the sterilisation of these images, illustrations such as these can still be considered exemplar rather than general in purpose. One universal standard for textbooks was the aforementioned claim to epistemic authority that came from reference to dissections both within the image (as in textbooks other than Gray's) and within the preface to the book. In *Gray's Anatomy* for example his preface takes great pleasure in informing the reader that the images contained within have all been made from fresh dissections by both himself and Dr Carter.[333] This claim to authority therefore rested not only on the importance of the individual bodies but also on the publicly regarded skill of the dissector. Considering these claims to authenticity, these images can therefore be primarily considered as didactically similar to specimens which also aimed to illustrate a specific instance of anatomy and the skill of the dissector and preparator. As such, these images blur the boundaries between specific and general representations of the body, demonstrating that specific cases can be used to demonstrate wider points within the anatomical classroom.

This duality extends to anatomical imagery used to adorn classroom and museum walls, as seen in figures 3.3, 3.10, 3.21, and 3.23 (pages 105, 113, 126, and 128). These images were not entirely removed from textbooks. Whilst they could consist of artworks produced by the lecturer (see figure 3.27, page 137), they could also have been multiples of plates from medical textbooks ordered by the lecturer.[334] As such, they too occupied the same uncomfortable space between representations of the individual and the general. However, these images serve to cement the place of anatomical models firmly as images of the general. Modern models of normal anatomy were, as described in chapter two, neither taken 'from life' nor any longer attempting to claim the authenticity of specimens. The images were arguably imposing features within anatomical classrooms, covering large areas of wall space in museums, dissection rooms, and lecture theatres. In doing so, they provided constant and overpowering reinforcement of the relative position of models.

[332] Richardson, 226.
[333] Richardson, 208.
[334] William Webster Fisher, at Downing College Cambridge, ordered up to four of each different plate, indicating their use as teaching materials. See William Webster Fisher, 'Medical Papers and Manuscripts', 1860 1840, DCPP/FISH/1, Downing College Archive.

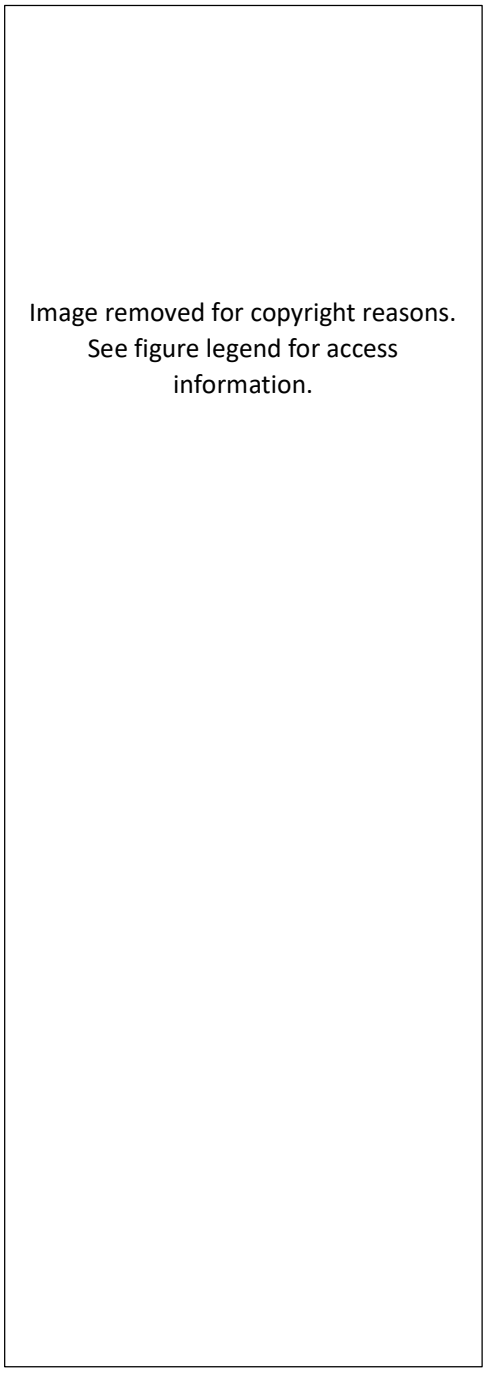


*Figure 3.26 Image from the first edition of Gray's Anatomy showing the sterilisation of anatomical illustrations in this new work. (Anatomy: Descriptive and Surgical, Henry Gray (1858), p. 521)*

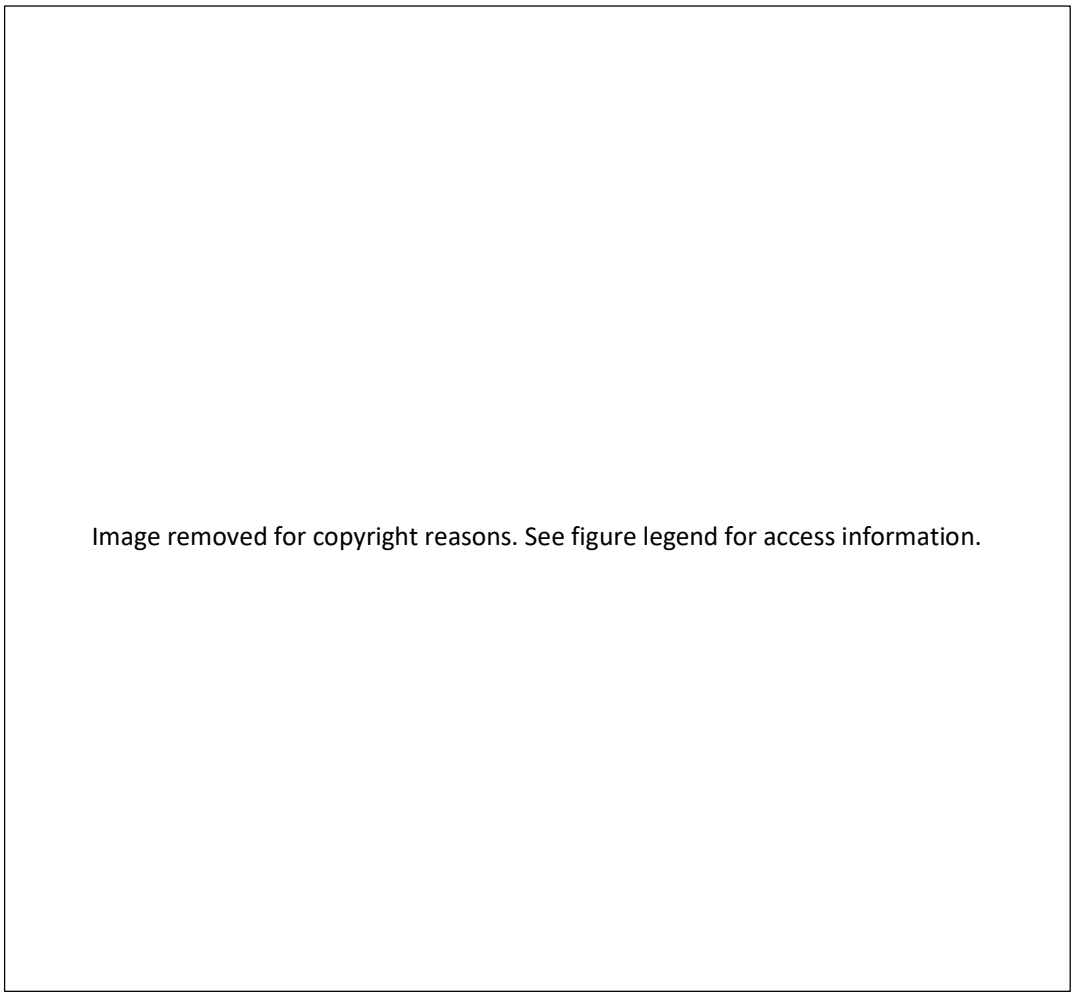


*Figure 3.27 Drawing of Bronzed Skin, created by the UCL professor of Morbid Anatomy, including diagrams of skin layers copied from a textbook or plate complete with figure numbers. (CARSWELL/Fd/970, University College London Archives, London)*

### *Specimens*

Specimens in the nineteenth century anatomical classroom occupied almost the same epistemic space as cadavers, and indeed were used more fittingly than models to fill the gap in body supply by preserving actual dissected body parts for later study. This substitution for cadavers is most evident within the museum space, as cadavers would not have been able to be present in such spaces. The reasons to produce a specimen can be summarised as; to preserve a particularly interesting case and/or to demonstrate dissection skill. In both cases specimens serve as didactic substitutes for cadavers, either by illustrating rare cases to those unlikely to see them in the course of their instruction or by demonstrating regular anatomy well. Often specimens were

clearer than dissections made by the students themselves, and cadavers used for student dissections would usually have been so heavily dissected, as a result of cadaver shortages, that they would have been rendered unsuitable for the creation of specimens. However, the desaturation of colour as a result of age, preservation solutions, and light exposure necessarily stop the specimen from being as colourful as either the cadaver or the model. Both the specificity and the colour of specimens leaves a didactic space for three dimensional anatomical models which two dimensional resources are otherwise unable to fill.

In the same way as textbooks, these examples of the human body could be used to extrapolate general information, as in the display cases at the Oxford Museum.[335] However, usually multiple specimens and images would have been used to represent one condition. This is seen most clearly in the case of the medical museum at Guy's Hospital, where the models of Joseph Towne were displayed. Within this space, specimens of a disease were presented alongside pathological models of the condition and other information about the disease. Here multiple resources were used to build a picture of the disease. These examples show that in the teaching context specimens were used as examples of pathology or as representations of a particular human body, rather than the general body. Models in this case refer to the pathological moulage models of Joseph Towne which depicted a range of specific diseases. Within this context, these pathological models held and continue to hold the same didactic and epistemic value as specimens. However, importantly these models differ epistemically from the normative models which are the focus of this thesis. We see these models only as part of a general image of the human body when they are grouped with wet specimens and skeletal remains to form a complete medical image of the disease. Whereas models which only depicted normal anatomy were not able to represent the individual in the same way and thus only depicted a general image of the human body.

Osteological collections of skulls and other bones, as well as articulated skeletons, can also be considered a kind of dry specimen. These objects, unlike wet preparations of dissections, again straddle the boundary of general and individual within the museum space. Collections of skulls were vast and arranged so as to represent the various types of mankind. On the one hand, these skulls were presented as individuals, examples of each geographical or ethnographical type, and on the other presented as representative of a wider group within mankind. This duality is especially noticeable in the measurements taken by lecturers of these specimens. In cases where more than one skull was present, individual differences were recorded, as well as conclusions

[335] Acland, 'The Medical Department in the Court of the Museum'.

more widely applicable to that specific grouping.[336] Individual bones more generally within the museum, as in figure 3.21 (page 126), filled a similarly uncertain role. However, articulated skeletons performed a very specific and often extremely generalised role. These objects most closely reflect models in their size, three-dimensionality, and purpose within the classroom, offering a general view of the skeleton of the human body. In certain cases, such as at Cambridge where an articulated Hottentot Skeleton was specifically recorded, there is evidence of articulated skeletons as individual examples (although, again, epistemically walking the boundary between individual and general).[337] However, the majority of images display skeletons as general anatomical structures, performing the same role as models of normal anatomy within these spaces (see figures 3.6, 3.8, 3.9, and 3.22, pages 109, 110, 112, and 127).

### *Models*

When we compare late-nineteenth century models of normal anatomy with these other resources, their role within the anatomical classroom becomes clear. These models shared the colouration of diagrams which generalised these depictions of the body, distinguishing them from illustrations and specimens which lay claim to visual and actual authenticity. The abandoning of these claims to authenticity within anatomical modelling, as discussed in chapter two, meant that models did not uncomfortably walk the line between representing the individual and the general simultaneously. Rather, models of normal anatomy, by becoming more general, moved to fill a didactic and epistemic gap presented by the other anatomical resources. In two dimensions, diagrams performed a general role, whilst illustrations and artwork offered examples of individual cases from which more general observations could be made. Meanwhile, the roles of models and specimens mirror those of diagrams and illustrations but in three dimensions, adding shape, form, and tactility to these visualisations of the human body. As above, articulated skeletons in some part contributed towards filling the same quarter of this didactic quadrant, both normalised and three-dimensional, of teaching materials as models of normal anatomy. The skeletons aimed to present a general view of the whole body, however without depicting muscles could not offer the same additions of shape, form, and

[336] George Rolleston and William Turner, *Scientific Papers and Addresses* (Oxford : Clarendon Press, 1884), 163.
[337] 'University Registry Guard Books: Professor of Anatomy', 1903 1707, University/CUR 39.13, Cambridge University Library, Department of Manuscripts and University Archives.

tactility to diagrams that specimens offered to illustrations. Thus, the role for models of normal anatomy is clear, defined within this material and spatial context.

This duality between models and diagrams is encapsulated by the existence of paper technologies which have travelled with anatomical models from the late 18th Century to the modern day. Dr Auzoux produced what Anna Maerker has described as "synoptic tables" of information which were sent alongside all models purchased from the company.[338] Indeed Adam,Rouilly continue to provide accompanying booklets of diagrams and label descriptors with all their products to this day. The present day UCL anatomical department has several examples of these kept chained to each model so that they might survive for future student use. The students apparently find these booklets so useful that a number have gone missing in the past and it is evident from the wear and tear of these booklets that they are a heavily used tool for self-directed study. It is therefore evident that these 'maps' which allow students to navigate the models are vital support tools in the classroom today and as such cannot be ignored historically as mere props to support models. These diagrams consist of flat representations of the models, often in the same blank style discussed above, with lettered descriptor points corresponding either to points on the image or the model itself. This is a practice which mirrored the preceding eighteenth century work on waxwork models in western Europe undertaken by Clement Susini and Felice Fontana at the Museum in Florence where diagrammatic schemes, exported with the models to Vienna, of the section of the body shown by models were provided in drawers underneath the model displays for use by the public and medical students alike.[339]

Meanwhile, I argue that there is a certain discomfort embodied within the generalised anatomical model that it is difficult to verbalise. On the one hand, these generalised images of the human body relay the concept that we are all essentially the same inside. And yet, this conceptualisation of the normal human body is both white and male. As discussed above, diagrams supported the generalisations of whiteness formed in three dimensions by models. They played a major role not only in the work of students but in the record keeping of lecturers and in the promotion and publication of models.[340] Diagrams of this nature show that colour scheming in medical teaching was well established by this point in time, bringing the focus of investigations into the relationship between race and anatomical modelling to the 'skin' of the models rather than the internal organs. The link between diagrams and models established by

[338] Maerker, 'Anatomizing the Trade', 542.
[339] For a discussion of the Florence, Vienna, and Bologna collections see Maerker, *Model Experts*; Dacome, *Malleable Anatomies*.
[340] Hopwood, 'Plastic Publishing in Embryology'.

manufacturers shows their didactic similarities. Indeed, when we consider how blankness in the 'skin' of the diagrams can equate to whiteness in the mind of the observer, diagrams can be thought of as essentially two-dimensional versions of models. This creates a certain amount of cognitive dissonance, should we be concerned that these representations of the body seem to imply that the norm is white and male, or should we rejoice that gender and race are seemingly unimportant in this context? This quandary is not novel, and as I demonstrate in chapter four it can be traced back to the origin of this style of anatomical representation, when debates about human difference were at a peak. Caught in a moment in time in which the status of physiological differences between races and gender was uncertain and undefined, these now standard issue school classroom models illustrate the precarious status of the body in late nineteenth century scientific discourse.

## Conclusion

As I have explored above, models of normal anatomy in the nineteenth century British anatomical classroom would have had limited use as a result of their generalised form, the didactic roles already fulfilled by other resources, and concerns about space in the busy locales of anatomical science. It is evident that these larger models would have been impractical in the laboratory setting. However, it is equally as clear that models were used regularly and interchangeably in the lecture theatre and in private extra-curricular study. Obviously, when large models were used within a lecture setting students' detailed study of these models would have had to be done after the class, or in the medical and anatomical museum setting. Moreover, within these settings we can see these large models as paragons of normality where in many cases specificity was required for the lesson, used as the basis for further learning of the specific parts of the body and not necessarily as an everyday object of learning within the classroom. The role models were thus able to play was a background, normative, but importantly foundational one. Models of the entire body not only displayed the interrelation of parts but formed the introductions and conclusions to courses on the body. They acted as self-directed learning tools to aid the memory of students when revising not just one specific lecture but possibly a whole course on the body. This is vital to understand for this thesis, as it helps to contextualise the impact of these models on student study, illustrating the more latent, unconscious, and foundational effect of the knowledge and ideas they imparted.

This archaeological excavation of the nineteenth-century classroom begins to reveal the experiences of students within these spaces. The use of textual images provides us with an idea of the enactment of anatomical study; something that has too often been excluded from the

historical scholarship on anatomy and anatomical models. These sources address the daily practicalities of using anatomical models in the classroom setting as well as the unrecorded discussions of students as they conducted their studies. Jamieson indicates a much closer relationship with the materials of the anatomical lecture theatre than previously known to be the case, whilst H. G. Wells hints at the intellectual and theoretical level on which classroom discussions were conducted. Both revelations add strength to the argument of this thesis that models were used thoroughly within anatomical lectures and private study to illustrate points clearly, simultaneously operating within a context that was highly aware of the biological theories of the day surrounding the human body. Finally, the comparison of diagrams and models, which are revealed to be connected when we consider the similar pairing of illustrations and specimens, encourages us to consider the representation of race within these materials. As well as demonstrating that models acted as three-dimensional generalisations of the body, this comparison suggests that in this normalised role models functioned as an image specifically of the white norm.

# Chapter 4 : Establishing a theoretical culture

In this chapter, I investigate the intellectual context in which anatomical models were assigned meaning. I demonstrate the strength of nineteenth century human anatomists' interest in racial anatomical difference. Through this process it becomes clear that it was not only zoologists, physiologists, and comparative anatomists who took an active scholarly interest in racial anatomical difference. In fact, I argue that the breadth and depth of belief in racial anatomical difference across the discipline demonstrates a coherent intellectual culture within the discipline of anatomy. I not only establish evidence of this culture but demonstrate that belief in racial anatomical difference was at the centre of anatomists' discipline building processes. As such, I argue that this research was not only illustrative of anatomists' interdisciplinarity; anatomists were not reaching into other fields when performing this research. Rather, that research into racial difference was demonstrably central to the anatomical discipline and was itself an anatomical concern. I therefore contend that human anatomists' deep interest in racial anatomical difference outside of the classroom formed part of the wider culture of teaching in which anatomical models were used inside the classroom. The research presented in this chapter shows that anatomical models demonstrated a white normality, but also suggests that they were representative of a white ideal; a phenomenon which will be explored further in chapter six.

This chapter is partly prosopographical, focussing on key individuals in the anatomical departments which form the basis of this study in order to infer the wider culture of the discipline. To establish the existence of a coherent theoretical culture of belief in racial anatomical difference, this chapter assesses the beliefs of some of the main anatomists at Edinburgh, UCL, Oxford, Liverpool, and Cambridge in turn. To establish each professor of human anatomy's thoughts on the matter, I analyse their published works and professional activities alongside unpublished materials found within the archives. Each has expressed their views through different modes of scholarship including books, articles, papers, addresses, lectures, and letters, with each individual or institution offering a different insight into how the idea of racial anatomical difference manifested and propagated within the discipline. The variety of publication methods demonstrates the continuity of these ideas both throughout the country and throughout the different scholarly aspects of the discipline. Moreover, the division of these individuals by institution serves to cement the arbitrary nature of such a delineation. Almost all the individuals named in this chapter held positions in one or more other British university

before taking up the professorships for which they are listed here. Meanwhile, irrespective of institutional boundaries, there is sometimes difficulty in assigning expressions of belief in racial anatomical difference to single individuals. In some cases, papers are communicated by others, both included and excluded from this chapter, in other cases letters demonstrate an ongoing communication and flux of ideas between two academics. However, rather than detract from the narrative of the chapter, these issues instead make my core argument stronger. I argue that the instances where boundaries between institutions and individuals break down are indicative of a widespread disciplinary academic culture which accepted racial anatomical difference as a predetermined fact. I begin to demonstrate here that this interest in racial anatomical difference demonstrably influenced teaching materials and classroom discussion, although discuss this further in chapter six. When we situate the anatomical models in this study within this intellectual culture, their normalisation of whiteness and othering of racial difference is highlighted. As such, this chapter begins to demonstrate the inevitable transfer of ideas into the classroom is a result of the permeable and parasitic nature of theories of racial difference.[341]

During this process it is important to note that the publications, lectures, and letters discussed represent a small amount of the total research output of each of the cited individuals. Although it is therefore fair to say that they do not make up a significant amount of the research outputs generated for all the individuals in this study, as the bulk of the theoretical papers produced, I argue that they do make up a significant portion of the theoretical atmosphere. Unlike other papers which present research on undiscovered bodily processes or structures, these papers present theories of comparative human anatomy which are motivated not by an underlying desire to discover more about the body but by a belief in the fundamental physicality of racial difference. Papers on more general anatomical topics, such as John Goodsir's paper 'Structure and Pathology of Kidney and Liver', add to the understanding but not the theoretical conceptualisation of the body.[342] In the words of Charles Darwin, the other works of these anatomists are, for the purposes of this chapter, "all general & useless anatomy".[343]

[341] For more on the parasitic nature of racist ideologies see Stepan, *The Idea of Race in Science*.
[342] William Turner, John Goodsir, and Henry Lonsdale, *The Anatomical Memoirs of John Goodsir*, vol. 2 (Edinburgh : A. and C. Black, 1868), 379–88.
[343] C. R. Darwin, 'Dr Munro Anatomy [Edinburgh University Lecture Notes]', 1825, CUL-DAR5.A12, Darwin Online, http://darwin-online.org.uk/.

Note: As discussed in the introduction, many of the terms used in the works discussed in this chapter are both offensive and derogatory. In all instances where this is the case, I have quoted from the text directly to make it clear that the language used is not my own and originates with the scholar of the time.

## Edinburgh

We begin this study at one of the most renowned medical schools of the nineteenth century. When historians write about the teaching of anatomy at Edinburgh, they normally gravitate towards either the infamous Robert Knox, who in fact ran an extra-mural anatomy school and did not teach at the university itself, or the Monro's (primus, secundus, and tertius): the dynasty which lead anatomical teaching in Edinburgh for 126 years. This section focuses instead on the products of this anatomical culture: the professors of anatomy who followed in the footsteps of the Monro dynasty, and to some extent of Knox. This footsteps metaphor is particularly fitting for the anatomical department at Edinburgh because during this period it displayed a strong culture of mentorship in which professors were previously taught or employed directly by their predecessors. After Alexander Monro tertius resigned the Chair of Anatomy at Edinburgh in 1846, John Goodsir was appointed to the Chair. He was the first anatomist to teach as the new style of anatomical modelling developed in the second half of the nineteenth century and immediately began to discuss racial difference; a topic that would be vigorously picked up by his successors.[344] John Goodsir employed William Turner as his senior demonstrator in 1854, while Daniel John Cunningham was both one of Turner's earlier students and his demonstrator from 1876-1882, with the two forming a close friendship. The closeness of these relationships is evident in their respective research interests, with Turner picking up Goodsir's interest in racial differences in the skull and Cunningham expanding Turner's preliminary research into racial difference in the lumbar region of the spine.[345] As such, the department of anatomy at Edinburgh is a prime example of both the continuation of belief in racial anatomical difference through

[344] William Turner, John Goodsir, and Henry Lonsdale, *The Anatomical Memoirs of John Goodsir*, vol. 1 (Edinburgh : A. and C. Black, 1868).
[345] See, for example, Wm Turner, 'Contributions to the Craniology of the People of the Empire of India. Part I.—The Hill Tribes of the North-East Frontier and the People of Burma', *Proceedings of the Royal Society of Edinburgh* 22 (ed 1899): 550–52; and Cunningham Daniel John and Turner William, 'The Spinal Curvature in an Aboriginal Australian', *Proceedings of the Royal Society of London* 45, no. 273–279 (1 January 1889): 487–504.

interpersonal relationships and of the elaboration and expansion of these theories during the course of the nineteenth century.

## Goodsir: Racial hierarchy in the lecture theatre

The case of John Goodsir offers us as historians some of the clearest evidence for the transfer of knowledge about racial anatomical difference to students. In a series of 10 lectures entitled 'On the Dignity of the Human Body', delivered to his anatomical class in 1862, Goodsir made his belief in the existence of racial anatomical differences quite clear. In lecture 6, 'Skull and Brain in Man', he made a brief reference to the use of the vomerine angle in ethnological research.[346] However, in lecture number 9, 'Retrogressive Man', Goodsir expounded his theory behind the cause of racial difference in mankind. This lecture echoed his belief that man had been perfectly formed by God and that "the less civilised races" were degraded versions of humanity.[347] As such, racial anatomical difference was a result of regression rather than progression, clearly indicating that in his view it was non-white races who have degraded away from perfection when adding that these "imperfect forms" could constitute part of an ethnographic study.[348] Within this context, anatomical models which displayed a white norm could be considered images of idealisation. However, these views also place Goodsir in a clearly anti-evolutionary stance.

Indeed, these lectures were given partly in response the series by Thomas Henry Huxley entitled 'The Relation of Man to the Lower Animals' and to "check the growth" of Darwinism after the publication of Darwin's *Origin* in 1859.[349] Previously, Goodsir had attracted the attention of both Darwin and Huxley with his publication 'On the Morphological Constitution of the Skeleton and Vertebrate Head'. Goodsir argued that there were more segments in the vertebrate head in mammals than in other animals.[350] This paper was published in the Edinburgh Philosophical Journal but was obviously not insignificant, discussed by Darwin and Huxley in their written correspondence. Here Darwin states that he cannot speak to the truth of the statement but that it would take a lot of research to demonstrate.[351] However, for the purposes of this research, Goodsir's anti-evolutionary explanation for racial difference not only highlights his perceived

[346] Turner, Goodsir, and Lonsdale, *The Anatomical Memoirs of John Goodsir*, 1868, 1:259–60.
[347] Turner, Goodsir, and Lonsdale, 1:276.
[348] Turner, Goodsir, and Lonsdale, 1:279.
[349] H. Lonsdale in Turner, Goodsir, and Lonsdale, 1:185; as discussed in Dugald Gardner, 'John Goodsir FRS (1814–1867): Pioneer of Cytology and Microbiology', *Journal of Medical Biography* 25, no. 2 (1 May 2017): 120.
[350] Turner, Goodsir, and Lonsdale, *The Anatomical Memoirs of John Goodsir*, 1868, 2:88–197; See also transcriber notes on Charles Darwin, 'Darwin to Huxley, 5th July 1857', 5 July 1857, Darwin Correspondence Project, https://www.darwinproject.ac.uk/letter/DCP-LETT-2118.xml.
[351] See Darwin, 'Darwin to Huxley, 5th July 1857', 5 July 1857 and corresponding footnotes in the Darwin Correspondance Project.

perfection of whiteness but also begins to demonstrate that individuals justified biological racism from a wide range of theoretical standpoints.

It is possible that Goodsir inherited this belief in racial hierarchy from his teachers and mentors in Edinburgh as part of a wider university culture. We know that Alexander Monro tertius discussed racial anatomical difference in the classroom through the notes of Charles Darwin whilst he was a medical student at Edinburgh. Although commonly quoted as describing Monro's lectures as dull, Darwin actually paid particular attention some aspects of his anatomical training; namely to the colouration of bones "in Negros & Dropsical people".[352] Here there is an equation, comparison, and conflation of racial difference with illness – a state of being that has degenerated from the norm – within a classroom setting in which Goodsir at one point studied. Moreover, although Robert Knox is not the focus of this section, he must be mentioned when referring to both Goodsir's education and views on race. Goodsir was a student of Knox himself and maintained a close relationship with his former teacher. Indeed, it has been said that Knox had quite the influence on Goodsir.[353] When we consider these lectures of Goodsir's in light of Knox's own writings on race it is clear that Knox may have had a considerable influence on Goodsir's thinking in this respect.[354] The full impact of extra-mural lecturers on anatomy teaching in the nineteenth century is a topic that could be explored through further research.

## Turner: An authority on skulls and an influential mentor

William Turner followed Goodsir in the professorship after Goodsir's death in 1867 as well as in his belief in the existence of anatomical differences between the races. However, Turner can be considered even more extreme than Goodsir in his belief in the existence of anatomical differences between the races, extending this belief into his anatomical research. In particular, Turner's work demonstrates that he believed in the demonstrability of this through the use of detailed and numerous measurements. As discussed in the previous chapter, Turner's research was aided by the considerable collection of skulls amassed at the University of Edinburgh; a collection which grew considerably under Turner's tenure. During Turner's period as Chair the collection of the Edinburgh Phrenological Society was subsumed into the museum, bringing the total number of skulls available for research to over 1700.[355] It is therefore unsurprising that

[352] Darwin, 'Dr Munro Anatomy [Edinburgh University Lecture Notes]'.
[353] Lonsdale in Turner, Goodsir, and Lonsdale, *The Anatomical Memoirs of John Goodsir*, 1868, 1:27–28 and 122.
[354] See, for example, Robert Knox, *The Races of Men: A Fragment. [With Supplementary Chapters.]* (London-62, 1850).
[355] Logan A. Turner, *Sir William Turner : A Chapter in Medical History* (London and Edinburgh: William

Turner published prolifically on skull measurements, writing a two-part collection on the craniology of the Scottish people as well as papers on the crania of India, Borneo, Formosa, Malaysia, Tasmania, and New Guinea.[356]

Apart from his work on skulls, Turner also published on racial differences in the spine, pelvis and extremities. He did so most notably in his *Report on the Human Crania and other Bones of the Skeletons collected by H.M.S. Challenger during the Years 1873-1876* as one of the most expansive treatises on racial anatomical difference published by any of the anatomists in this chapter.[357] Here he theorised that racial anatomical differences in the shape of the spine were, "without doubt, correlated with the development of those deep muscles of the back which are attached to them"; a theory which would subsequently be expanded by D. J. Cunningham, Turner's student and successor.[358] In fact it was Turner who communicated the very paper that made this extension to his original theory by Cunningham 'On the lumbar curve in Aboriginal Australians' to the Royal Society in January 1889 (with Cunningham having been a student of and demonstrator for Turner).[359] In this paper Cunningham, via his mentor, established the concept of the lumbo-vertebral index to measure and compare the lumbar region of the different human 'races'. He used the evidence that this constructed index provided to argue that

Blackwood and Sons, 1919), 207.

[356] Turner, 207; William Turner, 'A Contribution to the Craniology of the People of Scotland. Part I., Anatomical', *Earth and Environmental Science Transactions of The Royal Society of Edinburgh* 40, no. 3 (ed 1905): 547–613; Turner, 'Contributions to the Craniology of the People of the Empire of India. Part I.—The Hill Tribes of the North-East Frontier and the People of Burma'; William Turner, 'Contributions to the Craniology of the People of India. Part II.—The Aborigines of Chútá Nágpúr, of the Central Provinces and the People of Orissa', *Proceedings of the Royal Society of Edinburgh* 23 (ed 1902): 161–62; William Turner, 'Contributions to the Craniology of the People of the Empire of India. Part III.: Natives of the Madras Presidency, Thugs, Veddahs, Tibetans, and Seistanis', *Proceedings of the Royal Society of Edinburgh* 26, no. 1 (ed 1906): 320–320; Turner, 'On Two Masks and a Skull from Islands near New Guinea', *Proceedings of the Royal Society of Edinburgh* 10 (ed 1880): 635–36; Sir Wm Turner, 'Decorated and Sculptured Skulls from New Guinea', *Proceedings of the Royal Society of Edinburgh* 22 (ed 1899): 553–72; William Turner, 'A Contribution to the Craniology of the Natives of Borneo, the Malays, the Natives of Formosa, and the Tibetans.', *Earth and Environmental Science Transactions of The Royal Society of Edinburgh* 45, no. 3 (ed 1907): 781–818; Wm Turner, 'A Contribution to the Craniology of the People of Scotland. Part II. Prehistoric, Descriptive and Ethnographical', *Earth and Environmental Science Transactions of The Royal Society of Edinburgh* 51, no. 1 (ed 1916): 171–255; Wm Turner, 'The Craniology, Racial Affinities, and Descent of the Aborigines of Tasmania', *Earth and Environmental Science Transactions of The Royal Society of Edinburgh* 46, no. 2 (ed 1909): 365–403; William Turner, 'Contributions to the Craniology of the People of the Empire of India.— Part IV.: Bhīls, Frontier Tribes of Burma, Pakôkku Tribes, South Shan Tribes, Tibetans.', *Earth and Environmental Science Transactions of The Royal Society of Edinburgh* 49, no. 3 (ed 1913): 705–34.

[357] William Turner, 'The Voyage of H.M.S. Challenger Zoology 47 Report on the Human Crania &c.', 1886.

[358] Turner, 62.

[359] Cunningham Daniel John and Turner William, 'The Spinal Curvature in an Aboriginal Australian'.

the "low races of man" were distinct from "the European" in the shape and form of the lumbar region of the back.[360] In particular, Cunningham stated that

> "the Europeans and Australians constitute the two extremes: no race shows an index lower than that of the European, and no race presents an index higher than that of the Australian."[361]

Going further into the spinal analysis, comparing the Aboriginal spine he received from Sydney with that of a Chimpanzee, Cunningham demonstrated that the lumbo-vertebral index continued to increase as he moved towards the apes. He theorised that this was not because of any difference between the races in the evolutionary timing of standing fully erect but was a result of social and environmental factors, with "the low races" needing to bend and remain flexible for their lifestyles.[362] Turner's communication of this paper signals more than his tacit approval of the findings within, it is a seal of approval and a marker of authority given the much more junior position of Cunningham at the time of writing.

## Cunningham: Racial difference in the lumbar region

Cunningham became well known as the expert in racial anatomical difference in the lumbar region, publishing a monograph upon racial differences in the lumbar curve of the back and a paper on the sacral index, as well as the paper Turner read on his behalf.[363] In doing so, Cunningham again compared the various perceived differences in the spine of man with those of apes. This demonstrates the influence of teachers upon their students with both Turner and Cunningham working on racial variance in the lumbar region and has led to some confusion over the provenance of an unnamed anatomist's notebook at Edinburgh which contains tables of spinal measurements.[364] However, it was Cunningham's work on the lumbar region that was well-known enough for Arthur Keith, Conservator of the Hunterian Museum 1908-1933, to note it as something to be included when he reviewed a draft of a later edition of *Cunningham's Text-book of Anatomy*, edited by James Couper Brash who took the chair of anatomy at Edinburgh in 1931.[365] Although ultimately a point about racial difference in the lumbar region was not

[360] Cunningham Daniel John and Turner William, 487.
[361] Cunningham Daniel John and Turner William, 488.
[362] Cunningham Daniel John and Turner William, 489–90.
[363] D. J. (Daniel John) Cunningham, *The Lumbar Curve in Man and the Apes: With an Account of the Topographical Anatomy of the Chimpanzee, Orang-Utan, and Gibbon* (Dublin : The Academy, 1886); D. J. Cunningham, 'On the Sacral Index', *The Journal of the Anthropological Institute of Great Britain and Ireland* 30 (1900): 97–97.
[364] 'Anatomist's Notebook', c. -1884 1882, EUA IN1/ACU/A2/17/8, Edinburgh University Archives.
[365] Brash and Cunningham were only two removed from each other; D. J. Cunningham was succeeded in 1909 by Arthur Robinson, and Brash succeeded Robinson in 1931.D. J Cunningham, J. C Brash, and E. B Jamieson, *Cunningham's Text-Book of Anatomy* (London, New York: Oxford University Press, 1937);

included in this edition of *Cunningham's Anatomy,* it was included in a textbook of anatomy written by Alexander Macalister, Professor of Anatomy at Cambridge. Importantly this research on the lumbar region of the spine demonstrates that it was not just skulls that Edinburgh possessed (or had access to) in swathes, but spines too.[366]

Meanwhile Cunningham did not eschew the Edinburgh tradition of craniological research after succeeding Turner in the position of chair in 1903. Whilst chair, he contributed a paper on 'The Australian Forehead', alongside a paper by Arthur Thomson at Oxford, to a collection of *Anthropological essays presented to Edward Burnett Tylor in honour of his 75th birthday.*[367] Meanwhile his address as president of the anthropological section of the British Association for the Advancement of Science, published in *Science* (New Series) in 1901, focussed on the racial differences in cranial and cerebral development.[368] Cunningham, having spent the intervening 21 years of his career in Ireland at the Royal College of Surgeons, Dublin, and Trinity College, Dublin, also published on the skeleton and skull of Cornelius McGrath: the Irish Giant.[369] He also discussed the features of the idiotic brain and its similarities with those of apes in a paper given to the Anthropological Institute of Great Britain and Ireland.[370] These kinds of publication, whilst not focussing upon racial difference, are indicative of a wider interest in anatomical difference that borders upon the spectacular. It shows that whilst anatomists tried to distance themselves from fairground representations of so-called "monstrous" anatomy, as well as dramatic depictions of disease and racial difference, they themselves held similar interests.[371] This interest in the spectacular is echoed in the minutes of the Anatomical Society of Great Britain and Ireland where monstrous or abnormal cases were often discussed, as explored below.

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Items 1250 and 1250a in Arthur Keith, 'Letters to Brash from Arthur Keith', n.d., EUA IN1/ACU/A2/19/6, Edinburgh University Archives.

[366] This was a notable point in Cunningham's Royal Society paper where he was specially sent a specific spinal specimen from Sydney. See Cunningham Daniel John and Turner William, 'The Spinal Curvature in an Aboriginal Australian'.

[367] Northcote Whitridge Thomas, *Anthropological Essays Presented to Edward Burnett Tylor in Honour of His 75th Birthday, Oct. 2, 1907* (Oxford, Clarendon press, 1907).

[368] D. J. Cunningham, 'Address of the President of the Anthropological Section of the British Association for the Advancement of Science', *Science* 14, no. 355 (18 October 1901): 603–10; and D. J. Cunningham, 'Address of the President of the Anthropological Section of the British Association, II', *Science* 14, no. 356 (1901): 640–47.

[369] 'Prof. D. J. Cunningham, F.R.S.', *Nature* 81, no. 2070 (July 1909): 15; D. J. Cunningham, 'The Skeleton of the Irish Giant, Cornelius Magrath', *The Transactions of the Royal Irish Academy* 29 (1887): 553–612; D. J. Cunningham, 'Cornelius Magrath, the Irish Giant.', *Man* 3 (1903): 49–50; D. J. Cunningham et al., 'Discussion On Giants And Dwarfs', *The British Medical Journal* 2, no. 2290 (1904): 1379–82.

[370] D. J. Cunningham, 'On the Microcephalic Brain', *The Journal of the Anthropological Institute of Great Britain and Ireland* 30 (1900): 104–5.

[371] For a discussion of racial and spectacular representation in the fairground see Bates, '"Indecent and Demoralising Representations"'; Fausto-Sterling, 'Gender, Race, and Nation'.

It is also interesting to note that D. J. Cunningham acted as an examiner for the Indian Medical Service entrance examination.[372] This leads to further questions about the applied nature of these discussions about racial difference within medical treatment, not just their theoretical use within the anatomical classroom. Although not feasible within the scope of this current project, this is a topic worthy of further exploration in future research.

## UCL

At University College London during the early-to-mid-nineteenth century, the anatomy department was somewhat overshadowed by the departments for comparative anatomy and physiology and the great names attached to them (Professors Sharpey and Foster).[373] The university was comparatively forward thinking in the separation of these disciplines into separate departments, with the department of comparative anatomy founded with the university in 1826 and the department of physiology just two years later in 1828. UCL was also one of the first institutions in Britain to offer a Zoology degree.[374] In comparison, the University of Oxford did not have a chair of physiology until 1882 or separate chairs of comparative and human anatomy until 1893. Equally, the University of Cambridge did not have a separate professor of zoology until 1866 or a separate professor of physiology until 1883 (although Michael Foster was Praelector in physiology from 1870). As such, at University College London research into racial anatomical difference may have been understood to be the purview of the likes of William Sharpey and Michael Foster in Zoology and Physiology, and separated from anatomy.[375] This may explain the lack of engagement of Richard Quain and George Viner Ellis, who held the professorship of anatomy at UCL from 1832-1850 and from 1850-1877 respectively, with ideas about racial anatomical difference. Alternatively, this could be because both of these professors held the chair of anatomy within the first two thirds of the nineteenth century and as such before the peak of the explosion in popularity of race science.[376] This appears to be a common trend across universities, with Goodsir at Edinburgh and Acland at Oxford both also relatively speaking inactive in research into racial anatomical difference.

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[372] T. Clifford Allbutt et al., 'The Indian Medical Service', *The British Medical Journal* 2, no. 2190 (1902): 1930–1930.
[373] H. A. H., 'Sir George Dancer Thane, Ll.D., Sc.D., F.R.C.S., Emeritus Professor Of Anatomy, University College, London', *The British Medical Journal* 1, no. 3603 (1930): 175.
[374] See https://www.ucl.ac.uk/biosciences/sites/biosciences/files/gee-about-short-history.pdf
[375] See comments about the energy of the Physiology department in the obituary for G. D. Thane H., 'Sir George Dancer Thane, Ll.D., Sc.D., F.R.C.S., Emeritus Professor Of Anatomy, University College, London'.
[376] See Stepan, *The Idea of Race in Science*.

## Thane: Skull research in the anatomy department

However, the arrival of George Dancer Thane to the chair of anatomy in 1877 ended this effective abstention of University College London from the debate over racial anatomical difference. Not only was Thane said to have given the anatomy department at UCL a much more commanding presence in the face of the physiological (and zoological) greats but actively supported and engaged in research into racial anatomical difference.[377] In the field of craniometry, Thane presented a paper to the Anthropological Institute of Great Britain and Ireland 'On Some Naga Skulls'. Here he contributed in the usual way towards craniometric research by providing average measurements of male and female skulls and comparing these with the average measurements taken from the skulls of other races to find the ones most closely aligned to the Naga skulls (in this case Mongolian).[378] Meanwhile, in an article in *Nature* Thane compared the brains of various types of ape with that of the "Bushwoman" and "European", referencing work by Oxford's George Rolleston, in order to add to a classificatory and hierarchical ranking system in which the "Orang" was at the head of the apes.[379] Thane, similarly to Turner, also introduced a paper by another scholar intimating his approval for the contents of the work; 'Notes on the Skull of an Aboriginal Australian' by C. Dudley Cooper.[380]

Meanwhile, amongst Thane's research papers is a variety of material pertaining to racial anatomical difference. Here we find an image labelled "Chinese Brain", diagrams of the facial angle with reference to the work of Paul Broca, and a "Notebook on racial characteristics" which references W. H. Flower's 1879 'Lectures on the Comparative Anatomy of Man'.[381] In these lectures Flower compared skulls from Eskimos, Europeans and "the black races" to demonstrate that "Eskimo" skulls deviated in the opposite direction to those of "the black races" from the European standard. Crucially Thane's interest in these lectures, as well as his labelling of the

[377] H., 'Sir George Dancer Thane, Ll.D., Sc.D., F.R.C.S., Emeritus Professor Of Anatomy, University College, London'.
[378] George D. Thane, 'On Some Naga Skulls', *The Journal of the Anthropological Institute of Great Britain and Ireland* 11 (1882): 215–19.
[379] George D. Thane, 'The Brain of the Gorilla', *Nature* 15 (1876): 142–44, https://doi.org/10.1038/015142a0.
[380] C. Dudley Cooper, 'Notes on the Skull of an Aboriginal Australian', *The Journal of the Anthropological Institute of Great Britain and Ireland* 23 (1894): 153–56.
[381] George D. Thane, 'Ten Scrapbooks of Anatomical Drawings', 1913 1869, Ms Add 282/C/1, University College London, UCL Archives, UCL Special Collections; George D. Thane, 'Notebook', 1894 1888, Ms Add 282/B/6, University College London, UCL Archives, UCL Special Collections; George D. Thane, 'Notebook on Racial Characteristics, Etc.', 1884 1878, Ms Add 282/B/3, University College London, UCL Archives, UCL Special Collections; W. H. Flower, 'Abstract Report of Lectures on the Comparative Anatomy of Man', *British Medical Journal* 1, no. 962 (7 June 1879): 847–48.

"Chinese Brain" demonstrate his perception of a white norm and the othering of racial difference.

## Oxford

Oxford is much more complicated institutionally than other universities, with new positions created for single individuals, chair and lectureship name changes, and concurrent university as well as collegiate professorships.[382] Within this complex structure, many positions only existed temporarily before a name change or a role alteration. For example, it is at Oxford that E. Ray Lankester temporarily becomes a lecturer on Human and Comparative Anatomy for two years (1891-1893) before his position is altered to remove the human anatomy element. As such, this section is somewhat prosopographical in that it analyses some of the main figures at Oxford in order to understand the culture therein.[383] However, this section also demonstrates the complex relationships that existed within the discipline. Although at the other institutions in this study, individuals succeeded each other in professorships, the structure of anatomical teaching at the institution meant that at Oxford these figures could temporally overlap in their professorships. As such, rather than the mentor mentee relationship, we should be mindful of potential collegial interactions. Meanwhile, those who had trained elsewhere, such as Arthur Thomson, maintained links with their previous mentors demonstrating the methods of discipline building that anatomists took at this time. Perhaps unsurprisingly, research into anatomical difference in the skull similar to that already explored at other institutions was also undertaken at Oxford.

### Acland: Presenting racial difference in museum collections

The work of Sir Henry Wentworth Acland is important in this narrative because it offers us an insight into the ways in which narratives of racial difference were woven into the museum spaces outlined in the previous chapter. Acland held the position of Lee's Reader of Anatomy at Oxford from 1845 to 1857 and the Aldrichian Praelectorship of Anatomy from 1857 to 1895, as well as the position of Regius Professor of Medicine. Acland largely avoided discussing racial anatomical difference in his published works with one significant exception: his *Synopsis* of the Christ Church Anatomical Museum. In this descriptive work, Acland briefly discusses the crania

[382] For a clear description of the structure of anatomical teaching positions at Oxford see Sinclair and Robb-Smith, *A History of the Teaching of Anatomy in Oxford*, 71.
[383] Figures not included in this section include Henry Nottidge Moseley, John Burdon Sanderson, John Barclay Thomson, and Edwin Ray Lankester, as well as the demonstrators Charles Robertson and William Church.

on display in the museum. Although Acland clearly accepts the existence of distinct varieties within the human race in his use of language, initially his statement on these crania seems to be at odds with the rest of the material in this chapter. Here Acland states that there is not "sufficient data… for constructing natural groups of the nations" within the skull collection, whilst maintaining that Ethnologists are turning to languages in their research. However, an analysis of this statement within the context of the references provided for further reading elucidates a different meaning; one harmonious with the views expressed by Acland's contemporaries.

Within the same section of his *Synopsis*, Acland directed readers to Pritchard's 'On the Advancement of Ethnology' which contains a further discussion of the issue of national identity and crania grouping. In this work Pritchard explicitly derided the work of Professor Retzius of Switzerland's attempts to classify crania into national groups. Specifically, Pritchard maintained the impossibility of this task as multiple nations "are historically known to have descended from the same original stock".[384] Moreover, Pritchard does not claim that Ethnology has turned purely to linguistic analysis, rather that it is a method concurrently used to extend ethnological research. He specifically states that anatomical investigation still forms the basis of Ethnological work, referencing the works of Camper (facial angles) and Blumenbach (distinct racial categories) as foundational to the discipline.[385] In this context we can re-read Acland's comments in his *Synopsis* as refusing solely to the creation of national groups of crania, whist still supporting the grouping of crania into races as in his surrounding use of language. Indeed, the very collection is still organised according to "the great Philosophical views of John Hunter"[386] – a known subscriber to Blumenbach's theory of distinct racial categories.[387] We can therefore understand this collection to have supported the racial categorisation of mankind, with this concept foundational to the collection. This is the context in which anatomical models

[384] James Cowles Pritchard, 'On the Various Methods of Research Which Contribute to the Advancement of Ethnology, and of the Relations of That Science to Other Branches of Knowledge.', in *Report of the British Association for the Advancement of Science.*, vol. 17th Meeting (1847) (London., 1847), 233.
[385] Pritchard, 232; Petrus Camper, *Berigt van den zaaklyken inhoud van twee lessen, gegeeven aan de leden van de Teken-Akademie te Amsterdam, op den 1sten en 8sten Augustus 1770* (S.l.: s.n., 1770); Blumenbach, *De generis humani varietate nativa*.
[386] Henry Wentworth Acland, *Synopsis of the Physiological Series in the Christ Church Museum : Arranged for the Use of Students after the Plan of the Hunterian Collection, and Chiefly under the Divisions of the Hunterian Catalogue.* (Oxford: Printed by James Wright, Printer to the University, 1853), iii.
[387] Londa Schiebinger, 'The Anatomy of Difference: Race and Sex in Eighteenth-Century Science', *Eighteenth-Century Studies* 23, no. 4 (1990): 392.

of white bodies were present, suggesting that they too fed into this narrative of white superiority.

## Rolleston: Craniometry in the curriculum

George Rolleston is notable for his zealous research into craniological difference in man and would have conducted much of his work with the collections described by Acland. Taking over the Lee's readership from Acland in 1857, Rolleston later became the Linacre Professor of Anatomy and Physiology in 1860, a position he held until 1881 shortly before his death. During his time at Oxford he conducted a vast amount of craniological research, evidenced by the 11 different craniometric measuring devices attributed to Rolleston in the current collections of the Oxford Museum for the History of Science.[388] Like William Turner at Edinburgh during the same period, Rolleston published on both 'modern' and historic crania, often drawing comparisons between the two to make arguments about the relative cognitive evolutionary development of the races of man. Notably, it was Turner who complied Rolleston's papers and addresses for publication after his death in 1881, illustrating a close professional relationship between the two scholars, if not also a friendship.

Rolleston's works on modern skulls included 'On the Craniology of the Bushmen', 'On the Weddo of Ceylon', and 'On the Affinities and Differences between the Brain of Man and the Brains of certain animals'.[389] In his 'On the Craniology of the Bushmen', Rolleston explained away a skull which did not fit his expected norms for the "Bushman" category by theorising that the owner of the skull in question was "really… a cross between a white man and a female of the Bushman stock".[390] Similarly in 'on the Weddo of Ceylon' Rolleston attributed a difference in a single specimen to the method of carrying infants sometimes used in the region.[391] Meanwhile, 'On the Affinities and Differences' is more traditional in its approach, creating a hierarchy of brain size and skull capacity in support of an idea that some races are "higher" than others.[392] This hierarchical position is emphasised by Rolleston's work on historic skulls, where he establishes not only that there are several "notes of inferiority… commonly found in savage races of modern days" but also that the absence of these markers in Neolithic British barrow

[388] Search: 'Rolleston', Museum of the History of Science Website, accessed 10/09/2014, at http://www.mhs.ox.ac.uk/collections/imu-search-page/results/?querytype=basic&query=rolleston&search=Search&thumbnails=on
[389] Rolleston and Turner, *Scientific Papers and Addresses*.
[390] Rolleston and Turner, 472.
[391] Rolleston and Turner, 163.
[392] Rolleston and Turner, 463, 10, and 24–52.

skulls places them "in a position of superiority as compared… with the modern savages".[393] Here again the use of language about height is linked with language about superiority, a common theme in the works of these lecturers. Rolleston also begins to demonstrate the approach to skull measurements criticised heavily by Samuel J. Gould, in which data which does not fit with an expected outcome is ignored. The dominance of ideology over methodology is strong in these examples of Rolleston's work, demonstrating clearly the ways in which this area of anatomical research was value-laden.

## Thomson: Correspondence and the building of academic networks

Arthur Thomson also fostered a close relationship with William Turner, his anatomy teacher during his time as a student at Edinburgh. This relationship offers us insight into the ways in which the coherent intellectual culture we see at Edinburgh was built and maintained across institutions within the field of anatomy during the late-nineteenth century. Thomson held various positions in the anatomy department at Oxford from 1885 until 1933, including the Extraordinary Professorship of Anatomy and the University Professorship of Anatomy. In his correspondence with Turner we find both evidence of Thompson's engagement with craniological questions and encouragement for such research provided by Turner, in a blurring of individual boundaries in research. Here the two men discussed the work still to be done at Oxford, particularly in the museum, stating that there was "a good deal yet to be done in the comparative anatomy of the races of men."[394] The many letters exchanged between the two men demonstrates both one of the ways in which the nineteenth century anatomical discipline functioned on a practical level and the importance of networks of correspondence in the formulation of intellectual culture. It is perhaps unsurprising given this relationship and the size of the Oxford craniological collections that Thomson also published extensively on craniometry of both modern and ancient skulls, making much the same comparisons as Turner, Rolleston and Alexander Macalister.[395] Thomson was extremely protective of his work on this area and did not

[393] Rolleston and Turner, 310–11.
[394] Letter from W. Turner (Undated), item 4, HA 105/1: 'Letters to Arthur Thomson (1885 onwards)', University Archive Material, Bodleian Libraries, University of Oxford, Oxford.
[395] Arthur Thomson, 'Composite Photographs of Early Egyptian Skulls.', *Man* 5 (1905): 65–67; Arthur Thomson and D. Randall-MacIver, 'Egyptian Craniology.', *Man* 6 (1906): 55–55; Wm Turner, 'On Human Crania Allied in Anatomical Characters to the Engis and Neanderthal Skulls', *Proceedings of the Royal Society of Edinburgh* 5 (ed 1866): 161–62; Arthur Thomson, 'A Consideration of Some of the More Important Factors Concerned in the Production of Man's Cranial Form', *The Journal of the Anthropological Institute of Great Britain and Ireland* 33 (1903): 135–66; Alexander Macalister, 'Description of a Skull from an Ancient Burying Place in Kamtchatka.', *The Journal of the Anthropological Institute of Great Britain and Ireland* 16 (1887): 21–22; Arthur Thomson, 'Note on Dr. A. Keith's Review of "The Ancient Races of the Thebaid" ("Man," 1905, 55).', *Man* 5 (1905): 101–2; Turner, 'A Contribution to the Craniology of the People of Scotland. Part II. Prehistoric, Descriptive and Ethnographical';

appreciate criticisms of his measurements and his accuracy. This is evident in a response he published to a review by Arthur Keith in which the two men debate the specificities of "negroid characteristics".[396] Here, as with Rolleston, there is an attempt to explain away differences from an expected racial norm in order and sincere efforts on both parts to protect the sanctity of the cranial type.

Meanwhile, in one of his applications for reappointment, Thomson described his own teaching philosophy, illustrating how he himself continued to transfer knowledge in this area to his own students and mentees:

> "It has always been my endeavour, whilst presenting the subject to my pupils in its practical bearings, to treat of man in his relations to the other members of the animal kingdom, as well as to make references to his racial characters and differences."[397]

Indeed, as part of his stated quest to transmit this knowledge to students, Thomson gave an extra-curricular lecture to the Oxford University Junior Scientific Club on 'Man's Cranial Form', discussing the origin, "gradual development", and cranial varieties of mankind.[398] These lectures were sometimes noted as "illustrated by models" which suggests that Tomson actively discussed racial difference whilst using or in the presence of models. These lectures are also yet another example of how the mentorship which produced and nurtured new anatomy lecturers served to perpetuate ideas about racial anatomical difference, leading us to question the date at which this transferral of knowledge ceased.

## Liverpool

There is much less to be said about individuals at the University of Liverpool, partly because of the "provincial" nature of the school, but also partly due to the turmoil which faced the department during the late nineteenth century.[399] During the majority of the time period considered in this study, the anatomy department of the University of Liverpool was yet to exist. Its predecessor, the Royal Infirmary Medical School was merged into University College, Liverpool in 1884 as part of Victoria University, whilst the University of Liverpool was officially

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Rolleston and Turner, *Scientific Papers and Addresses*.

[396] Thomson, 'Note on Dr. A. Keith's Review of "The Ancient Races of the Thebaid" ("Man," 1905, 55).'

[397] Letter, Arthur Thomson to the Electors for the Linacre Professorship of Human and Comparative Anatomy, item 2, HA 106, University Archive Material, Bodleian Libraries.

[398] Item 1 (1884), MU 3/53: Oxford University Junior Scientific Club Programmes, p.2 and p.7.

[399] Jonathan Reinarz, 'Unearthing and Dissecting the Records of English Provincial Medical Education, c. 1825–1948', *Social History of Medicine* 21, no. 2 (1 August 2008): 381–92.

founded in 1903. During this transition the school maintained its key member of anatomical staff, lecturer and then professor William Mitchell Banks. Banks remained until 1894, becoming professor during the merger, until the endowment of a chair in anatomy which was then filled by Andrew Melville Paterson.[400] However, it is important to consider the relative difficulty of performing research under such conditions when considering the lack of research conducted into racial anatomical difference by these two eminent members of the field. With access to materials restricted by location and time consumed in the creation of a new school, the bureaucracy of becoming a university department would have monopolised the time and resources of these academics. Indeed, building work joining the new Thompson-Yates laboratories (opened 1898) to the old medical school buildings via the pathology museum would have been disruptive to medical research in its own right, without the added administrative pressures of University College, Liverpool becoming the independent University of Liverpool.

## Banks and Paterson: The difficulty of research whilst building a new university

Having been taught by both Goodsir and Turner, one would surmise that William Mitchell Banks' research would have taken a similar route to that of D. J. Cunningham. Indeed, Banks spoke about the late Sir John Goodsir of Edinburgh in his introductory address to the Anatomical Society of the University of Liverpool (1904), shortly before his own death. In this address, Banks noted Goodsir's particular enthusiasm for his theory of the skeleton head and vertebrae and listed his lectures 'On the Dignity of Man', although without discussion of the content of these lectures.[401] Banks' own research focussed primarily upon the removal of breast cancer by means of mastectomy, leading him to be described in his various biographical entries as a surgeon rather than an anatomist (despite serving on the council of the Anatomical Society of Great Britain and Ireland).[402] However, he does briefly demonstrate an affinity for both hierarchy and spectacular abnormality, noted above as often appearing parallel to representations of racial difference in the fairground, in his *Catalogue of the Preparations contained in the Museum of*

[400] Plarr, 'Banks, Sir William Mitchell (1842 - 1904)', RCS Plarr's Lives of the Fellows online, accessed 25 June 2019, https://livesonline.rcseng.ac.uk/client/en_GB/lives/search/detailnonmodal/ent:$002f$002fSD_ASSET$002f0$002f372931/one?qu=%22rcs%3A+E000748%22&rt=false%7C%7C%7CIDENTIFIER%7C%7C%7CResource+Identifier; Plarr, 'Paterson, Andrew Melville (1862 - 1919)', RCS Plarr's Lives of the Fellows online, accessed 25 June 2019, https://livesonline.rcseng.ac.uk/client/en_GB/lives/search/detailnonmodal/ent:$002f$002fSD_ASSET$002f0$002f375092/one?qu=%22rcs%3A+E002909%22&rt=false%7C%7C%7CIDENTIFIER%7C%7C%7CResource+Identifier.

[401] Turner, Goodsir, and Lonsdale, *The Anatomical Memoirs of John Goodsir*, 1868.

[402] Plarr, 'Banks, Sir William Mitchell (1842 - 1904)'; D. A. Power and Christian Kerslake, 'Banks, Sir (William) Mitchell (1842–1904), Surgeon', Oxford Dictionary of National Biography, n.d.

*the Liverpool Royal Infirmary School of Medicine.* In this catalogue Banks demonstrates that he had reserved sections in the museum for "monstrosities", both human and "of the lower animals".[403] Here we again see a casual use of language about height in relation to evolutionary superiority, as well as the clear expressions of these ideas within museum spaces.

Banks' successor and first chair of anatomy at the new University of Liverpool was Andrew Melville Paterson. Paterson was also engaged with the Anatomical Society, becoming it's 10th President in 1908.[404] This suggests the tacit approval of Paterson, as well as Banks, for the papers presented to the Anatomical Society, which often presented anatomical papers of an ethnographic and anthropological nature. Paterson also noted the importance of comparative anatomy for anatomical study, suggesting a hierarchical approach to anatomical work.[405] However, Paterson says nothing on the subject of racial anatomical difference within his published works. This is somewhat surprising given the clear references to race made within the dissection room at the University of Liverpool during Paterson's tenure as will be explored in chapter 6. The absence of discussion about race within Paterson's work becomes even more surprising when we consider that Paterson, like Cunningham, was also an examiner for the Indian Medical Service.[406] In this role Paterson would have had a vested interest in the propagation of knowledge about racial anatomical difference. As such, I theorise that both Banks and Paterson, given their anyway comparatively low publication rates, had much of their time occupied elsewhere. Despite this, both men do show an approval for the wider disciplinary consideration of racial anatomical difference in their work with the Anatomical Society of Great Britain, specifically in their lack of challenges brought towards this work.

## Cambridge

Finally, at Cambridge there were just two professors of anatomy during the late-nineteenth/early-twentieth century: George Humphry (1866-1883) and Alexander Macalister (1883-1919). Both demonstrated clear and strong views on the existence of racial anatomical difference. However, both also add another perspective on the propagation, inclusion, and expression of belief in racial anatomical difference. The works of George Humphry encourage us

[403] William Mitchell Banks, *Catalogue of the Preparations Contained in the Museum of the Liverpool Royal Infirmary School of Medicine.* (A. Holden, 1870), v and 53–57.
[404] 'Officers of the Anatomical Society', accessed 25 June 2019, http://www.anatsoc.org.uk/Portals/0/Documents/AS-officers-hist-final.pdf.
[405] Andrew Melville Paterson, *Manual of Embryology* (London, 1915), v.
[406] Plarr, 'Paterson, Andrew Melville (1862 - 1919)'.

to consider the language used by anatomists to describe racial anatomical difference at this time and the ways in which they used this language to demonstrate their power in this area. By choosing when to speak strongly about these issues and when to only hint at their wider beliefs, anatomists show their command of the topic of racial difference as well as their academic status in the field through their power to choose. Indeed, it is possible to link some of their weaker language to their stronger views on the topic, which they are choosing not to express in certain cases. Meanwhile, the publications of Macalister, like John Goodsir at Edinburgh, begin to demonstrate one of the ways in which ideas about racial difference were incorporated into the anatomical classroom.[407] Unlike Goodsir's lectures, Macalister's approach to this was far more formalised and here he is credited as the only anatomist to include discussion of racial difference within widely-disseminated printed teaching materials.[408]

## Humphry: The language of type and race

The case of George Humphry at Cambridge really epitomises the importance of language in the expression of belief about racial difference and hierarchy during the nineteenth century, illustrating the subtle but pervasive ways in which these beliefs were expressed. In many of his publications and addresses Humphry only mentions race in small and seemingly insignificant ways.[409] Specifically, he stated that the "future destiny and welfare" of "our race" depended upon the inclusion of physiology within the medical curriculum (because of links between physiology and a moral understanding of the body).[410] Whilst advocating for the improvement and survival of the race in itself does not equate to a belief in the existence of different races, other works of Humphry's betray the underlying assumption of racial difference which is present in statements such as these. Humphry, in a lecture on old age, made a specific allusion to his consideration of other races when he stated that "the rude races of mankind" tended still to die at a comparatively young age.[411] He attributed this early death to the qualities needed to survive

[407] Alexander Macalister, *A Text-Book of Human Anatomy: Systematic and Topographical, Including the Embryology, Histology and Morphology of Man, with Special Reference to the Requirements of Practical Surgery and Medicine.* (London: Griffin, 1889).
[408] Although the content of Goodsir's lectures was published, this publication was not a teaching material which would have been brought into the anatomical classroom by other lecturers in the same way as Macalister's textbook.
[409] George Murray Humphry, 'President's Address, Delivered At The Forty-Eighth Annual Meeting Of The British Medical Association, Hold In Cambridge, August 10th, 11th, 12th, And 13th, 1880', *The British Medical Journal* 2, no. 1024 (1880): 241–44; George Murray Humphry, 'An Address Delivered At The Opening Of The Section Of Physiology. At The Annual Meeting Of The British Medical Association, In London, August 6th, 1873', *The British Medical Journal* 2, no. 658 (1873): 160–63.
[410] Humphry, 'President's Address, Delivered At The Forty-Eighth Annual Meeting Of The British Medical Association, Hold In Cambridge, August 10th, 11th, 12th, And 13th, 1880', 243.
[411] George Murray Humphry, 'Old Age and Changes Incidental to It: The Annual Oration Delivered before the Medical Society of London May 4th, 1885' (Macmillan and Bowes; Cambridge, 1885), 11,

in the "hand-to-mouth" lifestyle of animals and historic man, treating the three as comparable and demonstrating not only a belief in the existence of different races but in a hierarchical structure within said races of man.[412]

However, nowhere is this opinion of Humphry's stated more clearly than in his *A treatise on the human skeleton (including the joints)* where he boldly and clearly declared:

> "The inferior races of mankind exhibit proportions which are, in many respects, intermediate between the higher or European orders and the monkeys."[413]

Humphry's hierarchy, as with many others, considered black people as the lowest of the human races, closest to monkeys.[414] To emphasise this point, Humphry uses data to illustrate the reduced difference between European and Polynesian measurements. Here Humphry, like Turner in his report on the skeletons of the Challenger expedition, addresses anatomical difference in the whole body. However, he is much clearer in his views on hierarchy and racial difference, describing non-European bodily structures as approaching "the animal type" and to Europeans as the "perfect standard".[415] This is the European perfect standard that anatomical models presented, suggesting that they were images of white idealisation. This is also Humphry's strongest expression of belief in racial difference and hierarchy. However, when we use this expression to contextualise the weaker statements explored above, we gain a much stronger sociolinguistic understanding of Humphry's words as expressions of belief in racial difference and hierarchy. This language is pervasive within nineteenth century works on anatomy and hints that there may be more to understand from these works than their words at face value. We can also begin to understand the power Humphrey wielded in this area of scholarship through his power to choose when he was to speak at length about racial anatomical difference and when he was only to hint at his wider beliefs. He had the power to choose which mediums he was going to use to express these views, and which he was going to hold them back from.

## Macalister: Racial difference within textbooks for students

It is somewhat surprising that Alexander Macalister, Humphry's successor, picked up so vigorously on Humphry's work on skeletal difference between the races when he arrived at

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https://www.jstor.org/stable/60239620, The University of Manchester, John Rylands University Library.

[412] Humphry, 11.

[413] George Murray Humphry, *A Treatise on the Human Skeleton (Including the Joints)* (Cambridge: Macmillan, 1858), 91.

[414] Humphry, 91.

[415] Humphry, 104.

Cambridge in 1883. This is surprising because whilst Macalister worked in Dublin, his work focussed mostly on Zoology and Egyptology. However, as W. L. H. Duckworth has noted, the considerable collection of skeletons amassed by Humphry in the pursuit of his *treatise* must have attracted the attention of the newly appointed Macalister with his publications immediately post-1883 newly focussed on the examination of human variations.[416] Macalister's extensive work on the more general variation of the human form, throughout his career, is evident in his two sizeable publications on the matter, as well as in his numerous other works.[417] Although not the main focus of the work, in his additional notes on human variation, Macalister does include some observations, made by other practitioners, on differences in "negro" bodies.[418] However, it is also possible that Macalister prepared part of his publication record in anticipation of applying for the position at Cambridge with two hastily published papers in the months leading up to his appointment in 1883: 'On the Osteology of Two Negroes' and 'On the Crania of Natives of the Solomon Islands'.[419] If this was indeed the case, then these articles could speak volumes about the perceived focus and purview of anatomical study at Cambridge at this time, particularly in the wake of Humphry's work on the subject.

However, it is Macalister's *Textbook of Human Anatomy* which separates him from the other anatomists in this chapter. This work of Macalister's is notable for its unique inclusion of a discussion about racial difference in the lumbar region of the spine. With this inclusion, Macalister became the only anatomical textbook author of the nineteenth century to include notes about contemporary research on racial difference, appearing in sections on both the lumbar region and the skull. This is despite the apparently ignored recommendation of Arthur Keith (anatomist, Hunterian Museum Conservator 1908-1933, student of George Dancer Thane), that similar information be included within significantly later editions of Cunningham's anatomy textbook (edited by that time by James Couper Brash at Edinburgh).[420] As such, Macalister

[416] W. L. H. Duckworth, 'Professor Alexander Macalister', *Man* 19 (1919): 164–68.
[417] Alexander Macalister, 'Notes on Muscular Anomalies in Human Anatomy', *Proceedings of the Royal Irish Academy (1836-1869)* 9 (1864): 444–69; Alexander Macalister, 'Additional Observations on Muscular Anomalies in Human Anatomy. (Third Series) With a Catalogue of the Principal Muscular Variations Hitherto Published', *The Transactions of the Royal Irish Academy* 25 (1875): 1–134; Alexander Macalister, 'Notes on the Skeleton of an Aboriginal Australian', *Scientific Proceedings of the Royal Dublin Society* 1 (1877): 63–65; Alexander Macalister, 'Description of the Shippea Man', in *Notes on the Fenland*, ed. T. McKenny Hughes; Alex Macalister, *Some Morphological Lessons Taught by Human Variations*, Robert Boyle Lecture ; 3 (London: Henry Frowde, 1894).
[418] Macalister, 'Additional Observations on Muscular Anomalies in Human Anatomy. (Third Series) With a Catalogue of the Principal Muscular Variations Hitherto Published', 57 and 109.
[419] Alexander Macalister, 'On the Osteology of Two Negroes', *Proceedings of the Royal Irish Academy. Science* 3 (1883): 347–50; Alexander Macalister, 'On the Crania of Natives of the Solomon Islands', *Proceedings of the Royal Irish Academy. Science* 3 (1883): 774–80.
[420] Keith, 'Letters'; Macalister, *A Text-Book of Human Anatomy*.

remains the only anatomist to formalise the imparting of knowledge about racial anatomical difference to students within printed text teaching materials.

## Continuity and community

The picture developed in this chapter is one of continuity between departments and individuals. It is evident that a coherent intellectual culture around racial anatomical difference emerged within the discipline during this time. This continuity was achieved through both informal avenues of discipline building such as mentorship and communication networks, as well as through more formal disciplinary structures like the Anatomical Society of Great Britain and Ireland. The pervasiveness of research into racial difference across the discipline encourages us to infer that this interest and belief in the existence of racial differences extended to the work of lesser known members of the discipline; for whom it has not been possible to establish research profiles. However, most importantly this continuity demonstrates that research into racial difference was not considered solely the purview of disciplines like physiology and comparative anatomy.

Some elements of the informal networks which propagated ideas about racial difference within the discipline of anatomy are outlined above. Firstly, the culture of mentorship to students and junior employees demonstrated by both Goodsir and Turner at Edinburgh served to foster these ideas within upcoming generations of anatomists. This mentorship continued with Turner and Thomson's continued professional relationship through a culture of letter writing. This relationship between Turner and Thomson is also illustrative of the informal networks of correspondence which also aided the development of a coherent discipline and enabled the sharing of ideas about racial anatomical difference.[421] Other ways in which this informal network materialised was in the editing and publishing of the papers of deceased professors, with the papers of both George Rolleston and John Goodsir collected and published by Turner.[422] These informal networks were reflected in the more formal disciplinary structures of anatomy such as the Anatomical Society of Great Britain and Ireland, which in turn also propagated ideas about racial anatomical difference. Founded in 1887 by Charles Barrett Lockwood, surgeon at St

[421] See, for example, Arthur Thomson, 'Letter from Arthur Thomson', 20 October 1908, HA 105/2, University of Oxford Special Collections, Bodleian Library; 'Letters to Arthur Thomson', 1885, HA 105/1, University of Oxford Special Collections, Bodleian Library; Keith, 'Letters'.
[422] Rolleston and Turner, *Scientific Papers and Addresses*; Turner, Goodsir, and Lonsdale, *The Anatomical Memoirs of John Goodsir*, 1868; Turner, Goodsir, and Lonsdale, *The Anatomical Memoirs of John Goodsir*, 1868.

Bartholomew's, with the help of Humphry and Macalister at Cambridge, most of the individuals in this chapter were members of the society at one time or another.[423] Indeed the first five presidents of the society were: George Humphry (Cambridge), William Turner (Edinburgh), Daniel John Cunningham (Trinity College Dublin, later UCL), George Dancer Thane (UCL), and Alexander Macalister (Cambridge). They were closely followed by Arthur Thomson (Oxford, 9th president) and Andrew Melville Paterson (Liverpool, 10th president).[424] The minutes of the society reveal that anatomists regularly presented research on crania and racial anatomical difference within this forum, with a somewhat disproportionate focus on research in this vein above other topics.[425] As such, this was a formal disciplinary space which only served to further encourage anatomical research into racial difference, offering collegial support and presentation platform for this work.

However, these high-profile staff members were not the only people to contribute to departmental life or the anatomical discipline. As such, the focus of this chapter on professors is a somewhat prosopographical approach to understanding the views towards racial anatomical difference held within anatomical departments and the wider discipline. Anatomical departments (in many cases the above named chair holders themselves) would have employed demonstrators, senior demonstrators, lecturers, and assistants to help deliver courses to an ever-growing cohort of medical and pre-medical students.[426] On the one hand, it is difficult to fully ascertain the academic environment of any of the given anatomy departments due to such a high turnover of staff at the most junior of levels. At the University of Cambridge, for example, there were over 20 different demonstrators in Anatomy between 1870 and 1910.[427] On the other hand, senior demonstrators tended to be more permanent fixtures within an anatomical department, sometimes serving for over 30 years.[428] However, even these more permanent figures are largely forgotten in both archives and historiography, publishing little and leaving few handwritten notes behind. As such, the research interests of these figures, if any, must be assumed prosopographically from the work of their seniors within the department. It is plausible to argue that as these people held their positions for such great lengths of time, they would not have held opinions too vastly removed from the readers, chairs, and professors with whom they worked. Importantly, many of the senior staff members discussed within this chapter began

[423] With the obvious exception of those who died before the society was founded in 1887.
[424] 'Officers of the Anatomical Society'.
[425] 'Proceedings of the Anatomical Society of Great Britain and Ireland'.
[426] See the position of Assistant to the Lee's Reader, Oxford, for example.
[427] See records at http://venn.lib.cam.ac.uk/acad/2018/search-2018.html
[428] E.g. Charles Robinson who served in post as demonstrator at Oxford from 1860 to 1891.

their careers as demonstrators within the universities of this study, emphasising the professional mentorship given to men in these senior roles.[429] We also know that those who progressed on from senior demonstrator to lecturer and professor were the most successful of their peers, offering some indication of institutional support for their shared research interest in racial anatomical difference.

The establishment of research into racial difference as an anatomical topic is important as it demonstrates that this topic was not purely physiological, comparative, anthropological, or ethnological, during the late-nineteenth century. It presents a counter-narrative to the discrete disciplinary separation which is presumed at this time and begins to question the autonomy of the concurrent branches of knowledge more traditionally associated with ideas about race: Comparative Anatomy, Zoology, Anthropology, Ethnology, and Physiology. Indeed, there was significant intellectual and physical proximity between these disciplines and Human Anatomy during the late nineteenth century. Some of these disciplines grew out of anatomy at the institutions listed in this study and in the discipline more widely. For example, the Professorship of Human and Comparative Anatomy existed at Oxford until 1893, whilst the Anatomical Society of Great Britain and Ireland's journal continued to be called *The Journal of Anatomy and Physiology* until 1916.[430] Intellectually, Alexander Macalister saw physiological research as "solid advances in Anatomy" with anatomists paying no small amount of attention to the work produced by these other disciplines.[431] Meanwhile, a number of the papers published by anatomists cited in this chapter were presented to the Anthropological Institute of Great Britain and Ireland, demonstrating both the membership of these scholars of the society and the interdisciplinary attraction of their research into racial anatomical differences.[432] This clearly demonstrates that anatomists were held to be experts in the area of racial anatomical difference by those in other disciplines, cementing their role in the study of race at this time.

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[429] Turner, Cunningham, and Thomson all held junior positions at the University of Edinburgh, for example.

[430] See the archive of the journal at https://www.ncbi.nlm.nih.gov/pmc/journals/270/ [accessed 14/06/2019].

[431] Macalister, The History of the Study of Anatomy in Cambridge, p. 27

[432] Cooper, 'Notes on the Skull of an Aboriginal Australian'; Cunningham, 'On the Microcephalic Brain'; Cunningham, 'On the Sacral Index'; Macalister, 'Description of a Skull from an Ancient Burying Place in Kamtchatka.'; Thane, 'On Some Naga Skulls'; Arthur Thomson, 'On the Osteology of the Veddahs of Ceylon', *The Journal of the Anthropological Institute of Great Britain and Ireland* 19 (1890): 125–59; Thomson, 'A Consideration of Some of the More Important Factors Concerned in the Production of Man's Cranial Form'; Arthur Thomson and L. H. Dudley Buxton, 'Man's Nasal Index in Relation to Certain Climatic Conditions.', *The Journal of the Royal Anthropological Institute of Great Britain and Ireland* 53 (1923): 92–122.

## Themes

As I outlined in the introduction, the separation of this material by institution as well as individual draws rather arbitrary boundaries within this topic. An approach by individual is useful for enunciating the scale and prevalence of research into racial anatomical difference within the anatomical community, as well as the various relationships between these individuals as colleagues, students, teachers, mentors, and mentees. However, it is equally useful to draw out some themes from the works of these individuals, helping to shape our understanding of the continuity described above.

The most prevalent theme is the presence of craniometry, craniology and brain measurement within the anatomical research into racial difference. Goodsir, Turner, Cunningham, Thane, Rolleston, Thomson, and Macalister all published works on cranial shape, size, and racial difference, with Acland and Humphry offering suggestions of their views on the topic of crania within their wider works.[433] This research at times made spurious assumptions to explain outliers, particularly in works by Rolleston and Thomson which demonstrate how the values of these anatomists shaped the conclusions they drew from their measurements. Issues with late-nineteenth century skull measurement remains a topic of debate even today with Stephen Gould decrying the methods of Samuel Morton's capacity measurements, *Lewis et al.* defending Morton's nineteenth century methods, and others then defending Gould's aspersions.[434] However, irrespective of measurement accuracy or underlying assumptions influencing conclusions, it is evident that an interest in cranial measurement and the methods used to make these measurements were both widespread and highly credible during this period. This is a feature of the discipline partly controlled by the supply of materials; skulls were easier to steal and ship than entire skeletons.[435] As such, this research focus highlights the ethically questionable processes by which non-European remains were obtained for anatomical study. However, demand for skulls over other body parts was also high because of a perception that

[433] Turner, Goodsir, and Lonsdale, *The Anatomical Memoirs of John Goodsir*, 1868; Turner, 'On Human Crania Allied in Anatomical Characters to the Engis and Neanderthal Skulls'; Turner, 'Contributions to the Craniology of the People of the Empire of India. Part I.—The Hill Tribes of the North-East Frontier and the People of Burma'; Turner, 'Contributions to the Craniology of the People of India. Part II.—The Aborigines of Chútá Nágpúr, of the Central Provinces and the People of Orissa'; Turner, 'Contributions to the Craniology of the People of the Empire of India. Part III.'; Turner, 'A Contribution to the Craniology of the People of Scotland. Part I., Anatomical'; Cunningham, 'On the Microcephalic Brain'; Thane, 'On Some Naga Skulls'; Rolleston and Turner, *Scientific Papers and Addresses*; Macalister, 'On the Crania of Natives of the Solomon Islands'; Acland, *Synopsis of the Physiological Series in the Christ Church Museum*; Humphry, *A Treatise on the Human Skeleton (Including the Joints)*.

[434] Gould, *The Mismeasure of Man*; Lewis et al., 'The Mismeasure of Science'; Weisberg, 'Remeasuring Man'.

[435] MacDonald, 'Corpse Stories'.

the brain (and its house) would be most likely hold the secrets of intelligence and ability. It was in this ranking of intelligence and ability that a hierarchy of humanity might be created and maintained, leading to a profuse amount of work by anatomists into crania as they strived to scientifically prove their wider racist values.[436]

A smaller but no less important theme is the investigation of racial difference within the spine or the skeleton more generally. Turner and Cunningham at Edinburgh clearly developed their ideas about the lumbar region of the spine together as they worked closely, and both published on the subject. However, both Macalister at Cambridge and Arthur Keith at the Hunterian clearly agreed with their position on the matter and made reference to their works. Macalister included information about racial difference in the lumbar region within his own textbook of anatomy, whilst Keith implored James Couper Brash (Cunningham's successor at Edinburgh) to include this information within later editions of Cunningham's own works in 1933. This Keith – Brash correspondence, in particular, illustrates the longevity of this theme within anatomical research into racial difference. Concurrently, the work of George Humphry at Cambridge, as well as some passing remarks by Turner, illustrate that this interest in demonstrating racial anatomical difference in fact extended to the skeleton and indeed flesh as a whole.

It is notable here that William Turner is the only anatomist to speak of racial anatomical differences within the soft tissues of the body, insisting on further studies to identify them.[437] Given the general focus of anatomical study upon soft tissues, this sparseness of research into soft tissue material is again indicative of the problem of dissection room demographics, discussed in chapter six. The sheer lack of non-European soft tissue material would have prevented any detailed investigation into this phenomenon in British anatomical dissection rooms. Anatomists were required to work on bones because their supply of this material was controlled by the generosity of colonial doctors and the collections of explorers, with the procurement and preservation of flesh impossible in the nature and conditions of collection.[438]

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[436] See Macalister, 'On the Crania of Natives of the Solomon Islands'; Turner, 'On Human Crania Allied in Anatomical Characters to the Engis and Neanderthal Skulls'; Turner, 'The Voyage of H.M.S. Challenger Zoology 47 Report on the Human Crania &c.'; Thomson, 'A Consideration of Some of the More Important Factors Concerned in the Production of Man's Cranial Form'; Cooper, 'Notes on the Skull of an Aboriginal Australian'; Thane, 'On Some Naga Skulls'; Turner, 'On Two Masks and a Skull from Islands near New Guinea'; Turner, 'Decorated and Sculptured Skulls from New Guinea'; Thomson, 'Composite Photographs of Early Egyptian Skulls.'

[437] William Turner, 'On Variability in Human Structure, with Illustrations from the Flexor Muscles of the Fingers and Toes', *Proceedings of the Royal Society of Edinburgh* 5 (ed 1866): 327–327 (abstract only).

[438] For further discussion of procurement practices see the works of Helen MacDonald, notably MacDonald, 'A Body Buried Is a Body Wasted: The Spoils of Human Dissection'.

The overarching theme within the anatomical works presented here thus revealed as a focus on osteology.

A second focus which ties all of these works together is the concept of racial hierarchy, rather than just racial difference. Many who did not conduct their own research into racial anatomical differences, like Goodsir, Acland, Banks and Paterson, still expressed sentiments which, with varying levels of subtlety, demonstrated their belief in the superiority of whiteness. Here it is the language of height (higher, lower), perfection, and inferiority which betray the views of anatomists on the matter of racial anatomical difference. The language of height is used widely to convey a sense of the direction of hierarchy, with European races on the top and all others, including animals, below them.[439] Meanwhile others use derogatory terms to express disdain for and superiority over the subjects of their studies; for example, "less civilised", "savage", "rude", and "inferior" in contrast to the "perfect" European.[440] It is obvious from the casual usage of these terms in publications not devoted to racial anatomical difference as their main topic that this was a widely accepted manner of parlance about race and humankind at this time. These terms also suggest that anatomical models were not just images of white normality but of white superiority.

## Conclusion

This chapter presents a somewhat united front within anatomical research on the topic of racial anatomical difference. I demonstrate here that although each professor had a different mode or focus of investigation, almost all believed in anatomical differences between the races which was reflected in their research interests. I argue that this represents a coherent culture of thought on this topic within the discipline of anatomy. This not only demonstrates that anatomy was far less isolated from its sister disciplines in the study of racial difference than previously believed, but also that this research was itself considered anatomical rather than anthropological or ethnographical. A coherent culture of anatomical research into racial difference was fostered both formally and informally, through the workings of the Anatomical Society of Great Britain and Ireland and its journal, as well as through networks of

[439] Cunningham Daniel John and Turner William, 'The Spinal Curvature in an Aboriginal Australian'; Mitchell Banks, *Catalogue of the Preparations Contained in the Museum of the Liverpool Royal Infirmary School of Medicine.*; Rolleston and Turner, *Scientific Papers and Addresses*; Humphry, *A Treatise on the Human Skeleton (Including the Joints)*.
[440] Turner, Goodsir, and Lonsdale, *The Anatomical Memoirs of John Goodsir*, 1868; Rolleston and Turner, *Scientific Papers and Addresses*; Humphry, *A Treatise on the Human Skeleton (Including the Joints)*.

correspondence, mentorship, and friendship. Specifically, interest in racial difference across both individuals and institutions serves to demonstrate just how pervasive this concept was within anatomical research. As such, I not only establish racial difference as an anatomical area of research but also demonstrate the coherence and continuity of ideas about racial difference within the anatomical community.

However, the full impact of this culture of thought upon anatomical teaching and the classroom discussions surrounding models remains to be seen. It is entirely possible that this research into racial anatomical difference had no impact on the day to day teaching of anatomy within these universities. If this was the case, then this research also would have had little impact on the contextualisation of anatomical models within anatomical classroom spaces during the nineteenth century. However, in this chapter I have begun to reveal specific cases where these ideas about racial anatomical difference clearly and definitively spread from research into the anatomical classroom. Alexander Macalister's inclusion of notes on racial differences in the lumbar region of the spine within his textbook, John Goodsir's lectures, and Arthur Thomson's teaching philosophy and student society talks are all student facing elements of this research culture. In fact, John Goodsir's lectures demonstrate that these ideas could be transferred to students by lecturers with little research interest in racial difference. Of Goodsir's 32 publications, none referenced race or racial anatomical difference, with only a small handful referencing sexual anatomical differences (usually in the context of reproduction).[441] This phenomenon is repeated by Henry Wentworth Acland who made subtle references to the presentation of racial anatomical difference within his museum collections but not within his own publications. This suggests that theories of racial anatomical difference may have been *more* prevalent within the classroom than in research. Importantly, the prevalence of this research also suggests that anatomical models were not only depictions of white normality, but also of white idealisation. In chapter six, I will explore this possibility, examining exactly how three-dimensional models might have interacted with theories of racial difference in anatomical classroom spaces.

[441] For example, John Goodsir and Harry D. S. Goodsir, *Anatomical and Pathological Observations* (Edinburgh, 1845).

# Chapter 5 : Interdisciplinary digression

Evidence in the preceding chapters demonstrates that late-nineteenth century anatomical models depicted a white norm, with the contemporary theories of anatomists about racial anatomical difference suggesting that this was also a white ideal. However, evidence of a clear link between these theories and models is still, at best, circumstantial. Whilst these theories and models co-existed within the same spaces at the same time, there is no clear evidence that these theories directly influenced the meaning assigned to these models. Within this short digressionary chapter, I will present a methodology which I believe helps us to connect theory and objects within historical study. Here I will demonstrate that the consideration of objects *during use* could be an important historiographical tool for the historical exploration of material culture, before testing the efficacy of the methodology in chapter six.

As Gerritsen and Riello emphasise in the introduction to their edited volume, material culture consists of more than just objects; material culture is also a study of the meanings objects have for people, with meaning being borne out of the relationships between people and objects.[442] However, this construction of value and meaning around an object is part of the field that has largely been left undefined. In the previous chapters I have searched for the meaning of these anatomical models, assessing the meaning embedded within their form and their meaning in context within the context of rising scientific racism within the late nineteenth century. In doing so, I aimed to elucidate the unwritten meaning assigned to objects within the historical record. However, the history of unwritten everyday practices is notoriously difficult to ascertain, and the more complex or commonly accepted the idea the more difficult this becomes. The complexity of this problem is compounded in the case of this thesis by missing elements in the historical record. This was especially problematic given my focus on objects, not text, and because of the specific objects chosen. Whilst wax anatomical models have traditionally been praised for their aesthetic beauty, independently of their scientific utility, the models which form the basis of this study have been used solely as teaching materials. Not only have these models been traditionally regarded as mere teaching tools rather than as sites of epistemic focus, and thus destroyed or discarded, but they are rarely mentioned in accompanying textual

[442] Anne Gerritsen and Giorgio Riello, 'Introduction: Writing Material Culture History', in *Writing Material Culture History*, ed. Anne Gerritsen and Giorgio Riello (London: Bloomsbury Academic, 2015), 2.

materials. In the case of these models, this has limited the investigative abilities of traditional historical approaches to object sources.

## Use-value and value-in-use

In my search to overcome the problems outlined above, I searched for another methodology to address the creation of meaning in objects, looking at both literature on the history of emotions and at important works from material culture studies.[443] Through my search I discovered the definition of value as it was initially conceptualised by Arjun Appadurai in his foundational *The Social Life of Things.* This use of the word value encompasses monetary worth, importance, utility, sentimental attachment, meaning, and benefit perceived by the owner/user, in line with dictionary descriptions of the word 'value'.[444] Appadurai made the important observation that the meaning and value of things are constructed three ways; in their forms, their uses and their trajectories.[445] I had not yet analysed the so-called 'use-value' of anatomical models. This particular insight builds upon the Marx/Engels definition of commodity (i.e. an object with value) as "a product… transferred to another, whom it will serve as a use-value, by means of an exchange".[446] It establishes the creation of value given the intended or current use of an object and the importance of that action to the recipient. However, the Marx/Engels concept of 'use-value' is largely employed to establish exchange values and not to understand how value is created in use. Appadurai continued within his work to focus on the creation of meaning in the trajectories of objects. As such, the potential of this concept of 'use-value' to elucidate meaning under Appadurai's wider definition of value goes underdeveloped within his own work and within historical and material culture scholarship more broadly.

Through database searching, I discovered a similar term in use within a field far removed from historical study: the field of marketing theory. The concept of 'value-in-use' within marketing theory scholarship analyses who creates meaning/value in an object and how value creation occurs, using a broad approach to the concept of value similar to that in Appadurai's work.[447]

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[443] Primarily Styles, 'Objects of Emotion: The London Foundling Hospital Tokens, 1741-60'; and Arjun Appadurai, ed., *The Social Life of Things: Commodities in Cultural Perspective* (Cambridge: Cambridge University Press, 1986).
[444] See for example, 'Value, n.', pt. II.
[445] Arjun Appadurai, 'Introduction: Commodities and the Politics of Value', in *The Social Life of Things: Commodities in Cultural Perspective*, ed. Arjun Appadurai (Cambridge: Cambridge University Press, 1986), 5.
[446] Karl Marx, *Capital: Vol. I. A Critical Analysis of Capitalist Production* (Moscow: Progress Publishers, 1871), 48; Appadurai, 'Introduction: Commodities and the Politics of Value', 8.
[447] For each of these terms in use simultaneously see Emma K. Macdonald et al., 'Assessing Value-in-Use: A Conceptual Framework and Exploratory Study', *Industrial Marketing Management*, Service and Solution Innovation, 40, no. 5 (July 2011): 671–82; Bo Edvardsson, Bård Tronvoll, and Thorsten Gruber, 'Expanding Understanding of Service Exchange and Value Co-Creation: A Social Construction Approach',

Marketing theory has a significant framework around this term which I believe can be applied to the study of anatomical models. Within the material culture literature there is a distinct acceptance that recreating the meaning of objects is an elusive and "opaque" endeavour.[448] Marketing literature also acknowledges that "understanding what consumers value has long been a challenge."[449] As David Harvey discusses in his monograph on the end of capitalism, use-values (as opposed to monetary or exchange values) are "infinitely varied", even when considering the same object.[450] However, marketing theory strives to provide models of the process of use-value creation. These can help us as material culture scholars to assess the actual value created on a case by case basis, by following the processes of creation outlined. Within this short chapter, I will outline the frameworks of value creation that marketing theory proposes. Then, in chapter six, I will test this approach and I will use this framework to investigate the use-value created around the new style of anatomical models in a reasonably homogenous group of late-nineteenth century British universities. In doing so, I look to link the theoretical culture and spaces in which these models existed, operated, and were used with the models themselves.

## Marketing literature: brief outline of the field

Traditionally, marketing literature saw the producer as the creator of knowledge and value. Objects or services would already be imbued with use, value and knowledge "as they left the factory gate" and carry such knowledge with them as they were exchanged.[451] This is the premise under which most histories of anatomical modelling operate, focussing on the producers and production of models. However, marketing theory has moved away from this school of thought towards a much more user-centric model of value creation: Service-Dominant Logic.[452] This model reconsiders the actors involved in the creation of meaning/value, as well as the processes by which this value creation comes about. Service-Dominant Logic scholarship works with the concept of 'value-in-use'. Here, value, monetary or otherwise, is created through

*Journal of the Academy of Marketing Science* 39, no. 2 (2011): 327–39; and Jennifer D. Chandler and Stephen L. Vargo, 'Contextualization and Value-in-Context: How Context Frames Exchange', *Marketing Theory* 11, no. 1 (1 March 2011): 35–49.

[448] Gerritsen and Riello, 'Introduction: Writing Material Culture History', 2.

[449] Macdonald et al., 'Assessing Value-in-Use', 671.

[450] David Harvey, *Seventeen Contradictions and the End of Capitalism* (London: Profile Books, 2014), 33.

[451] Christian Grönroos, 'Service Logic Revisited: Who Creates Value? And Who Co-creates?', *European Business Review* 20, no. 4 (27 June 2008): 305.

[452] For a complete list of publications and resources relating to this topic see Stephen L. Vargo and Robert F. Lusch, 'Service-Dominant Logic', Service-Dominant Logic, accessed 7 August 2019, http://sdlogic.net/.

use. 'Value-in-use' positions the user as a key component in value creation; either as the sole creator of value or as a co-creator who is always included.

Users have also been positioned as important within Science and Technology Studies literature.[453] Within Oudshoorn and Pinch's *How Users Matter,* scholars have explored the user role in pressure groups and as mediators who feed into production methods, as well as studying the co-opting of certain technologies by users. However, these constructions of users either focus on specific examples of the role of users without extrapolating wider frameworks, consider the mechanisms of interaction between users and producers, focus on user activism, look to understand the effect of products on users, or conceptualise users solely as members of the public. For example, in Steven Epstein's chapter users are members of the public who have received medical knowledge and technologies from experts.[454] These approaches are similar to those expressed here, going into more detail on considerations such as the relationship between different generations of users, or resistance to new technologies. However, this thesis does not contain any interaction between user and producer and focusses instead on users' internal processes for understanding objects. Service Dominant Logic, when combined with means-end-laddering theory, offers a suitable general framework for the consideration user-driven creation of value, and hence meaning, in an object which de-centres producers almost entirely. As such, this work contributes towards Oudshoorn and Pinch's scholarly territory by both centring users and considering users internal processes for creating value and meaning in a manner which does not require, although can incorporate, interaction with producers.

Although the user is at the fore of this marketing theory framework, the role of the producer in value creation is still heavily debated within Service-Dominant Logic scholarship. Christian Grönroos maintains that value is never embedded in products supplied by firms.[455] Specifically he has argued that without direct interaction "the firm has no direct control over how the customer's value-creating process proceeds, and what it leads to".[456] In this framework, visually represented in figure 5.1, Grönroos claims that the firm is a "value facilitator" who can only engage in co-creation of value through interaction with the customer (the interaction

[453] Nelly Oudshoorn and Trevor Pinch, eds., *How Users Matter (Inside Technology): The Co-Construction of Users and Technology*, New Ed edition (Cambridge, Mass. London: MIT Press, 2005).
[454] Steven Epstein, 'Inclusion, Diversity, and Biomedical Knowledge Making: The Multiple Politics of Representation', in *How Users Matter (Inside Technology): The Co-Construction of Users and Technology*, ed. Nelly Oudshoorn and Trevor Pinch, New Ed edition (Cambridge, Mass. London: MIT Press, 2005), 173–90.
[455] Grönroos, 'Service Logic Revisited', 304.
[456] Christian Grönroos, 'Value Co-Creation in Service Logic: A Critical Analysis', *Marketing Theory* 11, no. 3 (1 September 2011): 287.

concept).[457] This is a very strict parameter that Grönroos imposes upon this model of value creation by the producer.[458] If there are no *direct* interactions *during* service use, the firm cannot become a co-creator of value (see figure 5.1).[459] However, Stephen Vargo and Robert Lusch recognise that, whilst value cannot be created without the user, there is a more holistic process of value creation which involves multiple parties.[460] Vargo and Lusch have concluded that "value is cocreated by multiple actors, always including the beneficiary".[461] Within Vargo and Lusch's framework users are placed at the forefront of value creation, as without them it cannot take place, but the influence of other actors is accounted for. It is this more complete account of the influences on value creation that makes more sense when we consider the social construction of meaning within a historical context. Specifically, Grönroos' assertion that value co-creating interactions between producers and consumers must occur after exchange and during use of the service comes under question when we address the historical record. [462]

As both Anna Maerker and Nick Hopwood have shown in their historical work on models, interaction more often happens prior to exchange and it seems that this can influence value creation. In her work on Dr Auzoux's modelling company, Maerker explores demonstrations given by Auzoux and his workers to illustrate the utility and success of his models to potential buyers. These talks would demonstrate exactly how the product could be used and the learning goals that could be achieved.[463] Meanwhile, Hopwood shows that Zeigler consulted academics, his target audience, about the form of his models. He also provided the consumer with the details of the papers to which his models made reference, as such providing explicit contexts for their use.[464] As such, Vargo and Lusch's more realistic approach to the user's creation of value and the broad influences upon its creation make more sense to the historian. I argue that using this framework we can summarise the value created at each stage of the life of an object

[457] Grönroos, 288–89.
[458] It is important to note that Grönroos discusses the consumer as perceiving and experiencing value. Here he personifies value as 'emerging', taking the agency away from users and positioning the service itself as an actor in value creation. Linguistically, this implies that value is already extant before use for the user to perceive, experience, and react to, and that therefore there is value creation by another party. As such, his terminology undermines the idea of the user as the sole creator of value. Grönroos, 295.
[459] The provision of the 'service' (or object) itself is not considered an interaction, and so interaction is not seen to be embedded within the service. Grönroos, 290–91.
[460] Edvardsson, Tronvoll, and Gruber, 'Expanding Understanding of Service Exchange and Value Co-Creation'; Chandler and Vargo, 'Contextualization and Value-in-Context'.
[461] Stephen L. Vargo and Robert F. Lusch, 'Institutions and Axioms: An Extension and Update of Service-Dominant Logic', *Journal of the Academy of Marketing Science* 44, no. 1 (2016): 8.
[462] Grönroos, 'Value Co-Creation in Service Logic', 289.
[463] Maerker, 'Anatomizing the Trade'.
[464] Hopwood, *Embryos in Wax*; Hopwood, 'Plastic Publishing in Embryology'.

accordingly: the producer creates potential value in the creation of a service, they also create intended value (how they would like the service to be used), the user then utilises both of these parameters provided to them in the service (as well as their own skills and other resources) to create their own specific value-in-use within their own context.


*Figure 5.1 'A value-in-use creation model' reproduced from Grönroos (2011). This diagram demonstrates the role of the producer as value facilitator unless they are interacting with the customer during their use of the service. ('Value Co-creation in Service Logic', Christian Grönroos, Marketing Theory 11:3 (2011), p. 291)*

## Applying the concept of value-in-use

Macdonald *et al.* have broken down the process of creation value-in-use into four aspects.[465] They identify the main elements of value creation as: the quality of service provision from the provider, the quality of the relationship between the provider and the customer, the quality of usage, and the hierarchy of goals of the customer. Figure 5.2 illustrates how these elements interact. Macdonald *et al.* have answered questions about how a customer idiosyncratically assesses value-in-use, demonstrating that the customer is usually hyper-aware of the way in which they assess the value of a service. They have delineated the process by which a user creates value, showing how their hierarchy of priorities interacts with the service/object to produce the value that is created. In the archive materials which form the basis of this thesis there is little evidence of any exchange of communication let alone relationship between model

[465] Macdonald et al., 'Assessing Value-in-Use'.

providers and model users. However, the three preceding chapters of this thesis have already considered the quality of service through an examination of object form, the quality of use within the classroom and an assessment of lecturers' higher academic goals. This methodological framework illustrates how we can draw these disparate elements together to understand the value and meaning of these anatomical models within the nineteenth century British anatomical classroom.


*Figure 5.2 'Conceptual framework for customer assessment of value-in-use' reproduced from MacDonald et al. (2011). This conceptual framework for customer assessment of value-in-use demonstrates how the quality of an object (service) interacts with the use of an object, which is informed by a hierarchy of goals, with relationship quality bridging between the provider and the customer. ('Assessing Value-in-Use', Macdonald et al., Industrial Marketing Management 40:5 (2011), p. 673)*

The main contribution of this approach to the historical approach is the prioritisation of certain factors over others in the creation of value. This lends structure to an otherwise elusive idea of the social construction of value around these models. In this method Macdonald *et al*. build upon the work of Robert Woodruff and Sarah Gardial who have developed a means-end approach to understanding the consumer value creation process.[466] The means-end approach states that consumers construct value to meet specific end goals; "the use of a provider's service is goal-directed".[467] However, marketing theory scholars have combined laddering theory with these goals. Means-end laddering ultimately creates a hierarchy within consumer goals, allowing

[466] Robert B. Woodruff and Sarah F. Gardial, *Know Your Customer: New Approaches to Understanding Customer Value and Satisfaction* (Cambridge, Mass., USA: Wiley, 1996); Robert B. Woodruff, 'Customer Value: The next Source for Competitive Advantage', *Journal of the Academy of Marketing Science* 25, no. 2 (1997): 139–53.
[467] Macdonald et al., 'Assessing Value-in-Use', 673.

us to use means-end laddering to understand the "underlying emotions, consequences, and personal values that drive consumer choice".[468] Rugg *et al.,* amongst others, have delineated three levels within this goal hierarchy. Ascending in importance, these are: 1) goals that relate to the service provider; 2) goals that relate to perceived benefits of the service; and 3) goals that are consistent with their personal values.[469] This hierarchy is represented to the right of figure 5.2 (page 177) which shows how these goals interact with use to create value. Rugg *et al.* have posited personal values exist at the very pinnacle of the value creation process, a phenomenon which is visually represented in figure 5.3. Indeed, MacDonald *et al*. claim that customers will pay more for particular features or attributes because they help to reach these higher-level goals.[470] This presents the hypothesis that the personal views of anatomists on humans and the structure of humanity would have had the most impact on the value assigned to the anatomical models they used.

Image removed for copyright reasons. See https://rockresearch.com/understanding-consumer-decision-making-with-means-end-research/

*Figure 5.3 'Understanding Consumer Decision-Making with Means-End Research' reproduced from Woodall (2013). This diagram shows the intervening links between products and values in means-end laddering and movement up the chain from left to right. (rockresearch.com, Gina Woodall (2013))*

## Alterations for historical application

These frameworks are designed to be used in a modern context, and not necessarily for historical application. However, they are not unsuitable for a new industrial era of anatomical modelling in which printed trade catalogues and other advertisements are used to sell visions of the body to medical practitioners and schools alike. Only two modifications are needed in order

[468] Gina Woodall, 'Understanding Consumer Decision-Making with Means-End Research', Rockbridge, 9 December 2013, https://rockresearch.com/understanding-consumer-decision-making-with-means-end-research/.
[469] Gordon Rugg et al., 'Eliciting Information about Organizational Culture via Laddering', *Information Systems Journal* 12, no. 3 (1 July 2002): 215–29.
[470] Macdonald et al., 'Assessing Value-in-Use', 673.

to apply this methodology over longer periods of time within history: a consideration of time, and of limitations.

One shortfall of Service-Dominant Logic marketing literature is the notable absence of the idea of second-hand object/service use. These theories do not address is the second-hand lives of services/objects, or indeed second-hand users. Whilst a focus on use over time has been suggested in the marketing theory literature, it has not yet been tackled.[471] However, use over time is a considerable element of my project as students can be seen as secondary consumers of the model technologies. Explored by Christina Lindsay in her work on TRS-80, it is important to address both what is lost and gained in exchanges that are further, if not completely, removed from the producer.[472] The producer may have direct contact with future users through guidebooks, instruction manuals and other publications that are either sent with the item or otherwise acquired by subsequent users. In this way the producers are able to both influence co-create use-value with later users with literature and supporting materials, as well as with the materiality of an object itself. However, these supporting materials may also become lost and subsequent users may be influenced in their value creation processes by preceding users rather than the producer. Within my research I will assess the interaction of subsequent users with the original producers and the effect this has on changing value creation. In doing so, I will be bringing the disciplinary methodologies of material culture historians into this marketing literature approach to the creation of meaning. This approach allows us to consider a continuum of change in value over time in the "social life" of an object, albeit one with specific ages/time periods as suggested by Igor Kopytoff.[473]

A second limitation of SDL frameworks is a permissive approach to interpreting the power of the producer and production process in the shaping of value creation.[474] Grönroos categorises the role of the producer as value facilitation, creating *potential value*, whereas Vargo and Lusch discuss the value propositions made by the producer. Both of these conceptualisations stop short of wholly conceptualising the role of the producer. They are both linguistically permissive,

[471] Macdonald et al., 680; Lieven Quintens and Paul Matthyssens, 'Involving the Process Dimensions of Time in Case-Based Research', *Industrial Marketing Management*, Case Study Research in Industrial Marketing, 39, no. 1 (January 2010): 91–99.
[472] Christina Lindsay, 'From the Shadows: Users as Designers, Producers, Marketers, Distributors, and Technical Support', in *How Users Matter (Inside Technology): The Co-Construction of Users and Technology*, ed. Nelly Oudshoorn and Trevor Pinch, New Ed edition (Cambridge, Mass. London: MIT Press, 2005), 43–45.
[473] Kopytoff, 'The Cultural Biography of Things: Commoditization', 66–68; Appadurai, 'Introduction: Commodities and the Politics of Value'.
[474] For Grönroos, the production process includes development, design, manufacturing, and delivery, which all help to facilitate value.

but we can also frame the producer's role as restrictive. Producers, as well as passing on value propositions, also create value limitations and unbreachable parameters of use. For example, a hammer can obviously be used in ways not intended by the producer, as a paperweight or a door stop for example. However, by virtue of its very design, it cannot be used to hold liquids. In this way the producer has limited the use of an object through the design process; the materiality of the service itself dictates parameters for the construction of use-value. Although some SDL theorists argue "value is not embedded in goods", value creation limitations may be.[475] This construction means companies *can* still be seen to co-create value with consumers, even without interaction. This interpretation is fundamentally different to that of Oudshoorn and Pinch, who do consider the difference between dominant and secondary uses of objects in their introduction to *How Users Matter.*[476] They too, importantly, stress the agency of users in the choice of how to use an object. However, this approach in both SDL and STS ignores the concept of embedded limitations provided by the producer. As such, the idea of a limitation parameter adds an extra dimension to the producer's role in the value creation process. For my project, this idea can be used to consider the different narratives that users are *able* to give to the models taking into account their design.

It is possible to incorporate both limitations and multiple users into the Grönroos' model of value creation. The constraints originally provided by the producer as value facilitator still exist through the passage of time, but the object *may* be transferred with the implication of a different intended use-value created by the previous user (or with its original intended use). If the original consumer has altered the object itself then they may have altered the parameters of potential use. For example, in the life of a bed sheet, the first user may use it with the intended use-value and value facilitation parameters that the producers set out for said sheet. However, if the bedsheet then gains a hole, it may then be passed on to the next user with a different intended use, as say a cleaning rag or a dust cover. Here the first user and not the producer influences this development of meaning and value over the life of the object. Of course, the producer *could* still influence the value creation of subsequent users, depending on the use of the object and the passage of materials and ideas with the object. However, producers in this model will not be the only facilitators of value, each user is a facilitator for future users. Indeed, Grönroos acknowledges that the value creation process is not quite as linear as indicated by the timeline aspect of his figure (figure 5.1, page 176).[477] Using this framework, I will demonstrate

[475] Grönroos, 'Value Co-Creation in Service Logic', 292–94.
[476] Oudshoorn and Pinch, *How Users Matter (Inside Technology)*, 1–2.
[477] Grönroos, 'Value Co-Creation in Service Logic', 291.

in the following chapter that it is possible to conduct an historical assessment of value-in-use, the creation of value, and the dissemination of meaning within the context of material culture.

## Summary

To summarise the framework that this literature provides, I direct readers back to figure 5.2 (page 177). In this figure, Macdonald et al. demonstrate how the various different aspects of this methodology interact to produce the overall value-in-use of an object. I have already investigated each of these elements individually: in chapter two I looked at the models, (the quality of service provided), in chapter three I looked at the spaces and ways in which models were used (usage quality), and in chapter four I investigated the theories and deep seated beliefs held by anatomists (the higher level goals of users).[478] I used methods from Art History, Archaeology, and Intellectual History in turn, looking at models through different lenses of Material Culture Studies. However, SDL Marketing Theory differs from the other methodologies applied to this material is in its desire for clear evidence of a relationship between factors in order to establish conclusions. Whilst the material covered in previous chapters suggests a relationship between theories of racial hierarchy and white anatomical models, it does not offer clear examples of these objects and theories interacting directly. In chapter six, I will locate and analyse sites of interaction between service quality, usage quality, and user goals to understand the value-in-use of anatomical models. Specifically, I will offer several clear examples of interaction between theories and objects during their usage process in the different classroom spaces in turn; examples of interaction which are required in order to understand any value-in-use within this Marketing Theory framework. As such, chapter six will draw examples from each different space in order to link theory and models across late-nineteenth century anatomical pedagogy. In doing so, this method from marketing theory allows me to create a demonstrable relationship between theories of racial hierarchy and white anatomical models. I subsequently argue that the value-in-use that this framework creates shows these anatomical models as both normative and idealised representations whiteness in this period.

[478] As established in chapter two, there is no discernible relationship between modellers and the anatomists using their products: the fourth element of MacDonald et al.'s diagram.

## Conclusion

This approach from marketing theory adds a key element to my exploration the social construction of *unwritten* historical knowledge. The common historical approaches in chapters two, three, and four provide only circumstantial conclusions about the relationship between models and the theories of anatomists about racial anatomical difference. Instead, this approach from marketing theory has the potential to concretely link information about personal values, descriptive categories, and spatial positioning to the creation of meaning, allowing me to draw much more substantial conclusions. In the first place, service dominant logic places the user at the fore of our considerations, asserting that value is only created through use. This prioritises anatomists and students over modellers, tradespeople, and policy makers in the creation of model value, as well as spaces of use over spaces of display or creation. Means-end laddering then demonstrates that these users create value which is primarily in line with their personal values, with context and interaction as secondary and tertiary considerations. In chapters three and four, I have already explored the spaces in which models would have been used and the personal values of the users. I now propose, in chapter six, to connect these two elements of the historical record using this framework from marketing theory. To do so, I will consider how the models in this study and theories about racial anatomical difference interacted *during* use. I argue that a focus on models and theories within anatomical lessons demonstrates the connections between models and theory, creating a more complete account of these anatomical models. However, it also begins to demonstrate the effectiveness of this marketing theory approach in furthering our understanding of the unwritten meaning of objects within history.

As such, the final chapter of this thesis takes two methodological standpoints from this marketing theory approach. Firstly, it prioritises those who use materials over those who make materials when considering the creation of meaning, specifically focussing on the exact moment of use in teaching. Secondly, chapter six focusses on the users' personal values as the most important aspect of context. Whilst excellent work on the analysis of object meaning and value through the social construction of knowledge has been produced, this kind of work does not yet have a method for prioritising the various contextual influences on value creation.[479] The marketing theory methods above help to explain why personal values do more to motivate the creation of value and meaning than practicalities, allowing us to be more certain of the conclusions we can draw from the often limited historical record.

[479] See, for example, Styles, 'Objects of Emotion: The London Foundling Hospital Tokens, 1741-60'.

# Chapter 6 : Constructing 'use-value'; Race and Models in Context

> "It has always been my endeavour, whilst presenting the subject to my pupils on its practical bearings, to treat of man in his relations to the other members of the animal kingdom, as well as to make reference to his racial characters and differences."
>
> - Arthur Thomson[480]

In chapters two, three, and four, I discussed the models used, the classrooms in which they were used, and the values which may have informed their use. This chapter demonstrates the interaction between these three facets of anatomical education, contextualising models within the classroom within an ethos informed by anatomists' scholarly interests through the lens of use and utility. Bringing work from these preceding chapters together, I explore the direct application of racial anatomical categorisation within the late-nineteenth century British anatomical classroom to uncover the value-in-use, and thus the meaning, ascribed to the models in this study. In doing so, this will test the methodological theory outlined in the previous chapter by exploring specific cases of demonstrable interaction between object, use quality, and user values. Ultimately, I demonstrate that examples of the use of language about racial anatomical difference in the context of variance or abnormality highlights whiteness as normal. Concurrently, derogatory language about "lower races" demonstrates whiteness as not only a norm but as an ideal.[481] In this context, the normal anatomical model is given no other choice but to embody these values, showing clearly the importance of value systems in the creation of meaning in objects. Thus, during use the anatomical model appears to represent both the normal and the ideal body.

This chapter demonstrates that theories about racial anatomical difference, as explored in chapter four, permeated into anatomical teaching spaces in the late-nineteenth century, the pedagogy of which I established in chapter three.[482] I argue, following the methodology outlined in the previous chapter, that this permeation affected the context of model use and thus the use-values created around them. I demonstrate this through a series of examples of

[480] 'Papers Kept by Professor Thomson Recording His Various Academic Posts and Grants Obtained, with Material Relating to Dr Lee's Readership in Anatomy.', 1907 1884, HA 106, University of Oxford Special Collections, Bodleian Library.
[481] Macalister, *A Text-Book of Human Anatomy*.
[482] This contravenes modern conceptions of anatomy as an objective discipline.

demonstrable interaction between model, space, and theory during teaching. Within this chapter I explore sources which demonstrate the inclusion of ideas about racial difference within anatomical classroom spaces to argue that anatomical models of this period deliberately represented whiteness. I demonstrate the dissemination of ideas about racial difference in printed anatomical teaching materials of the time, explore the levels student interest in this particular topic, and discuss how the language used during teaching use frames models. In doing so, I explore a variety of sources including a set of student notes, lecture announcements, pamphlets from student societies, dissection registers, and museum collection catalogues, bringing out specific demonstrable instances in which race is explored as an anatomical difference during teaching. These sources span all the institutions in this study, attesting to the saturation of the discipline with ideas about racial anatomical difference. While published printed materials are illustrative of the more widespread nature of this phenomenon.[483] Here, the existence of these materials demonstrates not only that anatomists believed in racial anatomical difference, as in chapter four, but that these ideas were transmitted to students through widely-disseminated teaching materials.

This chapter demonstrates that the theoretical context of model use had serious ramifications for how the new style of anatomical model would have been understood in the nineteenth-century anatomical classroom. The separation of race categories suggests racial anatomical differences which make these categories important or useful in the classroom setting. The language used in the transmission of the concept of racial difference to students suggests whiteness as the norm and the othering of racial difference. While, references to hierarchy and comparisons which involve language about height, as in chapter four but within the classroom setting, demonstrate the values attached to the white norm. Importantly, we see these values applied to a range of objects within the classroom, linking these concepts of white superiority to the objects that surround them. In this context, I argue the position of the white model was elevated from the norm to the ideal. Whiteness was both the norm to be compared to and the norm to be aspired to. As such, I argue that we can establish that anatomical models were representative of a white ideal, as well as a norm, through their contextualisation within discussions of race within the anatomical classroom.

Note: It is important to note that this chapter, and indeed this thesis, refers only to the teaching of anatomy within the medical curriculum. This topic had, and continues to maintain, strict boundaries. Anatomical study consists only of basic theoretical knowledge about the human

[483] Macalister, *A Text-Book of Human Anatomy*.

body; both normal and abnormal. As such, students would not have encountered information about injury or disease within these classrooms.[484]

## Race in the lecture theatre

In chapter three, I demonstrated that models were used to illustrate key points within lectures, with lectures forming the pedagogical backbone of any university course in anatomy. Here, I explore specific examples of the inclusion of theories of racial hierarchy within the same spaces and in the context of model use *during* lectures. Information about the content of nineteenth century anatomical lectures comes to us through two main channels. Firstly, the official records of the lectures such as class announcements and lecture transcripts. These institutional sources offer insights into the overall topics of the class as well as the recorded script. Secondly, unofficial recordings of lectures have been made by students in note form or as recollections of lectures. In chapter three, we explored a student's recollections of William Turner's last lecture at Edinburgh.[485] Although this record is vague about some of the details of the lecture, it did indicate a large amount of information about lectures that went unrecorded in official accounts of lectures. Of particular interest to this thesis was information about model use during lectures missing from many other sources from the lecture theatre. Here it is evident that student notes are vital for any complete understanding of lecture content, allowing a small insight into what was said in passing rather than included in intended lecture content. However, sources from students are few and far between. This has often occurred because these kinds of records have not always been valued in the collation of archives and because many students do not donate their notes to the university. As such, the extent to which those that survive reflect the interests of individual students rather than the entire student body is unclear. However, the limited sources from students *do* offer us a unique insight into these interests, particularly demonstrating student engagement with ideas of racial difference. As such, these sources indicate the inclusion of racial difference within anatomy classes may have been equally driven by students as well as lecturers with an interest in the subject, as discussed in chapter four. The balance between this driving force is explored to some extent here in the analysis of extra-curricular lectures. Whilst guest lecturers invited from other institutions to give departmental talks may indicate lecturers' desires to include theories of racial difference within anatomical study, student society programmes demonstrate student engagement with and support for

[484] As understood within nineteenth century practices (i.e. growth deformations were not necessarily considered the product of disease). See Harvinder S. Chahal et al., 'AIP Mutation in Pituitary Adenomas in the 18th Century and Today', *New England Journal of Medicine* 364, no. 1 (6 January 2011): 43–50.
[485] Jamieson, 'Turner's Last Anatomy Lecture'.

these theories. Regardless of the impetus, it is clear that the inclusion of remarks about racial anatomical difference in all aspects of anatomical learning in the lecture theatre forms a telling context of use for anatomical models.

## Lecture records

The first examples of theories of racial hierarchy interacting with model use in the lecture theatre come to us though official narratives. Official lecture records confirm clearly that race was included within the late nineteenth century anatomical classroom. The University of Oxford records of the anatomical department offer two clear instances of racial difference being included in the main course of the lecture. Firstly, in October 1872 and again in October 1875 a class was given by George Rolleston, Linacre Professor of Anatomy and Physiology, on "Human Anatomy and Physiology, with special reference to Ethnology".[486] Following this, in April 1884 Henry Moseley, Linacre Professor of Human and Comparative Anatomy, gave a class on "The Morphological Relations of the Anthropoid Apes and Man, with Some Account of the Chief Physical Characteristics of the Principle Races of Men".[487] It is interesting to note that these two courses of lectures were run by successive Linacre professors of anatomy, showing some continuity in class content on the subject of racial anatomical difference which transcends the change in lecturer. Despite their change in title, both Rolleston and Moseley, were responsible for human and comparative anatomy, although Rolleston also had charge of physiology. Rolleston had a personal interest in anthropology whilst Moseley was in charge of ensuring the annual anthropology lecture as part of the Pitt Rivers bequest was given, which may have influenced the inclusion of these lecture series.[488] This illustrates a continuation of the curriculum from lecturer to lecturer in stark contrast to extant histories of anatomical personalities and contemporary descriptions of the changes made by new lecturers in the department.[489] Meanwhile at Cambridge, Alexander Macalister, Professor of Anatomy, lectured in 1893 on "some branches of physical anthropology; The Races of Australia, The Ancient

[486] 'Department of Zoology and Comparative Anatomy Register, University Museum, Oxford', 1879 and 1879-1905 1861, ZL1/1-2, University of Oxford Special Collections, Bodleian Library.
[487] 'Department of Zoology and Comparative Anatomy Register, University Museum, Oxford'.
[488] A. P., 'Pitt-Rivers and Moseley', Rethinking Pitt-Rivers: analysing the activities of a nineteenth century collector, April 2011, http://web.prm.ox.ac.uk/rpr/index.php/article-index/12-articles/406-pitt-rivers-and-moseley/index.html.
[489] Martin, 'Evolutionary Anatomy'; Henry Wentworth Acland, *Oxford And Modern Medicine: A Letter To Dr. James Andrew*, 1890; Thomson, 'Address at the Opening of the New Department of Human Anatomy'; Anon., 'Human Anatomy at Oxford'; Christopher Hibbert and Edward Hibbert, *The Encyclopaedia of Oxford* (Macmillan Publishers Limited, 1988). see 'University Museum', p.479 and 'Acland, Sir Henry Wentworth (1815-1900)', p.6.

Egyptians, and The Prehistoric Races of Britain".[490] Importantly, these lecture series illustrate the formalisation of these ideas into curriculum forming material. While their announcement in university gazettes and magazines illustrates de-facto approval of courses on this matter by the respective universities.

The content of these lectures on racial difference can be inferred from the notes of similar lectures given by George Dancer Thane, Professor of Anatomy at University College London. In an 1899 lecture on varieties in anatomy, Thane claimed that "existing differences [in man] are either individual or racial".[491] He expanded on what he believed to be the specific nature of racial anatomical differences in another lecture in 1917:

> "Racial differences
>
> The chief of these are
>
> 1. Character and colour of hair
> 2. Colour of skin
> 3. Form of features- head, face, nose, development and prominence of jaws, character of lips
> 4. Stature
> 5. Proportions of body"[492]

He expanded upon some of these areas, providing categories into which a person could be classified. He gave three categories for classifying hair – "ulotruichous (woolly-haired), oymotruichous (wavy-haired), [and] leistrichous (straight-haired)" – five categories of skin colour – "black, brown, red, yellow, and white" – three categories of head shape – "dolicho-, mesati-, and brachycephalic" – three categories of jaw type – "ortho-, meso-, and prognathorus" – three nose types – "platy-, meso-, and leptorhine" – and four categories of stature – "tall, medium, short, and pygmies."[493] The detail here is immense, and demonstrates the scale of work that had occurred within anatomical racial physiometry by 1917. Thane was conscious not to create harsh lines between his categories, arguing instead for a "gradual transition" between these specific classifications in the existing population of mankind. However, he made it clear that both anatomists and anthropologists were, by 1917, generally agreed that man was comprised of "numerous varieties and races." The methods of racial classification expressed in

[490] 'University Registry Guard Books: Professor of Anatomy', pt. 86.
[491] George D. Thane, 'Lecture on Varieties in Anatomy', 1899, MS ADD 282/A/2, University College London, UCL Archives, UCL Special Collections.
[492] George D. Thane, 'Lecture on the History of Anatomy', 1917, MS ADD 282/A/5, University College London, UCL Archives, UCL Special Collections.
[493] Thane.

this lecture mirror to some extent the research work of anatomists discussed in chapter four, however, they provide a little more specificity about what racial anatomical differences were seen to be. In this context, it is evident that anatomical models were designedly Caucasian within classrooms where these categories were considered accepted ways of classifying race.

Statements made by lecturers from other institutions about their teaching styles can also be indicative of the inclusion of theories about racial anatomical difference within their lectures. William Turner, Professor of Anatomy at Edinburgh, used "appropriate references to comparative anatomy" for contextualisation of "man's place in nature and his evolution."[494] The word "place" here is suggestive of hierarchy, whilst references to evolution and comparative anatomy could refer to comparisons with the historical and contemporary races of man, both of which Turner researched in his published works, as discussed in chapter four. At Liverpool the Chair of Anatomy confirmed that staff members were given the opportunity to "affect his pupils through his own personality."[495] In this case, it is possible that William Mitchell Banks or Andrew Melville Paterson passed on their own thoughts on racial anatomical difference as part of this encouraged academic freedom. While, as I began this chapter, Arthur Thomson was more explicit about his approach in a letter to the electors for the Linacre Professorship of Human and Comparative Anatomy, stating directly that he made reference to "racial characters and differences", confirming the Oxford approach to the teaching of racial anatomical difference discussed above.[496]

These sources indicate that racial anatomical difference was considered a feature worth highlighting in a lecture series or academic approach. As such, it should be considered one of the main discussion points of the lectures or classes run by these lecturers. However, in order to satisfy the framework of marketing theory for the creation of use-value, we must also demonstrate interaction of these theories within these spaces with models. If we examine this consideration alongside J. P. S. Jamieson's description of model use within the lecture theatre – that models were used to illustrate the main points within lectures – it brings to the fore the ways in which the anatomical models in this study might have been used to illustrate whiteness in comparison to predefined categories of other races.[497] Taking the nose as one area of comparison, the models used in this study can be categorised as "leptorhine". Leptorhine, or

[494] Turner, *Sir William Turner*, 122.
[495] 'University of Liverpool, Faculty of Medicine, Confidential Report to Committee, Chair of Anatomy', n.d., D605/14/5, University of Liverpool: Special Collections and Archives.
[496] 'Papers Kept by Professor Thomson Recording His Various Academic Posts and Grants Obtained, with Material Relating to Dr Lee's Readership in Anatomy.'
[497] Jamieson, 'Turner's Last Anatomy Lecture'.

leptorrhine, was defined as the type of nose shape most commonly measured on humans with Caucasian skin, which indicates a nasal index of around 70.[498] When using the equation, below, used to calculate nasal index, the nose of several models can be established as leptorhine and as such deliberately presenting as Caucasian.

$$Nasal\ index = \frac{Nasal\ width}{Nasal\ height} \times 100$$

For example, in a model made by William Bally for the University of Liverpool Anatomical Department in 1834, the nasal index is 66.67 (see figure 6.1).[499] This is clearly within the stated range of <70.0 required to classify this nose as leptorhine. As such, it is entirely plausible that models such as figure 6.1 could have been used to illustrate lectures about racial anatomical difference like that given by Thane at University College London.[500] As such, the value-in-use of these anatomical models can be defined by the fact that they were able to demonstrate racial anatomical difference.


*Figure 6.1 Anatomical model with nasal measurements added by the author demonstrating the nasal index of the model, W. Bally (1834). (ANA.45, University of Liverpool Heritage Collections (Victoria Gallery & Museum), Liverpool)*

[498] G Oladipo, H Fawehinmi, and Y Suleiman, 'The Study Of Nasal Parameters (Nasal Height, Nasal Width, Nasal Index) Amonst The Yorubas Of Nigeria', *The Internet Journal of Biological Anthropology* 3, no. 2 (2009).
[499] Measurements taken from image not from life, however the ratio which forms the nasal index will remain the same. Measurements taken from ala to ala and from nasion to subnasale as in Oladipo, Fawehinmi, and Suleiman.
[500] Thane, 'Lecture on the History of Anatomy'.

## Student notes

Other examples of potential interaction between models and theories of racial hierarchy during their use in lectures can be seen in student notes. Through more meticulous student notes by one J. Herbert Dixon on lectures by Dr Macdonald Brown (c. 1894) at the University of Edinburgh there is record of constant references to bodily variation in the lecture theatre, particularly between the sexes.[501] These notes make note of differences in length, shape and size of various elements of the human body with relation to either gender or age. These can be to the side of the main text appearing as added extras to the lecture rather than in the main bulk of the discussion. Often these side notes accompany small diagrams which it appears the student has rushed to include (see figure 6.2, page 193, for comparison with non-rushed diagram). The location of these annotations supports the theory that remarks about racial anatomical difference entered lectures as an aside. As discussed in chapter three, the printed recollection of Sir William Turner's last lecture at Edinburgh in 1903 (written in 1956) shows us both that models were used during lectures and how they were used within the lecture theatre setting. However, it also suggests how discussions of race might have entered this classroom. Whilst there is a "synopsis of the lecture on the blackboard", there is no script from which Turner is to read.[502] Rather the synopsis presents a skeleton which Turner would flesh out with his expertise. It is in this expansion on the synopsis that we see possible avenues for discussions of racial anatomical difference to enter the lecture theatre. While, some of the longer comments which occur within the text of Dixon's notes reveal prejudices of the day as would have been discussed within the lecture theatre setting. For example; "Gynaecomagia = whe[n] a male has female breasts. Always found only in weak men and is a tendancy towards Hermaphrodi[sm]".[503] We can see in this snippet the connection between femininity and weakness as has been explored by numerous scholars of gender and medicine in the nineteenth century.[504] This differentiation between the sexes, with female presented as the variation to the male norm is present in most of the other, admittedly limited and earlier, sets of student notes found in the course of this research.[505] Here, the normalisation of man mirrors the normalisation of whiteness found in the research of anatomists discussed in chapter four.

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[501] Herbert Dixon, 'Anatomy Lectures by Dr MacDonald Brown'.
[502] Jamieson, 'Turner's Last Anatomy Lecture', 2.
[503] Herbert Dixon, 'Anatomy Lectures by Dr MacDonald Brown'.
[504] For two examples of scholarship on this topic, see, Patricia Anne Vertinsky, *The Eternally Wounded Woman: Women, Doctors, and Exercise in the Late Nineteenth Century* (Manchester University Press, 1990); Gallagher and Laqueur, *The Making of the Modern Body*.
[505] Kathleen Hodgson, 'Volume of Anatomical Drawings', 1915, SDC 8065, University College London, UCL Art Museum; Michael Foster, 'Professor Elliotsen's Lectures of Medicine', 1832,

There are also a few direct mentions of race or racial difference within these volumes. The first reference to race within student notes can be found in the notes of failed physician Charles Darwin himself during his time as a medical student at the University of Edinburgh. In these notes, Darwin wrote that

> "The common colour of the bones is a dirty yellow, but in Negros & Dropsical people they are much whiter; in Young people they are dirtier, owing to the more numerous Blood Vessels, ; than in old & stronger, owing to a greater proportion of Cartilaginous substance."[506]

Here, Darwin clearly makes clear that there is a racial anatomical difference in the colouration of the bones, as well as addressing differences in age. However, these notes have two flaws. The first is that they reveal much more about the interests of Darwin himself than the proportional content of the lectures. We can see this in his closing remark, which appears after just one and a half pages of notes: "This is all general & useless Anatomy.—."[507] This seems to support the idea that observations about racial anatomical difference were made more in passing as a lecture progressed rather than as part of the core content of the class. The second flaw is that these notes are obviously taken much earlier in the nineteenth century (1825) than the rest of the material explored within this thesis and may contextualise earlier models in wax, which often showed yellower bones in line with their presented skin tone and this assumption. As such, whilst they can inform how discussions of race might have entered the classroom, they are no guarantee that the practice of discussing race in the classroom had not died out by the late nineteenth century.

A later reference to racial difference in anatomical notes does exist within J. Herbert Dixon's notes. These, with knowledge about the language of research into racial anatomical difference, suggest that research into racial differences in skulls was included within the anatomical lecturing curriculum. The first lecture on skulls recorded by Dixon introduces three "great types" of skull; "normal, dolicocphalic or scapho-ciphalic, and brachyaephalic [sic]".[508] These categories of skull are very much linked to discussions about racial anatomical difference, as is evidenced in the lectures of George Dancer Thane (UCL) discussed above. It is notable here that mesaticephalic – the nineteenth-century category for medium skulls – has been replaced here

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UCH/MS/UNOF/9/2, University College London, UCL Archives, UCL Special Collections; Alexander Woodcock, 'Three Medical Notebooks, Two of Which Relate to Alexander Woodcock', 1845 1833, Coll-1483, Edinburgh University Archives.

[506] Darwin, 'Dr Munro Anatomy [Edinburgh University Lecture Notes]'.

[507] Darwin.

[508] Herbert Dixon, 'Anatomy Lectures by Dr MacDonald Brown'.

with the word normal. Not only does the presence of the word normal in this context highlights the presentation of anatomical materials as deviations from a norm, as discussed in chapter two, but its substitution for the word mesaticephalic is significant. A mesaticephalic skull shape is classified as "typical of Europeans".[509] As such, this is clear evidence that a Caucasian/European type was being presented as normal within the anatomical lecture theatre during the period of this study. At Edinburgh, where both of these sets of notes by Darwin and Dixon were created, these references to bone and race might plausibly be linked with the articulated skeleton which was designated for lecture theatre use.[510] However, Dixon's discussion of cranial shape would also have contextualised the large number of face and head models present in anatomical classrooms (see, for example, figures 6.1 above). More research into student notes would be needed to make a conclusive statement about the wholesale transmission of ideas about racial physiological difference to students through lectures. However, from these notes it is evident that students were interested in anatomical difference, both racial and sexual, and that those reflected here did record the passing statements made during lectures using models on these matters.

[509] John P. Rafferty, 'Cephalic Index | Anatomy', Encyclopedia Britannica, accessed 19 August 2019, https://www.britannica.com/science/cephalic-index.
[510] Robert Knox, 'The New Knox Catalogue', 1957 1820, UEA IN1/ACU/A2/16/9, Edinburgh University Archives.

Images removed for copyright reasons. See figure legend for access information.

*Figure 6.2 Anatomy Lectures by Dr MacDonald Brown, by J. Herbert Dixon (c. 1894). Images from student lecture notes showing two vastly different style of note-taking, one rushed and one meticulous. (EUA IN1/ACU/A2/19/29, Edinburgh University Archives, Edinburgh)*

## Extra-curricular lectures

Meanwhile, student interest in the topic of racial difference demonstrates that the interaction between theory and model use would continue outside of the formal lecture structure. Indeed, both lecturers' desires to transmit information on and student interest in racial anatomical difference are demonstrated more thoroughly through an examination of materials relating to extracurricular activities. Examples of external lecturers invited to speak at departmental talks and the topics they chose to speak upon reflect the desire of staff to transmit knowledge about racial anatomical difference to students, as well as to other members of the profession. Meanwhile, examples of programmes of student society activities demonstrate the speakers and topics that students were interested in hearing from, by extension demonstrating their interest in racial differences.

In 1859 Sir Richard Owen, then superintendent of the natural history collections at the British Museum and previously Hunterian Professor of Comparative Anatomy and Physiology, was invited to give the Rede Lecture at the University of Cambridge. It is important to note that human anatomy, comparative anatomy, and physiology were combined under one chair of anatomy (George Humphrey) at this time. As such, this lecture would have been intended for all anatomical students and staff members. In this lecture, Owen compared the brain of the marmoset, the chimpanzee, and "the negro".[511] Here there is evidence obviously of comparative anatomy through interspecies comparisons, but also of racial categorisation within the human species. The comparison of brains of black people with those of animals again contributes to the narrative of white superiority within the anatomical lecture theatre and is illustrative of the wider intellectual atmosphere in which models were used. The transcripts of this lecture are accompanied within the archives by an amount of printed material, demonstrating the wider dissemination of these ideas.

Meanwhile, the Oxford University Junior Scientific Club held events which explored both variation and comparative anatomy. In 1894, Alexander Macalister, of the University of Cambridge, lectured to the Oxford University Junior Scientific Club as part of the Robert Boyle lecture series. This lecture focused on variation rather than comparison, emphasising the limited utility of textbooks as every human was different in the "details of their arrangement".[512] Although less specifically racially focussed than the Owen lecture, once again we have a

[511] Cambridge University Library, Department of Manuscripts and University Archives, Owen (Sir Richard): Draft of Rede Lecture, MS Add.8063.
[512] Macalister, *Some Morphological Lessons Taught by Human Variations*, 3.

recognition of perceived differences within humankind. Macalister's ideas on this topic are made far more explicit in his anatomical textbook for students, discussed below.[513] Following this, in 1903 Professor Arthur Thomson was invited to deliver a lecture more explicitly concentrated on racial anatomical difference entitled "Man's Cranial Form" for a "Conversazione in the University Museum" event for the OUJSC.[514] In this he championed the dissolution of a series of classification based upon geographical distribution and the creation of a system of classification based on form and the development of form, such as "that usually followed in dealing with zoological and botanical collections".[515] This included a reference to evolutionary hierarchy, describing "the successive stages through which the higher, more complex, forms have been gradually developed by Man."[516] Importantly, this second lecture was "illustrated by models", possibly the models of five crania purchased by the University of Oxford's Anatomical Department in 1890, otherwise lost to the historical record.[517] This talk demonstrates how models continued to be used within a lecture setting to demonstrate racial anatomical difference even outside of the formal curriculum.

## Race in the laboratory

Statements about racial anatomical difference in the lecture theatre were reinforced in the laboratory; a place of post lecture demonstration in which a range of resources are used to convey anatomy to students. It is here where interaction between model and theory during classroom use is most apparent, establishing clear links between theories of racial hierarchy and the creation of use-value and meaning in these objects. As I established in chapter three, this space could take a number of forms within the anatomical course setting, ranging from microscopy rooms to general purpose classrooms to museum spaces. This is the classroom in which students were most likely to have consulted printed materials, such as those which accompany the preparation notes of Owen's Rede lecture discussed above.[518] Two main locations for discussion about racial anatomical difference have surfaced during the course of my research. One occurs within these printed materials, such as textbooks, images, and

[513] Macalister, *A Text-Book of Human Anatomy*.
[514] Oxford University Junior Scientific Club, 'Conversazione in the University Museum', 26 May 1903, MU3/53 Item 2, University of Oxford Special Collections, Bodleian Library.
[515] Oxford University Junior Scientific Club, 7.
[516] Oxford University Junior Scientific Club, 9.
[517] Oxford University Junior Scientific Club, 9; 'Inventory of the Department of Human Anatomy'.
[518] 'Owen (Sir Richard): Draft of Rede Lecture', 1859, MS Add.8063, Cambridge University Library, Department of Manuscripts and University Archives.

pamphlets. Anatomical textbooks and printed images or diagrams were published and disseminated widely and contained specific observations about racial anatomical difference. Meanwhile, some of the printed pamphlets and images that followed models has also survived, in one case making direct references to race and hierarchy. The idea that comments about racial difference might be so formally and widely conveyed temporarily extends the scope of this research far beyond the institutions which currently form the focus of this thesis. In contrast, another tool that could be used to convey ideas about racial anatomical difference within the classroom was specimens. The production of non-white specimens is in part indicative of the lack of diversity within the dissection room of a university anatomy department, as discussed above. However, this practice also demonstrates the perceived continuing importance of these specimens for teaching. Specimens take a large amount of time and care to prepare and usually cannot be produced from material used to teach students. As such, all items made into specimens were deliberately preserved. The preservation of (parts of) non-white bodies show that they were considered to be of both anatomical and didactic interest. As such, both the pedagogical interaction through textbooks and the spatial interaction with specimens in this setting helps us to understand model use and model meaning within these contexts.

## Textbooks

Textbooks offer not only a clear example of the entrance of theories of racial hierarchy into the anatomical classroom space but also suggest extra-curricular use of these theories by students, expanding their interaction with the context of model use. Correspondence concerning a textbook that falls after the period of this study is indicative of the lasting nature of ideas about racial anatomical difference. Specifically, ideas which were produced by the original textbook author during the period of this study, which were believed to be concretely demonstrable long into the twentieth century. In correspondence between Arthur Keith in London and James Couper Brash in Edinburgh in the early twentieth century, Keith offers Brash some feedback on a draft of a textbook. In particular he recommends the inclusion of "references to racial differences in the lumbar curve as a whole" on page 54 as well as discussion of "facial angle" on page 153 of the anatomical textbook Brash was editing.[519] These notes presumably refer to Cunningham's Manual of Practical Anatomy which Brash began editing for the seventh edition,

[519] 'Arthur Keith to James Couper Brash', c. -33 1914, EUA IN1/ACU/A2/19/6 Item 1250a, Edinburgh University Archives.

published in 1937.[520] However, despite Keith's assurances that this was now accepted knowledge, as well as the original research interests of Cunningham himself (discussed in chapter four), it seems that this advice went unheeded. The final published version of this text, as well as subsequent versions, make no mention of racial difference in the discussions of the lumbar region of the spine. It is unclear why this might be as references to gender differences *are* included within this 1937 edition of the textbook. It is possible that by 1937 the context of rising Nazism had meant comparisons based on race were excluded from the final edit of this publication, although this context may not necessarily have precluded the inclusion of these comparisons. Britain's scientists were invested in Eugenics in this interwar period and we cannot say that the eugenics movement was uninterested in the comparison of racial characteristics.[521] As such, why Brash ignored this advice remains a mystery.

However, although not included in Cunningham's own textbook, Keith was not wrong that precedence for these kinds of statements had been set in other works. Alexander Macalister's 1889 *A Textbook of Human Anatomy: Systematic and Topographical including the Embryology, Histology and Morphology of Man* is one such example. It begins with this interesting disclaimer, which links this textbook to his earlier lecture at the University of oxford, discussed above:

> "The normal anatomy of man is a study of averages, and it is often hard to draw the line between what may be regarded as normal and that which is abnormal. I have endeavoured in each case to decide in accordance with what I have seen and noted during the past thirty years of my dissecting room experience."[522]

This disclaimer firstly explores the ways in which anatomical claims were validated through experience, highlighting that any claims made come from a large amount of study. This is particularly important when considering later claims about racial anatomical difference as experience in this area would not have been readily obtainable from cadavers. It is important therefore to question where this expertise originated from. Secondly, in its assurance that only the truly out of the ordinary will be noted as abnormalities, it leads us to question why supposedly normal bodily phenomenon for women or people of colour would be noted as abnormalities. It is only if the male white form was being used as the norm that this would be the case. On pages 129-131, Macalister explores the variations in the lumbar region of the spine, stating that there exist not only racial but also sexual variations from the norm in this region of

[520] Cunningham, Brash, and Jamieson, *Cunningham's Text-Book of Anatomy*.
[521] Dan Stone, *Breeding Superman: Nietzsche, Race and Eugenics in Edwardian and Interwar Britain* (Oxford University Press, 2002); Dan Stone, 'Race in British Eugenics', *European History Quarterly* 31, no. 3 (1 July 2001): 397–425.
[522] Macalister, *A Text-Book of Human Anatomy*, viii.

the body. In this particular case, Macalister describes people of colour as the "lower races".[523] This demonstrates more than just a white norm, it also idealises whiteness by placing it at the pinnacle of an evolutionary hierarchy. Later in his discussions of the skull, Macalister discusses the European male and female within the main body of text on the subject with the skulls of "other races" referred to later in the text in a separate section. In the first passage, Macalister reveals prejudice about the female form which places the white female also firmly below the white male in the anatomical hierarchy, describing her as immature.[524] While the second passage revisits the concept of racial difference in the human skull and face with Macalister explaining the differences between "Westerns" and "Mongolians" in a way which places the white man in a superior position. Here he compares a supposedly "Mongolian" facial feature to one usually found on foetuses which disappears before birth, in doing so infantilising the Mongolian.[525]

In Macalister's work the white man becomes an ideal norm. However, it is important to note that this textbook is extremely similar in its framing of normality to others on the market. As Ruth Richardson has explored in her work on *Gray's Anatomy*, very little originality was to be found in the publishing of anatomical textbooks. Images, text, and even formatting could be startlingly similar between textbooks.[526] As such, it is important to note that the presentation of white, and more predominantly male, as the norm was part and parcel of the way in which all anatomical texts of this period were written. Moreover, these published materials are more significant than the other types of source discussed in this chapter. Not only do they fit within the institutions in this study, acting as teaching aids within these classrooms, but they also disseminate anatomical knowledge beyond those walls. Although my study must necessarily be limited by scope, the information contained within these textbooks would have travelled far and wide. This has implications not just for anatomical study at the institutions named here, or even just for anatomical study at institutions, but for the field of anatomical education more generally. As such, it is possible to see the concept of racial anatomical difference spread widely across anatomical education. It is within this context that the new style of anatomical modelling was born.

[523] Macalister, 131.
[524] Macalister, 247–48.
[525] Macalister, 522.
[526] Richardson, *The Making of Mr Gray's Anatomy*, chap. 9.

## Specimens

Specimens, both wet and dry, on the other hand are another object that three-dimensionally and spatially contextualised models within the laboratory setting, providing both use limitations and theoretical context for model use. Again, there are clear representations of race as a differentiating anatomical difference within these preparations. At University College London, for example, a specimen still exists which could have been used to illustrate points about racial anatomical difference. The wet specimen of a cross section of a human thigh, recently displayed in the University College London Art Museum, was taken from a Black person.[527] As Michael Sappol and Stephen Kenny have explored, a narrative of racial oppression undoubtedly led this limb into the possession of University College London's anatomy department.[528] The removal of this specimen from its Victorian context can cause one to forget this history. However, in its context of creation, it takes on a very different narrative to the one in which it is currently presented. Firstly, this limb has been deliberately kept; it would not have survived student dissection in a state fit for preservation. The specimen has also been very well looked after, illustrating its continued importance as a teaching material. This leg would not have held the same significance as for example the non-white specimens in Stephen Kenny's work on the Louisiana Health Train. Those specimens instilled fear and medical mistrust within black populations who viewed them, because they acted as a reminder that black bodies could continue to be exploited by white people even after death.[529] Specimens like the one at University College London would not have ignited the same fears in medical students, all of whom would have been white (and male). When under a solely white gaze in Kenny's work these specimens became objects of interest, curiosity, and spectacle. In a context where blackness is set off against a white norm, this positioning of black specimens as unique spectacle is repeated in the British anatomical classroom. In this context, black bodies are apart from the norm and therefore become curio's to be preserved and collected in jars.

This specimen at UCL is currently recorded without reference to race. However, these are modern records. Specimens taken from non-white cadavers which appear in records from the late-nineteenth century were categorised clearly as such. At the University of Edinburgh there were two foetal specimens labelled as "the foetus of a negress".[530] The addition of information about race to the records for these specimens suggests that this detail is as important as the few

[527] 'Cross-section of a Human Thigh', RFH.D71a, University College London Pathology Collections.
[528] Sappol, *A Traffic of Dead Bodies*; Kenny, 'Specimens Calculated to Shock the Soundest Sleeper'.
[529] Kenny, 'Specimens Calculated to Shock the Soundest Sleeper'.
[530] 'Spencer Cobbold Catalogues', n.d., 225, EUA/IN1/ACU/A2/16/1-3, Edinburgh University Archives.

other details listed. These included gestation lengths before termination and the elements of the specimen which had been dissected. However, race was considered to be as important a label as these categories only in the case of non-white foetal matter. Recorded alongside many other foetal specimens, these are the only two to include any label referring to the race of the specimen. As such, this suggests that specimens, in their labelling and presentation, also helped to depict whiteness as normality, reinforcing the narrative surrounding anatomical models.

## Models and manuals

Models were used within these spaces, as were specimens, diagrams and a full multitude of other resources. These were the spaces in which lectures were explained in more depth, questions could be answered, and specimens prepared or dissected, linking the lecture room with the dissection room. In these cases, models are three-dimensionally diagrammatic, unlike in the lecture theatre where they are presented in a way that is removed from the students and therefore serve the same two-dimensional function as diagrams. Within the laboratory these models, therefore, offered a better visual and tactile comparison to specimens. Here they present normality in the face of potential pathology.

Obviously, full-body models during this period, as I have demonstrated in chapter two, did not represent anything but the white norm. However, some of the printed materials designed to complement their use did include references to racial anatomical difference. In a set of lectures given by Dr Auzoux converted into a pamphlet to accompany his full-body anatomical models, facial angle and phrenology are both referenced. Here, Auzoux directly links cranial capacity with intelligence, referencing Petrus Camper's prognathism.[531] Meanwhile, other smaller or less expensive three-dimensional materials that may have been designed to supplement models of the white norm, focussing on the skull and other skeletal racial anatomical differences. For example, five models of crania purchased by the University of Oxford in 1902 which may have been used during Arthur Thomson's 1903 lecture on Man's Cranial Form, discussed above. These models have not survived to the present day; however, it is plausible that they represented racial anatomical difference. The presence of five separate models coincides with the nineteenth century perception of the existence of five distinct races of man, as discussed in chapter four. These models were accessioned into the Oxford Museum and placed amongst the other

[531] Louis Thomas Jérôme Auzoux, *Leçons Élémentaires d'anatomie et de Physiologie, Ou Description Succincte Des Phénomènes Physiques de La Vie Dans l'homme et Les Différentes Classes d'animaux, à l'aide de l'anatomie Clastique*, 158–61.

anatomical materials used for teaching.[532] It is therefore not unreasonable to assume that they would have been taken to the laboratory during lessons on the skull or head, offering materials "for comparison" with items like skulls.[533]

To model representation of research into racial differences in the lumbar region on the other hand would have required the production of full-scale models of non-white anatomy solely for this purpose, which did not occur. Instead, for example, the University of Cambridge owned both an articulated "Hottentot" skeleton (male) and an articulated European skeleton, purchased in 1832.[534] Although the former cost almost three times as much as the latter, they both together cost less than a quarter of a model made by Dr Auzoux.[535] It is plausible that these articulated skeletons were used to demonstrate this particular point instead of models because of cost limitations but also because full-body models of normal anatomy were not designed to represent variations to the norm.

## Race in the dissection room

One of places in which we would expect to see references to racial anatomical difference is the dissection theatre. British dissection rooms would not have had the same supply of bodies as we have seen in some American classrooms during the nineteenth century (see figure 3.12, page 114). However, the demographics from which cadavers were usually sourced in Britain were far from homogenous, especially in the port cities of places like Liverpool, Edinburgh, and London. In the wake of the 1834 Anatomy Act, poverty filled Britain's dissection rooms. This demographic which had traditionally been most at risk from bodysnatching now legally formed the body supply. In Liverpool, one of the poorest areas was also one of the most diverse, as the port town drew inhabitants from around the world.[536] Meanwhile, records from the Paisley Workhouse near Edinburgh show smaller but still significant evidence of diversity within the poor population.[537] As such, we would expect steady, although perhaps not necessarily always high,

[532] 'Department of Zoology & Comparative Anatomy. Presentation Book Vol. 1 1883-1948', 1948 1883, Oxford University Museum of Natural History, Archives and Library.
[533] Thomson, 'Letter from Arthur Thomson'.
[534] 'University Registry Guard Books: Professor of Anatomy', pt. 8.
[535] £22, £8, £140.
[536] John Herson, 'Liverpool as a Diasporic City' (Economic History Society Annual Conference, University of Nottingham: Economic History Society, 2008), http://www.ehs.org.uk/events/academic-papers-2008.html.
[537] Wendy M. Gordon, 'The Demographics of Scottish Poverty: Paisley's Applicants for Relief, 1861 and 1871', *Journal of Scottish Historical Studies* 30, no. 1 (1 May 2010): 25–42.

numbers of non-white bodies to find their way onto the anatomist's table.[538] However, this is not the story we see in archive records. Surprisingly, given contemporaneous American dissection room and population demographics, there is just one isolated case of non-white cadavers being identified in records from these British university dissection rooms during the late nineteenth century.[539] I present this case here because it may be of interest to the reader; it demonstrates the pervasiveness of concepts of racial anatomical difference across classroom spaces, even those focussed more heavily on practice than theory. However, it is also important to note that alongside the rarity of discussion of race in these spaces, there is also a scarcity of models, as discussed in chapter three. As such, this space demonstrates the correlation between models and theories of racial hierarchy in anatomical classrooms through its comparative lack of both elements.

The cadavers that reached the anatomists table at this time were recorded in a number of ways. Firstly, purchase records give us an idea of how much departments were paying to suppliers of bodies and body parts.[540] It is unclear as to whether these were legally obtained; the anatomy department at Oxford for example had space for a van to be driven all the way inside the new buildings before unloading.[541] This allowed the unloading of bodies out of sight of public eyes, helping with university public relations, but also could have aided the trade of bodies outside of the regulation of the Anatomy Act. Secondly, records of student dissection were usually kept so lecturers could know that students had performed a sufficient number and range of dissections for their qualification. These would often be broken down into winter and summer sessions, with a table indicating which students had dissected which body parts (thorax, lower leg, etc.).[542] Finally, abnormalities and deformities books were kept in the anatomy department of some schools. These were used to record any extreme variations anatomists came across during the course of their work and might have been able to offer useful insights into the depiction of

[538] Although the category 'non-white' is problematic, I am using it here to emphasise the othering of diversity occurring within the source material which presents whiteness as a norm and everyone else as abnormal.
[539] Sappol, *A Traffic of Dead Bodies*.
[540] Bodies are recorded as costing £1 17s (with undertaker's costs at £2 6s) in the 'Department of Human Anatomy Account Book', 1903 1885, HA 1/1, University of Oxford Special Collections, Bodleian Library; whilst Elizabeth Hurren has recorded costs from between £1 1s and £6 14s 6d in her article Hurren, 'A Pauper Dead-House'.
[541] Anon., 'Human Anatomy at Oxford', 902.
[542] 'UCMS Practical Anatomy Class List', 1914 1894, S3121, University of Liverpool: Special Collections and Archives.

normality through what was considered abnormal.[543] Unfortunately most of these abnormalities and deformities books have not survived in the historical record.

What then can we ascertain from these records about race in the British dissection room, and what impact does this have on the presentation of models within the classroom? As detailed above, these records show an almost complete lack of diversity in British dissection rooms at this time. This is evident because the rare instances in which a non-white body is obtained are highlighted by the anatomists.[544] These records identify that diverse bodies were missing from the anatomists table. The ways in which non-white bodies were used, as demonstration material rather than material for student study, as well as the research interests of anatomists discussed in chapter four, indicates that the absence of these bodies was felt by the anatomist. This identifies non-white bodies as one of the most severe gaps in the cadaver supply, caused largely by population make-up. However, there was no attempt to meet this shortage with models. In the dissection room historiography, body shortages form a large narrative and models are depicted as items used to make up for this shortage within historical literature.[545] However, when we examine the places in which shortages were most keenly felt, we can see that the models produced do not fit this specification. As such, I argue that these models were not designed to fill these gaps, their use-value was, as with diagrams, gleaned from their ability to offer a white norm with which cadavers might be compared.

## Recording race

In the single example of racial identification in the dissection room, it is the categorisation of bodies which framed race as a differentiating feature. It is here that we can see racial diversity set aside from the white norm. The 1894-1914 Practical Anatomy Class List at the University of Liverpool is a book commonly to be found within anatomical archival records. The main function of this book, and those similar, is to record which students dissected which body parts and when. This was done in order to ensure that all students had been able to dissect the correct portions of the human body to receive their qualifications. The number of specimens used in each teaching term was usually recorded alongside these student records and are, in the numerous records across the country, usually divided into male and female bodies. However, on two

[543] 'Record of Abnormalities', 1906 1904, EUA IN1/ACU/A2/5/2, Edinburgh University Archives; 'Notebook of Anomalies', 1937 1909, IN1/ACU/A2/5/4, Edinburgh University Archives.
[544] 'UCMS Practical Anatomy Class List'.
[545] Hurren, *Dying for Victorian Medicine*, 232.

occasions between 1894 and 1914 the Liverpool record indicates that race, when encountered, was an equally as important signifier in the anatomical context as gender. The list of bodies used for dissection in summer term 1897 reads:

> "Dissected by students
> 5 Male
> 3 Female
> Dissected for observation
> 1 male (chinaman)
> 9 Total
> Number of students on roll 60"[546]

In the winter session of 1905-06 an again separate line reads "1 Male- negro". However, in this case it appears the students were permitted to dissect as well as watch the dissection of this rare cadaver.[547] Here we can see that race was specifically included as a separate category, of equal importance to gender when differentiating between cadavers. The concept that race was important as a signifier is bolstered by the context in which it is presented. In a record where male is strictly delineated from female- including in the student roll section of the records when female students began to be admitted to the course- and where male cadavers are used almost exclusively as the demonstration material, it is already clear that these anatomists viewed gender as an important categorical distinction.[548] It can therefore be inferred that if race was unimportant as a differentiating factor, the cadavers highlighted above would have been included within the male category. This is particularly visible in the second case where the cadaver is not being used for demonstration purposes and so does not have any other reason to be differentiated from the cadavers in use by students, irrespective of the selection criteria for demonstration material made in the case of the "chinaman".[549] Male was the demonstrable norm- in this case it is possible to extend that to exclusively include the white male body as the norm and indeed ideal teaching specimen.

The inclusion of these categories in the notes illustrates a clear distinction being drawn between white bodies and non-white bodies. Written in the same hand, it is possible to assume that the note-taker was consistent in their recording of race in this way. Whilst this could therefore be considered a quirk of the Liverpool anatomy school, records of other schools demonstrate a similar national approach to the recording of bodies by gender and, excepting London, were far less ethnically diverse in their local populations. It is also important to bear in mind that in this

[546] 'UCMS Practical Anatomy Class List', 30.
[547] 'UCMS Practical Anatomy Class List'.
[548] Female students were recorded in 'UCMS Practical Anatomy Class List' from 1905 onwards.
[549] 'UCMS Practical Anatomy Class List', 30.

Liverpudlian source they distinguish cadavers by specific racial origins, rather than grouping them into a non-white category. This demonstrates the scarcity of non-white dissection material even in the diverse port city of Liverpool. As such, this suggests that we do not see the same categorisation in the records of other universities because there were no non-white bodies passing through those anatomy schools. This makes it difficult to ascertain if this method of recording race in dissection room records was unique to Liverpool. However, I use the categorisations white and non-white here, not to present all human diversity in relation to whiteness but, because this is the meaning we can take from the categorisation of these bodies. These bodies were not seen to belong in the normal male/female categories because they were both not white, rather than in virtue of their specific ethnicity. As such, this drawing of such racialised distinctions at Liverpool is extremely telling when considering normality and abnormality in the anatomical classroom.

## Demographics: racial differentiation in context

It is important to acknowledge the rarity with which racial difference was recorded even within this individual record from the Liverpool dissection room; just two non-white bodies recorded in 20 years. Despite Liverpool's perceived heritage as a diverse city (Liverpool is home to one of Britain's oldest black communities, as well as the first British mosque, opened in 1889) the numbers of non-white bodies recorded in the Liverpool dissection room at first glance do not appear to be out of step with the percentage of non-white citizens living in Liverpool at this time.[550] In 1911, the black population of Liverpool has been estimated at around 3000, c. 0.4% of the total population of the city.[551] At the same time there were a maximum of 672 people of Chinese descent living in the city in 1911- less than 0.1% of the total population.[552] As such, roughly one in every two hundred citizens of Liverpool in 1911 would have been non-white. This correlates quite neatly with the figures we receive from the anatomical dissection logs of the medical school.

However, as Michael Sappol has observed, dissection rooms would not have been a clear reflection of the entirety of society under anatomy acts like the one passed for Britain in 1832, which legally allowed the dissection of paupers with no relatives to claim their remains. Rather dissection rooms would have drawn from the poorest and least socially and politically protected

[550] Raymond Henry Costello, *Black Liverpool: The Early History of Britain's Oldest Black Community 1730-1918* (Liverpool: Picton Press - Liverpool, 2001); Olivier Sykes et al., 'A City Profile of Liverpool', *J. Cities*, 2013, 6.
[551] Herson, 'Liverpool as a Diasporic City', 9.
[552] Herson, 10.

groups in society.[553] Michael Sappol and Stephen Kenny have demonstrated that in many cases the poor black American population was often the least well protected against body snatchers and that this was reflected within the local dissection classrooms (see figure 3.12, page 114). When taking this kind of class divide in anatomical provision into consideration, we might expect to see a greater representation of diversity on the anatomists table. Liverpool at the end of the nineteenth century was a thriving port town which sent and received international shipping and tropical expeditions. The area surrounding Liverpool's port was simultaneously extremely poor and considerably more ethnically diverse than the rest of the city. The poor and salubrious port-side areas of Liverpool had Black and Asian populations of between 15 and 18 percent in the late nineteenth and early twentieth centuries.[554] Indeed the scholar John Herson attributes the presentation of Liverpool as a highly diverse area in the records of visiting sailors to the concentration of the Black and Asian populations around this port area in Liverpool, as many sailors on short stops would not have ventured further into the city.[555]

Whilst illustrating the relatively low frequency with which these demographics appeared in the Liverpool dissection room, these figures do not explain the separate categorisation of these bodies. Although it may be tempting to put these striking categorisations down to the rarity of the types of bodies in question within the medical classroom, in the context of a highly racially aware Liverpool, this must be re-analysed. Ian Law has explored Liverpool's racist past claiming that racism has been an integral part of the city's development since the seventeenth century.[556] Whilst Liverpool had a reputation in the Americas for tolerance, leading many ex-seamen and runaway slaves to settle there, Liverpool was perhaps only proportionally less racist.[557] Liverpool spearheaded the anti-abolition movement in Britain. With so many of its politicians involved directly in the slave trade, one was either a "Humanity Man" or a "Liverpool Man".[558] There is even evidence of a continued trade in slaves in Liverpool after the slave trade in Britain was abolished in 1772. For example, in 1779, a Black boy was put up for sale in a Liverpudlian newspaper.[559] This Liverpudlian preoccupation with race in can be seen to continue into the nineteenth century; according to Ian Law, there was a significant rise in "coherent and well-developed racist beliefs" in the 1850s.[560] "Liverpool's dominant social character was white

[553] Sappol, *A Traffic of Dead Bodies*, 9–10.
[554] Herson, 'Liverpool as a Diasporic City', 9; Sykes et al., 'A City Profile of Liverpool', 6.
[555] Herson, 'Liverpool as a Diasporic City', 9–10.
[556] Law, *A History of Race and Racism in Liverpool, 1660-1950*, v.
[557] Law, 15.
[558] Law, 8.
[559] Law, 9.
[560] Law, 10.

and determined by its synthesis of British and Irish peoples" and, as such, we cannot overlook the ways in which non-white figures were presented in Liverpudlian anatomical accounts of the period.[561]

## Abnormalities and deformities

At other institutions there are hints of the same bodily categorisation evident at Liverpool, although without information regarding race. Some university anatomy theatres kept specific records of abnormalities and deformities that were seen on the dissection table. In her article of the same name, Elizabeth Hurren has discussed these abnormalities and deformities books, investigating anatomical research into insanity and the brain.[562] These books were records kept in dissection rooms of anatomical departments in which anatomists and demonstrators could record bodily conditions which were out of the ordinary. Within, categories such as sex and age were recorded next to information about the abnormality in order to provide provenance for the finds. These books, through the presentation of the abnormal, aid in our understanding of what was considered normal. They also help to contextualise the presentation of race as an abnormal quality elsewhere in the anatomical classroom. Hurren shows us that these books were available at Cambridge, and records at the University of Edinburgh confirm that they likewise had a Record of Abnormalities from 1904-1906 and from 1909-1937.[563] This does not necessarily appear to be a universal phenomenon with the Universities of Oxford, Liverpool and London showing no sign of comparable records. It is therefore unclear whether this was a widespread practice in which the records have been lost over time or a more institutionally specific occurrence. As such, it is necessary to bear in mind that conclusions drawn from these works may not be more widely applicable.

Surviving records at Edinburgh and Cambridge give a clear picture of what normality was considered to be in response to what was perceived to be abnormal. These records largely address variations in shape, size and location of organs and bones, in some cases making reference to the gender or age of a subject.[564] However, there appears to be no reference made to race and all of the accompanying images show no skin (see figure 6.3, page 209). Reasons for this exclusion of racial difference might be seen in the work of lecturers who looked at abnormalities within their private research. As we have already seen in discussions of Alexander Macalister's work, it was not 'abnormal' to be working on variations to the human body as an

[561] Herson, 'Liverpool as a Diasporic City', 10.
[562] Hurren, '"Abnormalities and Deformities"'.
[563] 'Record of Abnormalities'; 'Notebook of Anomalies'.
[564] 'Record of Abnormalities'; 'Notebook of Anomalies'.

anatomist. This kind of research was clearly pursued by William Webster Fisher, Professor of Medicine at Downing College, Cambridge (1841-1874) – another institution with an abnormalities and deformities record – who conducted "research pathological and physiological". This research consisted of three parts:

> "1. Exposition of the normal conditions of the parts- as necessary to the comprehension of the abnormal"
> "2. Exposition of the abnormal conditions which those parts occasionally offer"
> "3. Exposition of the embryonic of foetal conditions calculated to throw light on the abnormalities so offered"[565]

Here we can see that foetal development might be considered in cases of disfigurement or variation in size. This view of the causal effects of abnormality and deformity as foetal completely ignores race, gender, and age as reasons for variation. Mentions of gender and age of specimens in these cases rather points to a correlatory rather than causal approach to categorising variance. Of course, it is also quite possible that the above abnormalities and deformities books make no mention of race because there were no non-white bodies passing through the anatomy schools at this time. As such, it is difficult to draw distinct conclusions from this material. However, it is evident that the language of normality and abnormality continues to be used in this setting.

[565] Papers of William Webster Fisher, DCPP/FISH, Downing College Archive, Cambridge.

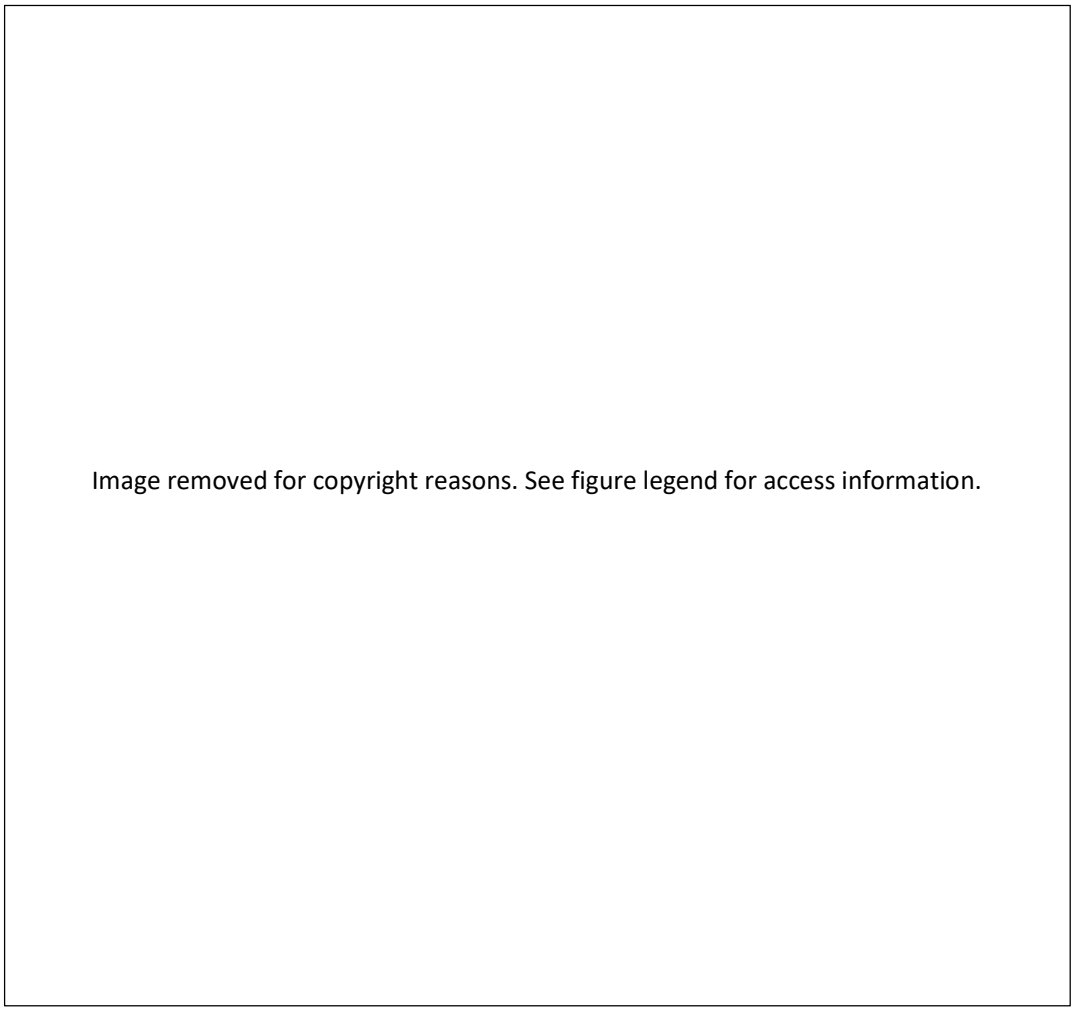


*Figure 6.3 Record of Abnormalities (1904-1906). Case illustration signed R. MacDonald showing no skin (EUA IN1/ACU/A2/5/2, University of Edinburgh Archives, Edinburgh)*

## Models filling the gap?

Anatomical models have broadly been categorised by historians as items used to 'fill the gap' in the supply of corpses for medical study.[566] This could possibly have been the case for earlier anatomical models, and for more complex models used in modern medical research, as these were created using specific corpses (even if multiple corpses were used) and in some cases literally designed to act as stand-ins.[567] However, this narrative does not fit with the style of models adopted in the 19th century. Generalised models of normal human anatomy cannot be

[566] Hurren, *Dying for Victorian Medicine*, 232.
[567] Surgical training models designed by Clare Rangeley in Hallam, *Designing Bodies*.

represented as cadaver replacements in the same epistemic way and as such must have had a different value-in-use.

More importantly, these normal models did not fill the most fundamental gaps in the body supply chain. As discussed above, nineteenth century anatomical schools lacked diversity in the corpses they were able to acquire. However, it is the anatomists desire for these kinds of cadavers which indicates a perceived gap in the supply of cadavers, that this shortage in supply was felt. That students were only permitted to observe dissection in the case of the "chinaman" discussed above reveals how desirable his body was to the professional anatomists within the Liverpool department.[568] Meanwhile, preserved specimens taken from these cadavers, none pathological, demonstrate an understanding of Black normality as fundamentally different from white normality. Not only were these bodies acknowledged to be different enough to require their own category within body registers, not only were they in short supply, but they were also clearly of interest to professional anatomists and useful as a teaching material. However, in response to this demand, we do not see a market emerge in the construction of models of these bodies. Perhaps this was because specimens were made from the remains of the body. However, as discussed, it is often difficult to preserve human tissue without decay and body parts after dissection are often in no state to construct useful teaching specimens. If specimens were made from these cadavers, they still would have been unique within the Liverpool department, barely satisfying the anatomists desire for this teaching material. Under these conditions, models which displayed higher ethnic diversity would have had a usefulness and value within the classroom. However, these models only represented whiteness and, as such, there is room for a different interpretation of these models which portrays them as deliberately excluding diversity.

This conclusion is emphasised by the production of embryological models, as discussed by Nick Hopwood. Anatomical models *could* be and *were* manufactured in response to the desires of the anatomical classroom. Embryological models depicted similarly unobtainable specimens, those so rare and difficult to obtain that they often had to be taught through models and microscope slides alone. In the late-nineteenth century Adolf Zeigler set up his modelling business which he then passed to his Friedrich son in 1889.[569] His models soon became indispensable to the anatomical classroom. These model sets were not cheap but were so desirable that some anatomical schools had fake copies made, in some cases employing in-house model makers to do so.[570] Embryological material was clearly desirable to anatomists, and

[568] 'UCMS Practical Anatomy Class List'.
[569] Hopwood, *Embryos in Wax*.
[570] This is specifically stated at Oxford and is evident in a visual study of the embryological models held

Adolf Zeigler monetised this niche in the modelling market to successfully fill this gap in anatomical supplies.

However, this pattern was not followed in the case of models of non-white bodies. This dismissal of non-white bodies reveals the presentation of white bodies over others as a form of idealisation. As such, I propose that the late-nineteenth century style of anatomical model was used both to reinforce and idealise the normalisation of the white body. Models interact with these instances of racial categorisation in the dissection room in a very specific manner; one which is linked to both their physicality and their presentation of whiteness. In some instances, models were stored in the dissection room, as discussed in chapter three (see figure 3.6, page 109). Although, more regularly, the dissection room walls were adorned with diagrams in two dimensions rather than three (see figure 3.8, page 110). In these spaces, then, models can be seen to have had the same use-value as two-dimensional diagrams, although in three dimensions: as objects for comparison to cadavers. By repeating material that could be found more readily in dissection rooms, specimen jars, and printed materials, these models do not add anything new but rather reiterate the normal depictions we see in those locations, reinforcing the primacy of whiteness.

## Race in the museum

The final space in which models and ideas about racial anatomical difference demonstrably interacted was the anatomical museum. Nineteenth-century university museums can be described as both teaching spaces and wider resources in the context of anatomical teaching. On the one hand, they could include the other lecturing and teaching spaces within their walls. They could also house the rooms of professors and lecturers, as often they would be simultaneously tasked with collection management.[571] On the other hand, the contents and organisation of specific museum rooms, as we might traditionally understand the term museum, formed part of the atmosphere in which students learned anatomy. These museums were, as I explored in more depth in chapter three, often a mixture of specimens, bones, and models, both human and animal. The interaction in these locations is one which is spatial and contextual, with curatorial ordering of materials as a mediator between theory and object. The human material presented numerous narratives, but these resources often told a very specific tale when it came to the question of racial difference. Skulls featured heavily in anatomy museum collections,

at UCL.

[571] Acland, 'The Medical Department in the Court of the Museum'.

there for the sole purpose of racial classification and comparison. As Samuel Redman and Stephen Jay Gould have both explored, skulls were used in these settings to corroborate opinions about the superiority of whiteness.[572] They were often presented in series and in categories. Although these categories or methods of categorisation might change, as Redman has shown, the narrative of white superiority did not.

These skulls were supported by other bones, both human and animal, which served to illustrate both a larger view of evolutionary hierarchy and offer other areas for racial comparison. The narrative of white superiority was strengthened further by specimens, explored in section two above, drawings, and other publications which contributed to the othering of non-whiteness and the creation of a hierarchy within humankind. In this space, theory and context combined most strongly. Models were used here more freely by students and are known to have been mixed in with the other resources available for study. Again, in this context, both physical and theoretical, the most reasonable interpretation of the role and value-in-use of models was as depictions of white normality, with whiteness at the pinnacle of the evolutionary scale.

### Purpose and interdisciplinarity

Why is demonstrably spatial and theoretical interaction epistemically important in these museum spaces? Firstly, the theoretical culture of anatomical museums within British universities was designed to be highly interdisciplinary in the late-nineteenth century. This interdisciplinarity could take two forms. Firstly, museums could be large institutions in which departments would have separate display cabinets in the same spaces. This is the case at Oxford and Cambridge where the museums were designed to foster interdisciplinarity within the sciences through common spaces. This meant that anatomists and anatomy students would be exposed to ideas from anthropology, physiology, ethnology, and zoology, as well as geology, physics, and natural history, during their research and studies. At Oxford, the donation of the Pitt Rivers collection to the University Museum in 1884 bolstered the museum's focus on anthropological material and made provisions for one anthropological lecture per year.[573]Whilst Pitt Rivers worried that the Oxford Museum might not have been quite the right place to house his collection permanently, the collections can be seen to fit nicely with the general research interests of the anatomical department, as discussed in chapter four.[574] Indeed, the purpose of the Oxford museum was designed to be "one place for teaching and studying the Natural History

[572] Redman, *Bone Rooms*; Gould, *The Mismeasure of Man*.
[573] A. P., 'Pitt-Rivers and Moseley'.
[574] A. P.

of the Earth and its Inhabitants", an aim which incorporated the Pitt Rivers ethnological collection seamlessly.[575] Other kind of collections housed in these museums are visible through the lens of student societies like the Oxford University Junior Scientific Club. As discussed above, the society held events at the museum. The programme for their 1903 event described a room which explored the evolution of a horse "from its four toed ancestor [sic]".[576] As such, we know both evolution and comparative anatomy featured strongly in the Oxford Museum. Similarly, at Cambridge, the Geology museum was housed next to the Anatomy Museum – which itself also contained the university's physiology collection – within a larger compound of rooms for the sciences.[577] This interdisciplinarity fostered a much closer relationship between the sciences than is usually acknowledged at this time. In this context, the framing of models of normal anatomy as representations of whiteness and ideal normality would have been stronger as they would be compared against the other disciplinary collections. Comparison with collections of pathological or zoological material would have only served to reinforce healthy models of man as the pinnacle of life on earth.

Alternatively, museums of anatomy could be more isolated collections, presenting bones and specimens, usually in seriation or categories, solely for the use of anatomical students. The larger museums at Oxford and Cambridge both contained these smaller kinds of anatomical museums within their walls (see figures 3.19 and 3.20, pages 123 and 124). However, these individual museum spaces were no less interdisciplinary than the larger ones. For example, the anatomical museum at the University of Edinburgh had a record dedicated solely to recording its ethnological accessions, whilst images of the original museum on display in today's anatomy museum space demonstrate the wealth of comparative anatomy specimens and skeletons displayed alongside the human anatomy materials (see figure 3.22, page 127). Importantly, these spaces were not free from ideas about racial anatomical difference. This was not just a result of the items contained within these collections, such as series of skulls or the specimens described above, but because of the arrangement and curation of these pieces. The seriation of development within cabinets and the relation of materials to each other seems designed to have encouraged discussion about evolution, hierarchy, and racial difference.[578] This was a discussion which would have placed white models of anatomical normality at the top of an evolutionary

[575] 'Papers Relating to Early Professors and the History of the Museum', n.d., pt. 7, MU 3/13, University of Oxford Special Collections, Bodleian Library.
[576] Oxford University Junior Scientific Club, 'Conversazione', 15.
[577] 'University Registry Guard Books: Sedgwick Memorial Museum', 1924 1873, University/CUR 110, Cambridge University Library, Department of Manuscripts and University Archives.
[578] D. J Cunningham, 'The Varying Form of the Stomach in Man and the Anthropoid Apes (With Four Plates)', *The Transactions of the Royal Society of Edinburgh* 45, no. 1 (1906): 32.

hierarchy. Indeed, in Edinburgh, renowned proponent of anatomical racial differences Robert Knox was made curator of the anatomy museum. Although Knox began a career as a touring lecturer after his fall from grace for his role in the Burke and Hare scandal, the work he undertook in the formation of the museum formed the basis on which Turner and Cunningham would later build. Described later as Cunningham's museum, it was seen by the Royal College of Surgeons in Edinburgh as "sufficient for the illustration of lectures on [anatomy]".[579] This demonstrates the potential use of the objects therein to demonstrate in lectures which would include information about racial anatomical difference. Letters between Turner at Edinburgh and Thomson at Oxford indicate that the presentation of racial anatomical difference was encouraged within these spaces across the institutions within this study.[580] Meanwhile, letters between Rolleston at Oxford and Alfred Newton at Cambridge suggesting that the Cambridge museum be modelled on the Oxford one indicates that the inclusion of racial anatomical difference within museums was spread further still.[581]

## More than skulls

Another important contributing element to the narrative of hierarchy in these museum spaces, which directly contextualised model use, were skull collections. Skull collections were popular additions to these museums and have formed a separate contribution to the literature on nineteenth century anatomical museums based at professional institutions.[582] These collections straddled this interdisciplinary boundary between anatomy, ethnology, and anthropology. At Edinburgh and Oxford specifically, skulls were considered to be anatomical material, and indeed still reside within the anatomical museum collections today. The collection was increased significantly when the University of Edinburgh received a sizable donation of skulls from the Edinburgh phrenological society in 1874.[583] This bone room, illustrating Samuel Redman description of the nineteenth century museum's obsession with racial categorisation, is still intact in its original nineteenth century form today. In fact, it is still possible to see exactly how these skulls were categorised by race and then by subcategories within races (see figures 6.4 and 6.5, pages 215 and 216).[584] Meanwhile, the purchase records of the University of Oxford

[579] 'Certificates from the Royal College of Surgeons', 1878, Coll-14/2/5, Edinburgh University Archives.
[580] 'Letters to Arthur Thomson'.
[581] George Rolleston, 'Letter for George Rolleston to Alfred Newton', 1863, MS Add.9839/1R/215, Cambridge University Library, Department of Manuscripts and University Archives.
[582] See, for example, Redman, *Bone Rooms*; and MacDonald, 'A Body Buried Is a Body Wasted: The Spoils of Human Dissection'.
[583] 'Inventory of Contents of Phrenological Museum Edinburgh', 1874, IN1/ACU/A2/16/15, Edinburgh University Archives.
[584] Redman, *Bone Rooms*.

Anatomy Department show that they were also heavily invested in skull collection.[585] Indeed, as discussed in chapter four, both George Rolleston and Arthur Thomson were heavily involved research surrounding skulls, including craniometric research and research into pre-historic man and were not willing to let these collections move elsewhere until much later.[586] The University of Cambridge similarly can be seen to collect skulls in the period between 1891 and 1903.[587] These skull collections would have been heavily linked to ideas of hierarchy, categorisation, and racial characteristics that were exposed by Stephen Jay Gould in the craniological investigations of Samuel Morton.[588] These were no neutral collections and even if these collections were not used in other classroom settings students would have thus been exposed to the idea of racial difference and racial inferiority as part of the wider culture of their anatomical education.


*Figure 6.4 'A selection of Guanche skulls on display in the Skull Room of the University's Anatomical Museum'. (David Cheskin Photography, 'Skulls Reveal Origin of Canary Isles' Aboriginals', www.ed.ac.uk (2017))*

[585] 'Department of Human Anatomy Account Book'.
[586] Thomson, 'Letter from Arthur Thomson'.
[587] 'Rough Journal of Receipts and Expenditure Relating to Dissection and Osteopathy', 1903 1891, University/ANAT/2/1, Cambridge University Library, Department of Manuscripts and University Archives.
[588] Gould, *The Mismeasure of Man*.

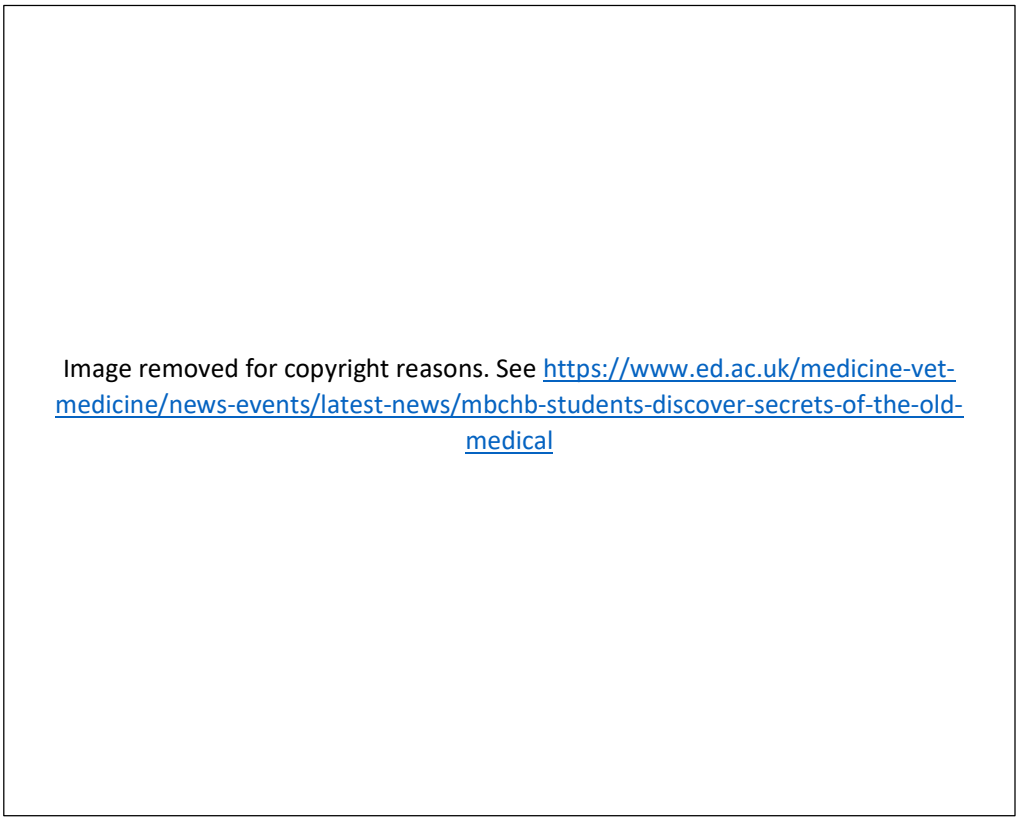


*Figure 6.5 'Javanese' skull. Illustrating the detailed categorisation of race in these collections. (Cropped from larger image, 'Students Discover the Secrets of the Old Medical School', www.ed.ac.uk (2016))*

Whilst perhaps the most explicit about racial categorisation, these skull collections were just one part of museum collections at these universities. Catalogues indicate that models, specimens, and paper resources all formed part of the collections curated within anatomical museums. As discussed earlier in this chapter, these museums contained items like the articulated skeleton of a "Hottentot" male, foetuses "of a negress", the cross-section of a black thigh, models of five crania- all of which were likely used for teaching elsewhere but stored within the museum.[589] The museum was the location where all of these kinds of materials could be viewed together directly alongside models of normal anatomy. It is in these spaces that the narrative of hierarchy and superiority was strongest, and it is in these spaces that models of normal anatomy were most regularly used and readily available to be compared to specimens designed to illustrate racial anatomical difference. Through comparison with these other

[589] 'Spencer Cobbold Catalogues: Catalogue 1', 1869 1848, EUA IN1/ACU/A2/16/1, Edinburgh University Archives; 'University Registry Guard Books: Professor of Anatomy'; 'Cross-Section of a Human Thigh', n.d., RFH.D71a, University College London Pathology Collections.; 'Inventory of the Department of Human Anatomy'.

materials designed to illustrate racial difference, images of white normality like anatomical models become images of white superiority.

Finally, these museums, not spaces of teaching but arguably spaces of learning, formed part of the wider culture of anatomical materials that contextualised models and influenced the quality of model use within the late-nineteenth century British university setting. For example, the libraries of these departments and universities also provide a window into the wider resources available to students and lecturers in their contextualisation of anatomical models. At Cambridge, the anatomical library contained copies of Paul Broca's *Instructions craniologiques et craniométriques,* Symington's *Topographical Anatomy of the Child*, and the Catalogue for the Glasgow Hunterian Museum.[590] Within these works, students would have been able to learn about facial angles and racial differences in skull shape, about the anatomy of children compared to adults, and about the specimens of the Glasgow Hunterian which included numerous specimens of hair, skin, ulcers, and genitalia described as "negro". It is in this wider atmosphere that the personal values of anatomists outlined in chapter four were formed, and within this context that late-nineteenth century models were given their value-in-use as depictions of both normality and as idealisations of whiteness.

## Conclusion

The instances of interaction between model, theory, and use analysed in this chapter demonstrate two points clearly. Firstly, that theories about racial anatomical difference were included within the context of late-nineteenth century British anatomical classrooms both evenly across the country and in abundance. Secondly, that these theories were demonstrably used to classify objects, including skulls, cadavers, and models, within these contexts. As discussed in chapter five, the value-in-use of an object can be understood by assessing the relationship between personal values, quality of use, and quality of service. That is to say by analysing specific instances of interaction between values, usage processes, and objects. As such, this chapter demonstrates not only that race was included within the narrative of the anatomical classroom in this late-nineteenth and early-twentieth century period but that this

[590] Paul Broca, *Instructions craniologiques et craniométriques*, Mémoires de la Société d'Anthropologie. 2e série ; t.2 (Paris: Georges Masson, 1875); Symington, *The Topographical Anatomy of the Child*; John H. Teacher, *Catalogue of the Anatomical and Pathological Preparations of Dr. William Hunter: In the Hunterian Museum, University of Glasgow* (Glasgow: James MacLehose and Sons, 1900).

occurred during model use and, as such, had a profound influence on the value-in-use and meaning created around anatomical models.

As discussed in chapter five, both personal values and spaces of use – which dictate quality of use – are of the highest importance in the creation of meaning. Within this chapter I have discussed evidence that these models, in these spaces, in these intellectual contexts were most likely to be portrayed as images of an ideal anatomical norm. Although of course there are other possible interpretations of the meaning of these late-nineteenth century normal anatomy, the instances of interaction explored within this chapter demonstrate why this portrayal is the most plausible. Following the framework provided by MacDonald *et al.* (see figure 5.2, page 177), I have in previous chapters analysed the quality of service (the models themselves) with the quality of use (the spaces and processes of model use) alongside the personal values of the users (which forms the highest level of consumer goal).[591] In this chapter, I have analysed points at which these three facets of history interacted during use to fully understand the value and meaning created around these objects. In doing so, I conclude that late-nineteenth century models of normal human anatomy represented whiteness as both a norm and an ideal. I believe that this methodology adds strength to this conclusion, adding weight to the argument that this is the most reasonable conclusion to draw from the evidence discussed in chapters two, three, and four. Although obviously more case studies are required to test the wider applicability of this methodology, here this methodology identifies one narrative above other possible narratives that could be reached using only methods from social history or the social construction of knowledge.

The othering of race in the anatomical classroom is vital in our comprehension of the new style of anatomical models. As outlined in chapter five, consumers use a hierarchical method to ascribe value and meaning to objects whilst using them. The pinnacle of this hierarchy is consistency with personal values.[592] As such, we know that anatomists' personal beliefs about racial anatomical difference should have influenced the value assigned to explicitly white

[591] Macdonald et al., 'Assessing Value-in-Use'.

[592] Rugg et al., 'Eliciting Information about Organizational Culture via Laddering'; Edvardsson, Tronvoll, and Gruber, 'Expanding Understanding of Service Exchange and Value Co-Creation'; Grönroos, 'Service Logic Revisited'; Grönroos, 'Value Co-Creation in Service Logic'; Robert F. Lusch and Stephen L. Vargo, 'Evolving to a New Dominant Logic for Marketing', in *The Service-Dominant Logic of Marketing: Dialog, Debate, and Directions*, ed. Robert F. Lusch and Stephen L. Vargo (London and New York: Routledge, 2006), 3–28; Stephen L. Vargo and Robert F. Lusch, 'Service-Dominant Logic: Continuing the Evolution', *Journal of the Academy of Marketing Science* 36, no. 1 (2008): 1–10; Stephen L. Vargo and Robert F. Lusch, 'Evolving to a New Dominant Logic for Marketing', *Journal of Marketing* 68, no. 1 (2004): 1–17; Vargo and Lusch, 'Institutions and Axioms'; Stephen L. Vargo and Robert F. Lusch, *The Service-Dominant Logic of Marketing: Dialog, Debate, and Directions* (London and New York: Routledge, 2006).

anatomical models. This chapter represents a comprehensive investigation into the value system that surrounded the use of anatomical models within the classroom setting, establishing that these values were influential in framing the meaning of these models. Nineteenth century anatomical classrooms were awash with ideas about anatomical differences between predefined racial categories. It is easy to see the dissection room as the main site of othering, with responses to literally coming face to face with difference. However, there is both an apparent lack of discussion of racial difference in most dissection rooms, as well as a demonstrably lower presence of models: an interesting correlation. Instead, the way race was presented in both the lecture theatre and the laboratory by professors and textbooks played a comparatively more important role in the creation of a wider culture of white normality. While, museums contributed to the wider problem of racial othering through emphasis on categorisation and seriation. I propose that this othering formed a significant part of the culture of university level anatomical study, invading all aspects of teaching and extra-curricular learning. This is the value system in which we must consider the new style of anatomical modelling.

As William Webster Fisher said of his physiological research, we must understand the normal to comprehend the abnormal.[593] In the case of nineteenth century anatomical models, the reverse is true; here we must comprehend the abnormal in order to frame normality. In its investigation of what was considered abnormal, this chapter has worked to establish what was considered normal. If racial difference was defined by anatomists in these spaces as abnormal, then whiteness must be considered normal. However, I argue that this normalisation of whiteness goes beyond the mere consideration of normality. Whiteness emerges as not only a norm but as a desired standard. One does not automatically follow from the other. The common appearance of white bodies is required to make whiteness the norm, but normalisation does not automatically signal an ideal. This is created through the favouring of the norm over representations of the so-defined abnormal; a phenomenon visible in the specific examples of interaction between context and use for anatomical models of this period. The further attention to the established norm amongst these models, at the expense of diversity, indicates a desire for the norm which outstripped interest in the defined abnormal. This idealisation through reinforcement becomes important when we consider the continued use of these models in classrooms today.

[593] Papers of William Webster Fisher, DCPP/FISH, Downing College Archive, Cambridge. See also: Georges Canguilhem, *The Normal and the Pathological*, trans. Carolyn R. Fawcett, New Edition (New York: Zone Books, 1991).

# Conclusion : Meaning in context

In this thesis I have begun to contextualise late-nineteenth century anatomical models within the British university classroom setting. I initially began this investigation because I was struck by the whiteness I encountered within anatomical teaching materials whilst conducting research into the late-nineteenth century anatomical curriculum at Oxford.[594] This phenomenon seemed peculiar given the nineteenth century obsession with race and racial difference in other arenas, such as the fairground, whilst at the same time natural given the rise of a scientific racism during this era which valorised whiteness.[595] This duality was heightened in the case of three dimensional models, given both the models' theorised role as replacements for the human body in the classroom and the body's role as the main focus of the nineteenth century obsession with race. I went on to theorise that the prevalence of whiteness within anatomical teaching materials might therefore be linked to this rise in scientific racism and intended for an investigation of this hypothesis to make up the bulk of this thesis. However, this avenue of investigation raised many more questions than it answered, some of them critical to the foundations of the historical method. I have asked here how theory and physical objects are related, questioning how meaning is created and how meanings become associated with objects. Fundamentally, I have found that these questions address the problem of how we as historians might detect unwritten assumptions and conversations within the historical record.

The concept of value-in-use has aided me in the elucidation of these aspects of the historical record. Value-in-use describes the creation of value, and by extension meaning, as a process undertaken almost solely by the consumers of an item as they use it. Initially expressed within the historical literature by Arjun Appadurai in his influential *The Social Life of Things,* this process refers solely to the assignation of value in economic systems of exchange where a 'purchaser' would value an item in a proposed swap depending on the utility of the item to themselves.[596] This process of value creation broadens the meaning of value beyond the simply monetary to include the relative worth and importance of an object. That is to say that it includes the meaning of an object within the concept of value. However, whilst the specifics of the process by which this value is created have eluded historians, the concept has been explored in considerable depth within marketing theory scholarship. Building on the interdisciplinarity of

[594] Martin, 'Evolutionary Anatomy'.
[595] Fausto-Sterling, 'Gender, Race, and Nation'; Bates, 'Dr Kahn's Museum'; Bates, '"Indecent and Demoralising Representations"'; Stepan, *The Idea of Race in Science*.
[596] Appadurai, *The Social Life of Things*.

the discipline of material culture studies, I have combined epistemic structures provided by marketing theory scholarship with more traditional historical methods in this thesis.

Marketing theorists have shown that the process of creating value-in-use consists of a decision-making process with three levels of goals in a hierarchy, with the highest level of goals relating to consistency with personal values.[597] Ultimately, this thesis has demonstrated the different elements of this top level of value creation. Earlier chapters elucidate the purchasing decision, any limitations on value creation, and the personal values of the purchasers with relation to the product, whilst chapter six addresses the combination of these elements in the creation of value. I firstly considered the anatomical models themselves, demonstrating the visual and epistemic differences between newer and older models with the aid of Erwin Panofsky's iconological methodology.[598] This demonstrated which models were chosen as teaching instruments, isolating the choices made by anatomists in their purchase of new equipment. Within this structure, I then considered the spaces in which these models were used. This allowed me to assess the physical limitations placed on value construction, drawing broadly on archaeological practices as used in material culture scholarship.[599] Finally, by exploring the intellectual history of anatomical racism I was able to investigate the first step in this identified decision-making process which gives precedence to the relationship between items and the fundamental values of purchasers.[600] However, it was only through the combination of these elements with a use-value approach in the final chapter that I was able to fully examine the meaning of these anatomical models to their owners and users. As such, I was able to conclude that anatomical models in the late-nineteenth century were demonstrably valued in use for their contribution to the construction of a normative vision of anatomy which prioritised whiteness above other forms of being.

[597] See, for example, Macdonald et al., 'Assessing Value-in-Use'; Rugg et al., 'Eliciting Information about Organizational Culture via Laddering'.
[598] Panofsky, *Meaning in the Visual Arts*; Berger, *Ways of Seeing*; van Leeuwen and Jewitt, *The Handbook of Visual Analysis*.
[599] Gaimster, 'Material Culture, Archaeology and Defining Modernity: Case Studies in Ceramic Research'; O'Connor, 'Anthropology, Archaeology, History and the Material Culture of Lycra'; Gaimster, 'Archaeology of an Age of Print?'; Anne Gerritsen and Giorgio Riello, 'Spaces of Global Interactions: Material Landscapes of Global History', in *Writing Material Culture History*, ed. Anne Gerritsen and Riello (London: Bloomsbury Academic, 2015), 111–33.
[600] Rugg et al., 'Eliciting Information about Organizational Culture via Laddering'; Macdonald et al., 'Assessing Value-in-Use'.

## Arguments

To examine the importance of the decision by many to purchase more anatomical models in the late nineteenth century, I first established the physical and aesthetic differences between late nineteenth century models and their predecessors. In doing so, I revealed an alternative historiographical narrative to that established by historians of wax anatomical modelling which traditionally prioritises the fate of wax models in the history of anatomical modelling more generally. Rather, than dying out in the early-twentieth century as a result of advances in photography, as described by Thomas Schnalke, or becoming one of Bates' "indecent representations" in the fairground, I demonstrated that there was a late nineteenth century separation in anatomical modelling which created a parallel history.[601] Working through the different models purchased by each of the institutions in this study (Universities of Oxford, Cambridge, Edinburgh, Liverpool, and University College London), I analysed four aspects of these objects to demonstrate a complete change in the style of anatomical modelling which saw the histories of wax models and models of other materials diverge. I firstly distinguished the different construction materials because of the different qualities they leant to the models. Wax, with its sweaty finish, is historically revered for its mimetic likeness to skin. Meanwhile plaster is rough and dry with a matte finish. I followed this with analyses of the physical form and colouring of these models, distinguishing between true to life forms with mimetic colouring and generalised forms with block colouring. Finally, I considered the production method of each model emphasising the difference between casting and sculpting 'from life', with the latter producing life-like but aggregated products. I argued that these two modes of production sit separately from sculpting or building alone which produced general and standardised models. Using a numerical chart to demonstrate these categories, I therefore demonstrated a move from life-like to standardised anatomical models during the nineteenth century. I proposed that it was this shift that resulted in a divergence of models of normal anatomy from wax models of anatomy which were becoming increasingly pathological, and which do not form the basis of this study.

After establishing the existence of a new and distinct style of anatomical modelling which prompted the purchase of new anatomical materials, I then drew on archaeological methods to consider the spatial position of the models in this study within classroom spaces and in relation to other teaching objects. In doing so, I argued that the models in this study had a unique place

[601] Schnalke, 'Von Der Normierten Anatomie Zum Historischen Patienten'; Bates, '"Indecent and Demoralising Representations"'.

in the classroom. Importantly, this conclusion challenged the notion that the role of anatomical models was their traditionally perceived role as cadaver substitutes.[602] I emphasised this point by indicating the demographics of cadaver supply and, consequently, the perceived gaps in cadaver supply that these models did not address. Instead, I demonstrate that within these spaces there were only two possible narratives for these models: as representations of the ideal body, or as representations of single instances of existence – a possibility I had already begun to challenge in chapter 3. Whilst I have demonstrated that this idealisation of whiteness is part of a wider classroom narrative that ran through contemporary objects and human tissues, I also maintain that it is somewhat embedded within the physical form of the models.

To complement the investigation of the spatial and physical context of model use, I then analysed the theoretical context of model use, addressing the personal values which drove the creation of value in use. My outline of the theoretical context of model use in chapter 5 emphasises the normalised racism of nineteenth century anatomists – during which I returned to the question about the domination of whiteness which initially fuelled this investigation.[603] I demonstrate here the depth and breadth of belief in racial anatomical difference, emphasising the range of different formats in which these opinions appear. Although there are several individuals who only have partial engagement with these ideas, through their ties to the community of anatomists endorsing these practices I argue that they were complicit in and did not challenge the creation and propagation of these ideas. It is through this continuity of adherence to the idea of racial anatomical difference that I demonstrate the processes of intellectual community building and the networks of communication used at this time. This in turn, I have argued is the context in which these models do not create cognitive dissonance. As per the methods from marketing theory, objects have value for consumers when they at the very least do not challenge their fundamental personal values. In this chapter I demonstrated that the fundamental view of anatomists, regardless of belief system, was that there were anatomical differences between the races and that this created a hierarchy within humankind (even if, for example, this hierarchy did not justify slavery). The white anatomical models in no way challenged these views. As such, I argued that these views account for the first rung of the means-end laddering system proposed marketing theorists as the process for value assignation.

[602] Hurren, 'A Pauper Dead-House'.
[603] For an investigation of early nineteenth century approaches to race by anatomists see Adrian J. Desmond, *The Politics of Evolution: Morphology, Medicine, and Reform in Radical London*, Science and Its Conceptual Foundations (Chicago: University of Chicago Press, 1989).

Finally, I constructed the value assigned to these models during use with a synthesis of the spatial, theoretical and iconographical contexts of these models within their context of use: the classroom. I argued that the new style of anatomical modelling, combined with its physical and intellectual context suggested that these models represented whiteness as both a norm and as an image of health and perfection. I demonstrated particularly the presence of the theoretical context within the spatial context during the process of use to show that the two limitations that these spaces placed on the interpretation of models were combined in the teaching arena. Finally, I have argued that the use of the models within these spaces shaped their meaning and value. Without the combination of these contexts it is possible to argue that models were used to represent one single iteration of humanity or that they were designed to stand in for the most common cadaver usually seen in nineteenth century dissection rooms. However, I argue that it is this particular combination of spatial, theoretical, and physical context within the classroom which indicates the use of white models as representations simultaneously of normality and of perfection.

One of the most common barriers that this work has faced is a persistent modern assumption that prevalence of whiteness in these models might have been because these were the bodies that medical professionals would treat or were interested in treating, as such making them the most appropriate for teaching and training. I have presented a number of arguments throughout this thesis to categorically demonstrate that this was not the case. Firstly, and most clearly, I have demonstrated that anatomists were highly interested in treating and working with non-Caucasian bodies as sites of intense exploration both during life and post-mortem. Secondly, the demographics discussed in chapter three demonstrate that the populations of these cities were, in some regions, diverse. As such, patient bases doctors, particularly those who worked in charitable institutions for the poor, would have been varied. However, the widest demographic variances, centred around ports and docks, also speak to the more common import and export of goods and expertise that formed part of thriving British trade and empire at this time. I have not investigated the career trajectories of the medical students trained at the institutions in this study. However, with schools of tropical medicine in Liverpool and London, and the service of several of the individuals within this study on the examination board for the Indian Medical Service, it is reasonable to assume that at least some students would have been destined to work abroad. This only further questions our assumed relevance of whiteness to the Victorian and Edwardian doctor, as well as demonstrating the persistence of assuming a white norm in the modern era.

## Impact

This work could have significant impact outside of academia. This work was inspired by two concerns. Firstly, concern over a widespread assumption that anatomical knowledge is neutral or purely factual. This thesis encourages people to challenge this belief by demonstrating the ways in which theory can affect the production of anatomical knowledge. Secondly, concern that models in the late-nineteenth century style continue to be used in classrooms today. This thesis demonstrates not only how these models were interpreted using scientific racism, but how they contributed to perpetuating a narrative of white superiority within the anatomical classroom. Specifically, I demonstrate that a white norm is not theoretically neutral. Anatomical models continue, with some notable exceptions, to reinforce narratives of white normality. As Reni Eddo-Lodge expands upon, white normality itself is part of white erasure of non-white narratives and part of a depiction of white supremacy.[604] This thesis speaks to these concerns within an anatomical context, highlighting how anatomical models are constructed as the norm which, in turn, offers tools to help dismantle these constructions.

This is particularly relevant given the current campaigns for a more inclusive medical curriculum. Conversations about race in the medical classroom are far from dead. At Edinburgh, the historically preserved skull room is still used for research, storage, and events.[605] The current promotion of the Black Lives Matter movement has led to a recent surge in concern over the diversity of medical teaching; taking the form of an online petition to the General Medical Council and the Medical Schools Council and a new book by Malone Mukwende highlighting the different, but ostensibly normal, presentations of certain conditions on non-white skin.[606] This thesis has already had impact on these discussions. As a result of my work here on white normality, I was recently asked (post-viva) to speak to the deans of the new Kent and Medway Medical School about diversifying their medical curriculum. Drawing on my research as presented here I was able to make the following recommendations. Firstly, diversity in materials is foundational and gives unconscious signals of your curricular intentions. As such, by

[604] Eddo-Lodge, *Why I'm No Longer Talking to White People About Race*.
[605] 'Edinburgh Medical School on Facebook', accessed 3 August 2020, https://www.facebook.com/EdinburghMedicalSchool/posts/1693778030679230; 'Students Discover the Secrets of the Old Medical School', The University of Edinburgh, accessed 23 August 2019, https://www.ed.ac.uk/medicine-vet-medicine/news-events/latest-news/mbchb-students-discover-secrets-of-the-old-medical.
[606] T K, 'Medical Schools Must Include BAME Representation in Clinical Teaching', Change.org, accessed 3 August 2020, https://www.change.org/p/gmc-medical-schools-must-include-bame-representation-in-clinical-teaching; Abi Rimmer, 'Presenting Clinical Features on Darker Skin: Five Minutes with . . . Malone Mukwende', *BMJ* 369 (25 June 2020), https://doi.org/10.1136/bmj.m2578.

diversifying the resources acquired for classroom learning, you can challenge the underlying assumption of white normality. Secondly, if you want knowledge about the different normal presentations of disease in BAME people to be properly assimilated by students, it needs to be included in multiple locations within the curriculum . In this way, students regularly encounter these concepts and these ideas, like those of supremacy before them, start to become part of the fabric of medical learning. Personal experience with the integration of women into the history of science and medicine curriculum, allowed me to strengthen this advice by noting that single sessions might appear tokenistic.[607] Whilst further research enabled me to emphasise the impact of foundational ideas about normality on medical research and the reduced efficacy of medical treatments for BAME people and women more broadly.[608] It is in these ways that the research outlined in this thesis has impact on conceptions of medical and anatomical teaching, even today.

This work is also timely, as anatomical teaching materials may currently be experiencing a paradigm shift. Traditional three-dimensional models and textbooks are now in competition with computerised three-dimensional visualisations, such as the Anatomage table and 3B Smart Anatomy, both of which allow for the storage of multiple iterations of the human body.[609] Traditional three-dimensional modellers like Adam,Rouilly are also beginning to expand their ranges to include black models.[610] This thesis has the power to impact the design of these new anatomical teaching materials as they develop. Demonstrating the ways in which prejudices and cultural biases have entered these objects in the past, this work encourages present day manufacturers to be more aware of the ways in which social theories might be influencing the production of their new anatomical technologies. I hope my work will encourage us to learn from the past, encouraging reflexivity over the motivation for the inclusion and exclusion of

[607] Sadie Harrison et al., eds., *Women in the History of Science: A Sourcebook* (UCL Press, 2021).
[608] Valentine J. Burroughs, Randall W. Maxey, and Richard A. Levy, 'Racial and Ethnic Differences in Response to Medicines: Towards Individualized Pharmaceutical Treatment.', *Journal of the National Medical Association* 94, no. 10 Suppl (October 2002): 1–26; Roger Mills, 'What's Behind The Gender And Ethnicity Imbalance In Clinical Trials?', accessed 3 August 2020, https://www.clinicalleader.com/doc/what-s-behind-the-gender-and-ethnicity-imbalance-in-clinical-trials-0001; Steven Epstein, *Inclusion : The Politics of Difference in Medical Research* (Chicago ; London: University of Chicago Press, 2007); Dr Alyson J. McGregor, *Sex Matters: How Male-Centric Medicine Endangers Women's Health and What We Can Do about It* (Quercus, 2020).
[609] 'Anatomage Table - Virtual Anatomy Dissection Table', Anatomage, accessed 2 August 2019, https://www.anatomage.com/table/; 'NEW: 3B Smart Anatomy - Medical Simulators, Anatomical Models and Charts, Therapy, Acupuncture and Massage Equipment, Physics and Biology Supplies - 3B Scientific', accessed 2 August 2019, https://www.3bscientific.com/3b-smart-anatomy,3bsa.html.
[610] 'SMALL TORSO OF YOUNG MAN WITH HEAD', Adam,Rouilly, accessed 2 August 2019, https://www.adam-rouilly.co.uk/products/anatomical-models/torso-models/mt62-small-torso-of-young-man-with-head.

certain bodies within these works. In doing so, this work aims to increase the momentum towards representative diversity within our anatomical teaching technologies.

## Limitations

As outlined in chapter one, this thesis forms one of only a handful of works on the anatomical models of the late nineteenth century.[611] This thesis is unique in its focus on the use of models rather than on the history of the model makers and context of making that dominate the field in the works of Roberta Ballestriero and Alessandro Riva.[612] However, as outlined in chapter 2, there are some instances in which producers are able to influence value creation for consumers and thus there would have been a space for modellers within this thesis. However, a lack of material, both primary and secondary, about these modellers, their correspondence, and their relationships with members of anatomical departments hampered my exploration of the interactions in which this co-creation of knowledge might have occurred. As such, whilst a relationship between producer and consumer *could* be influential in the creation of meaning, value, and narrative, material as evidence for this was lacking within the archives used. Meanwhile, an exploration of archives in continental Europe for materials from the perspective of the model makers themselves falls outside of the remit of a thesis focused both on the creation of value-in-use or in user interactions, not in production or with producers, and on British teaching practices.

One of the largest problems facing this thesis on *late*-nineteenth century anatomical models is that of the destruction of materials over time. Whilst earlier and more aesthetically striking models, such as those made of wax, or in some cases of papier-mâché, tend to have been well-preserved over time, many of the models explored in this thesis have not enjoyed the same fate. This problem has been compounded by a vague approach to record keeping with respect to models. Models were not deemed as valuable as specimens or other anatomical teaching materials because of their perceived epistemic distance from the living body, as is evident both

[611] See, for example, Hopwood, *Embryos in Wax*; Maerker, 'Anatomizing the Trade'.
[612] Ballestriero, 'Anatomical Models and Wax Venuses'; Ballestriero, 'The Scientific and Pathological Collections for Medical Teaching, an Underestimated Heritage. The Example of the Gordon Museum of Pathology in London'; Ballestriero, 'The Art of Ceroplastics: Clement Susini and the Collection of Anatomical Wax Models of the University of Cagliari'; Ballestriero and Richardson, *Joseph Towne at the Gordon Museum*; Riva, *Flesh & Wax: Clemente Susini's Anatomical Models in the University of Cagliari*; Riva et al., 'The Evolution of Anatomical Illustration and Wax Modelling in Italy from the 16th to Early 19th Centuries'.

in recording and preservation practices.[613] As such, it has been somewhat difficult to link these vaguely recorded models and large lists of materials to actual products. Chapter three is therefore a reflection of the models that I have been able to identify from the materials available. The lack of extant materials has also somewhat hampered a material culture approach to this study leading me to question the practicalities of a material culture studies work which deals with missing materials.

As such, although clear, the conclusions drawn in chapter six are formed from a relatively small amount source of material. Compared to the entire body of sources about anatomical teaching and classrooms in the historical record, sources which are explicit about racial bias are relatively few and far between. The topic of race usually only comes up once in a source as a passing reference with little time spent upon it. However, this is not to say that it is unimportant. Rana Hogarth, in her recent work *Medicalizing Blackness,* has faced similar problems with the frequency of references to race in her source materials. However, she correctly states that this minimalization of the importance of this material is only possible 'when disaggregated from the larger body of writing' on racial difference within medicine.[614] In this case, the material in chapter four contextualises the evidence found here in the classroom context. These small references show not that racial anatomical difference was at the forefront of medical education in the nineteenth century but that the concept had permeated every arena of medical teaching. The concept of racial anatomical difference had become so embedded and naturalised within medical discourse that passing references to it were possible. I propose that the lack of emphasis and explanation in these classroom sources shows that ideas about racial anatomical difference were normal and even expected within a medical educational setting at this time.

I also originally intended to include sources detailing students' reactions to lectures in anatomy, demonstrating the prevalence of ideas about racial anatomical difference in anatomical teaching as they appeared to students. Material in this instance was at once both scarce and vast. In the university archives consulted in this study there were few sets of student notes to peruse.[615] However, lists of student names within these collections were vast. As such, there was the possibility for this study to become vaster still in a quest to find material for comparison. Using the lists available of students attending anatomical classes in each academic year, it may have

[613] For example, models of five crania, recorded as purchased in 1890 in 'Inventory of the Department of Human Anatomy', have been neither recorded identifiably in the accessions register of the Oxford University Museum (as all purchases would have been) nor do they survive to this day. It is thus impossible to know exactly which Casciani & Son models these were.
[614] Hogarth, *Medicalizing Blackness*, 41–42.
[615] The University of Edinburgh is in possession of….

been possible to cross reference these lists with other resources to find archives of personal papers which might contain student notes. However, the scale and relative lack of certainty of such a project made it unfeasible to be considered within the time allowed for this thesis, although this could be a fruitful avenue for further exploration.

Within chapter six, there is some initial evidence to suggest that the dissemination of theories of racial anatomical difference to students did not fall on deaf ears. Student interest in lectures, student society meetings, and a set of student notes suggest that students engaged with these inclusions of racial difference as a topic for discussion in their lecture notes, in their lecture attendance, and in their extracurricular activities.[616] Their engagement serves to further suggest the prevalence of discussions of racial anatomical difference within the classroom. Student interest in racial anatomical difference may, in part, have driven the inclusion of these ideas within the anatomical classroom. This would be an interesting consideration in the relationship between lecturer and student in which lecturers influence student value creation discussed in the previous chapter. However, the evidence on this point is inconclusive and deserves further attention.

## Areas for further exploration

An analysis of student records and responses to these models in the classroom would be possible in the future as part of a separate study focussed solely on student responses. The search for these further materials would, as outlined above, be time-intensive but possible given the class lists available in the archives used for this thesis. However, as well as archival documents relating to the students' perceptions of anatomical teaching, this work should include research into the career trajectories and future publications of these students. In particular, it would be interesting to explore whether the ideas expressed about racial anatomical difference in the context of their education had influence any future thinking about race in these students. Many medical students became part of the medical provisions sent by the British to their late-nineteenth century empire, practicing tropical medicine in regions with a Caucasian minority.[617] As such, an investigation into the trajectories of these specific students could demonstrate most clearly what was learnt, rather than what was taught, about racial anatomical difference in the nineteenth century anatomical classroom.

[616] Oxford University Junior Scientific Club, 'Conversazione'; Darwin, 'Dr Munro Anatomy [Edinburgh University Lecture Notes]'; Herbert Dixon, 'Anatomy Lectures by Dr MacDonald Brown'.
[617] For example, the Indian Medical Service which became home to Henry Vandyke Carter, illustrator of Gray's Anatomy. As discussed in Richardson, *The Making of Mr Gray's Anatomy*.

In tandem with this line of enquiry focussed on a colonial setting, it would also be interesting to investigate medical teaching and the use of models in these locations. As Anna Maerker has shown, the same models that were present in nineteenth century British classrooms were exported from European countries to other parts of the world for use in teaching.[618] I hypothesise that the same narratives which I have demonstrated surrounded these models in the nineteenth century British classroom may not be present in these locations. Analysing the differences between the educational cultures in these spaces and European classrooms would help to inform the ways in which meaning is created, revealing the most important factors in meaning creation within these settings (see figure 7.1). As such, I believe there is good potential for this work as a tangible follow up to this thesis.

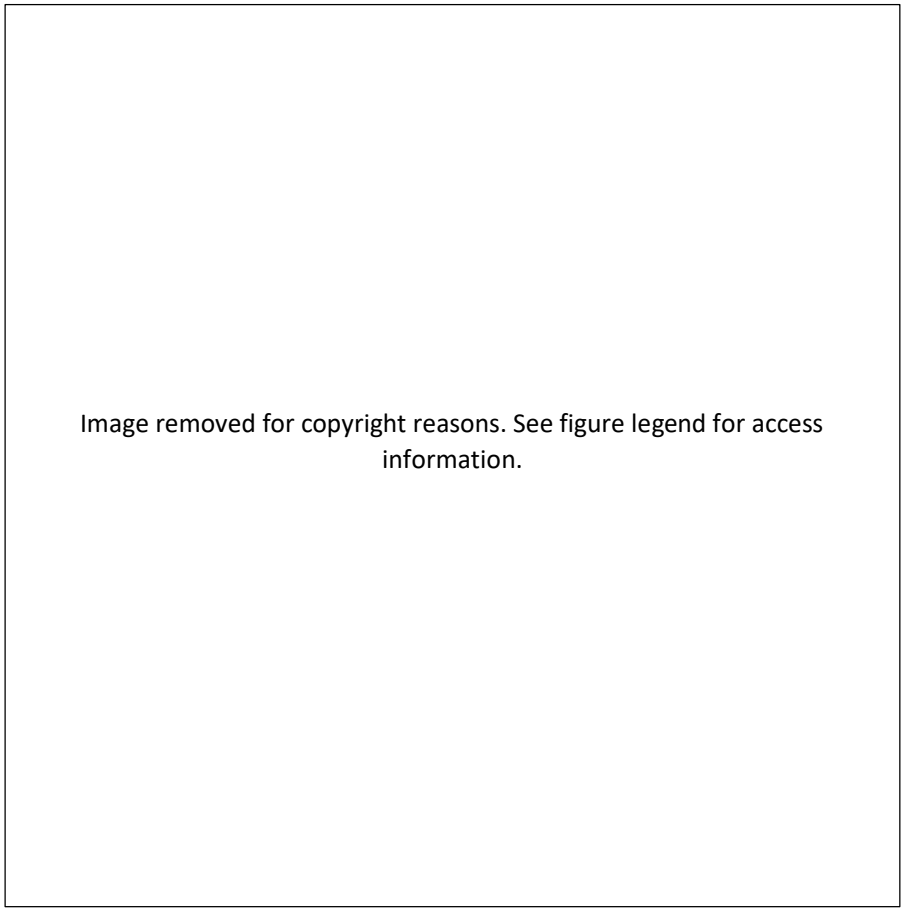


*Figure 7.1 Anatomy lesson in the zoology laboratory at Achimota College, Gold Coast [Ghana]. An image which could be compared with those of European classrooms in further work on this area. (RCS/CMS 24/7, Cambridge University Library, Department of Manuscripts and University Archives, Cambridge)*

[618] Maerker, 'Dissections in Papier-Mâché: The Models of Dr Auzoux'.

However, the main element of this thesis which requires further exploration is the methodological framework for analysis presented in chapter five. This framework provided by marketing theory's means-end laddering theory is in need of wider testing to assess its applicability as a historical methodology. Whilst it has allowed me to reveal interesting links between personal values and objects within this thesis through the lens of use, it may not be universally applicable within the historical record. This methodology has been created by a discipline focussed on the production of profit in a post-industrial, capitalist society. It may be that it is applicable in this late-nineteenth century British setting because Britain had already undergone its industrial revolution earlier in the century and, as such, the economic context was similar enough to that in which this methodology was formed. However, this methodology may not be as useful in historical contexts further removed from the modern economic context. As such, not only do we require more testing of this methodology to understand its suitability for historical study, but we require wider testing both geographically and temporally to understand the potential limitations of this methodology. This method has been most useful within thesis at uncovering the unwritten historical phenomenon of underlying racial bias within anatomical teaching. I theorise that this methodology might also be useful for exploring unwritten conversations around objects of cold war science, or for understanding the gender roles within colonising communities in Northern America in the seventeenth and eighteenth centuries. However, further testing is needed to understand the utility of means-end laddering theory and the concept of value-in-use for historians.

## Conclusion

Throughout this thesis I have argued that the form of late-nineteenth century anatomical models complemented narratives about racial anatomical difference that were propagated by anatomists within the context of British anatomical teaching. This work had the potential to be a history of absence; the absence of diversity within anatomical teaching. However, in more ways than one it is instead a history of presence. Firstly, the idealisation of whiteness is present here in both the physicality of these models and the context of their use. However, more importantly for the discipline this thesis has attempted a history of the unwritten. It attempts to elucidate what was present within these contexts but not recorded, either because it was assumed knowledge or not deemed important enough to note down. In synthesising a combination between methods from marketing theory, material culture studies, and social and intellectual history, this thesis aims to provide avenues for further investigation into history's

elusive conversations. It is a methodology I look forwards to developing further as I investigate unwritten elements of other areas of history. However, I particularly hope that it will contribute towards the ongoing investigation into practices of de facto racism, exposing the underlying racist assumptions that are embedded within the history of many more modern objects and practices.

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