

SPECIAL ISSUE ARTICLE

Evolution of a discipline—The changing face of anatomy

Jason M. Organ¹  | Amber R. Comer^{2,3} 

¹Department of Anatomy, Cell Biology & Physiology, Indiana University School of Medicine, Indianapolis, Indiana, USA

²Department of Health Sciences, Indiana University School of Health and Human Sciences, Indianapolis, Indiana, USA

³Center for Bioethics, Indiana University School of Medicine, Indianapolis, Indiana, USA

Correspondence

Jason Organ, Department of Anatomy, Cell Biology & Physiology, Indiana University School of Medicine, 635 Barnhill Dr., MS 5035, Indianapolis, IN 46202, USA.
 Email: jorgan@iu.edu

Abstract

This special issue is unlike any other special issue published in this journal's history. You will not find the types of original research in anatomy and evolutionary biology that you are accustomed to seeing adorning the pages of *The Anatomical Record*. Instead, the articles included cover the past and future of the discipline of anatomy broadly and of the American Association for Anatomy (AAA) more narrowly, and through two specific rhetorical frames: ethics; and diversity, equity, and inclusion. The articles in this issue are divided into two sections. The first section traces the history of anatomy and addresses many of the ethical dilemmas we face as a result of that history. The second section sets the stage for how the discipline and the AAA move forward to create a more diverse, equitable, and inclusive future for students, teachers, colleagues, and everyone else we touch through our work as anatomists. While this is only the beginning of our reconciliation with our past, the future certainly looks bright.

KEYWORDS

bioethics, diversity, inclusion, science communication

1 | INTRODUCTION

The first time I (J.M.O) attended an American Association for Anatomy (AAA) meeting at Experimental Biology, in 2006, it was transformative. I had started “growing up” professionally in another association where it felt like he (and I’m being intentional using this pronoun) who held the most recent fossil was king, the academic discourse was often nasty, and very few folks had a voice. The power dynamics were stereotypical in that way, and even though that has dramatically changed in the years since, it was noticeable at a visceral level, especially for someone just embarking on their career in academics. At my first AAA meeting, what stood out to me was the collegiality of the membership, the representative leadership which included

women, early career researchers, and students, and the supportive academic discourse. It created an “academic family” atmosphere that was warm and receptive. I was welcomed immediately into a leadership position as a member and later chair of the Advisory Committee for Young Anatomists (since renamed as the Committee for Early Career Anatomists—CECA—oh anatomists, I appreciate your sense of humor!). I am so privileged to belong to our amazing organization, and I owe my career to the guidance and mentorship provided by my peers and colleagues in the AAA. I also recognize that my experience in anatomy is not the same as others’ (Carroll et al., 2022).

The origin of this Special Issue of *The Anatomical Record* is linked to two specific events. The first was a symposium held at the 2008 AAA meeting at

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Experimental Biology on the art of anatomy. This symposium included an exhibition of original plates from several high-profile anatomy atlases, including Dr. Carmine Clemente's *Anatomy: A Regional Atlas of the Human Body* (Clemente, 1997, 2007, 2010). What struck me most during Clemente's talk—which those who were in attendance will remember as a captivating story told without any visual aids—were the tears in his eyes when he discussed the origin of many of the illustrations in the various editions of the atlas.

In the preface to the fourth edition, Clemente (1997) writes, “Most of the figures of this edition have come from the 3rd Edition of the Atlas or from the 20th German Edition of Sobotta [another well-known anatomical atlas] ...Additionally, a number of illustrations have been used from the classic Pernkopf textbook, *Atlas of Topographic and Applied Human Anatomy*.” During his talk in 2008, Clemente cried as he lamented the use of anatomical illustrations produced unethically, especially the Pernkopf (1963) images, but also the Sobotta images, many of which came from the Pernkopf atlas as well. By the fifth edition of his atlas, Clemente (2007) had removed the “nine remaining illustrations in the 4th edition that originated from the controversial atlas *Topographical Human Anatomy* by Pernkopf.” However, the Sobotta images remained even in the sixth and final edition of the Clemente atlas published in 2010.

When Clemente spoke of learning that several of the Sobotta (Paulsen et al., 2011) illustrations were also derived from Nazi murder victims, my heart sank. I had been an avid user of Clemente's atlases when I learned anatomy as a graduate student at the University of Missouri and Johns Hopkins. My mind went directly to a memory from April 7, 1994, or the 27th of Nisan, 5,754, on the Hebrew Calendar. It was Yom HaShoah, or Holocaust Remembrance Day, and I was standing on the grounds of Auschwitz about to embark on a symbolic *March of the Living* between the Auschwitz and Birkenau death camps, along with thousands of other Jewish young adults from across the globe. Before marching, we stood in the gas chambers where families were murdered and viewed the crematoria where their bodies were incinerated (and mass graves where they were interred, cremated, or not). Standing in the gas chamber at Auschwitz is something I will never forget. But what surprised me most about that day was that it was not the hardest thing for me to see. It is the memory of standing in front of a dissection table used to extract valuables like gold and silver teeth from victims of genocide—perhaps my relatives, for whom little is known of their fates, but certainly my mishpacha, my family—that I cannot shake (Figure 1). And it was that image that came to mind when Clemente spoke of using Pernkopf and Sobotta images in his atlas. I wanted to know more



FIGURE 1 Dissection table near one of the crematoria at the Auschwitz concentration camp. The placard next to the table read: “The Dissection Table. Bodies were dissected in order to find possible valuables; gold and silver teeth were extracted.” (Photo by Jason Organ, 1994)

about the Pernkopf atlas and found what I was looking for over the next several years in the research of Dr. Sabine Hildebrandt and several others (e.g., Atlas, 2001; Hildebrandt, 2006, 2016; Williams, 1988).

I felt like the story of the Pernkopf atlas needed a platform for telling the entire membership, and so I proposed a detailed symposium with Dr. Jeff Laitman for the 2015 AAA meeting on Anatomy and the Holocaust, which was fitting as that year was the 70th anniversary of the liberation of Auschwitz on January 27, 1945. The symposium was not selected for programming (nor was it selected in 2016 when we proposed it again) because the AAA Professional Development Committee preferred to sponsor symposia that are “practical sessions that help members with issues related to their careers,” (Sumner et al., 2022, appendix I). I was crushed. I felt like the Association which had supported me so much in the earliest parts of my career had turned its back on an important part of our history, and in turn, its back on me. Having our symposium rejected in two consecutive years, with one member of the Program Committee telling me privately that “no one wanted to touch this with a 10-ft pole,” was the second event that led to this special issue.

The symposium proposal was shelved at that point, and I did not expect to revisit it again any time soon. But all of that changed when a series of antisemitic incidents on our campus—Indiana University Purdue University Indianapolis (IUPUI)—led to the formation of the IUPUI Jewish Faculty and Staff Council (JFSC). The JFSC was created to give agency to Jewish faculty and staff on campus when voicing concern about growing

antisemitism with administration, which historically had been complicated and even disregarded. It was through the JFSC that I met Amber Comer, the co-editor of this special issue of *The Anatomical Record*.

Dr. Comer is a palliative care researcher, bioethicist, lawyer, and an amazing colleague, and there is no one better to introduce her than Amber herself:

As a young child, I (A.R.C) was shaped by the stories my grandfather told me about being a Holocaust survivor. As a teenager, my grandfather was taken from his family and placed in a workcamp by the Nazis. He never saw my great-grandparents, his parents, again. While in the camp, my grandfather was forced to do manual labor, such as digging ditches. One of the most striking parts of his story is how he described the wretched conditions and the suffering the people were forced to endure in the camps in which he stayed. Eventually, he escaped from the Nazis while digging a ditch in France. He hid for weeks until he came upon British soldiers who took him in and helped him enlist in the British Army where he fought as a gunner for the remainder of the war.

Growing up, my grandfather lived with me, and I thought of him as any other grandfather. It was not until I was grown that I began to understand that his life was truly unique. While my grandfather is no longer with us, his stories are very much alive inside of my mind and heart. I believe that my perspective on the Holocaust may be different from others because when I read and hear the stories of the atrocities of the Holocaust, I picture the kind and gentle gray eyes of my grandfather, sparkling with tears as he told me his story. Having loved someone who experienced the horrors makes it more real, more emotional, more powerful. It is my hope that by sharing my grandfather's story, as a living person who bore witness to his obvious pain, that the real and powerful emotions I experience will be imparted within the heart of the listener.

As a professor, I teach my bioethics students about the Holocaust each semester; and each semester, my students are notably shocked by what happened. While my students tend to know generally that the Holocaust happened and that many people died, most of them have never heard about the specific horrors that people were forced to endure. The shock and surprise of my students elicits mixed emotions within me and in some ways makes me sad but also happy. I am sad because the further we move away from the Holocaust, the less relevant it seems to become. This is an incredibly scary notion because if we forget what happened, we are bound to allow it to happen again. However, I am also happy because my students have never had to see or hear about people hurting one another in such horrific ways. Their disbelief, disgust, and confusion allow me to hope that

perhaps the world is a better place and that we would not allow these atrocities to happen again.

Some may say that my optimism is unfounded and that recent events in the world have shown that people can commit these atrocities again. The fear that this could happen again, that another person such as my grandfather could be taken from their family and forced to grow up in a world of torture and fear is what drives me to continue to tell not only the story of my grandfather, but the countless other stories of people who suffered and died during the Holocaust. As we have fewer and fewer survivors alive to tell their stories, I find it the responsibility of the next generation, the ones who bore witness to the survivors' stories to keep their memories and stories alive. If we allow the atrocities of the Holocaust to fade away to black and white images of yesteryear, I fear that the emotion, pain, and the connection to what happened will also fade because it is difficult to impart empathy to an event when we have no connection or tie to the lives of the people who experienced it. Without that emotional connection, I fear we may begin to believe that are not capable of committing such horror. We may try to convince ourselves that "that was in the past, and now we are different."

While I profoundly hope that we as humans are different, as an educator, I believe it is my responsibility to ensure that students understand the history of their discipline. In learning the history, it is my hope that they will garner an appreciation for the sacrifice that others made so that they may have a better life. It is also my hope that they will gain an understanding of the importance of not allowing history to repeat itself. Most importantly, it is my goal to teach my students history so that they learn the importance of standing up to even the slightest sign of racism, gender inequality, or oppression of any group of persons. In essence, by teaching the stories of the past, it is my hope that we can save the future.

Due to our own personal connections to the Holocaust, at one of the first meetings of the JFSC, we (J.M.O. and A.R.C.) volunteered to chair the 2020 IUPUI Holocaust Remembrance Ceremony. And to support it, we earned a grant from the Indiana University Consortium for the Study of Religion, Ethics, and Society, for our program *Reflecting on 75 Years Since the Liberation of Auschwitz: The Lasting Impact of the Nazi Regime on Medical Research*. We took two of the speakers originally in the AAA Anatomy and the Holocaust symposium proposals and forged ahead with a modified version locally. We figured that if we could not get this programmed at the AAA annual meeting, the least we could do is bring this discussion to the local IUPUI and Indianapolis Jewish communities. Ironically, the publication of this special

issue has afforded us the opportunity to hold a symposium at the 2022 AAA annual meeting highlighting three of the articles published here, although none of them is focused on the Pernkopf atlas or the Holocaust. Instead, the selected articles address diversity, equity, and inclusion in the anatomical sciences.

On January 27, 2020—International Holocaust Remembrance Day and the 75th anniversary of the liberation of Auschwitz—we hosted Sabine Hildebrandt on campus for a series of lectures about the victims of the Pernkopf atlas, with help from the Indiana University Center for Bioethics and the William S. Silvers Holocaust, Genocide, and Contemporary Bioethics Lectureship. A week later, we hosted Jeff Laitman who delivered a talk on antisemitism in anatomy that forms the basis of his contribution to this special issue.

It was during Jeff's visit that we began discussing the potential to assemble a special issue related to the Holocaust and Anatomy, but the conversation took a much different turn in the summer of 2020 when George Floyd was killed in police custody and the Black Lives Matter protests erupted nationwide. We could no longer tell only the story of one injustice in anatomy; we needed to reflect publicly on how anatomy and related disciplines broadly, and the American Association for Anatomy directly, have histories that have been sometimes unethical, and that have exploited and excluded minoritized communities and even encouraged racism and antisemitism. Thus, this special issue, *Evolution of Anatomy—The Changing Face of Anatomy*, was born.

2 | HISTORY AND ETHICS IN THE ANATOMICAL SCIENCES

This issue is divided into two sections. The first section contains 11 manuscripts that address history and ethics in the anatomical sciences. Sumner et al. (2022) report the initial findings of the AAA Task Force on Structural Racism, convened in the Spring of 2021 to examine how the structure of the organization contributes to the marginalization of some members. The task force found that throughout much of its history, the AAA has disregarded racism, and worse, admitted members who played essential roles in perpetuating racism. Both have led to the underrepresentation of minoritized groups. The Task Force makes several recommendations for how AAA can work to address the inequalities.

Following that important piece from AAA is a series of articles that examine the evolution of the discipline of anatomy through different lenses: historical (Brenna, 2022), epistemological (Ghosh, 2022), and ethical (Comer, 2022). These three articles work together to

describe how anatomical knowledge has changed through history and how that knowledge was acquired, and examine how ethics surrounding anatomical study have changed.

Philp (2022) follows with the story of the demise of the body snatchers and how three specific events led to the development of the Anatomy legislation in 19th century Britain. In particular, the article notes that the legislation was developed not out of an interest in addressing ethical issues related to cadaver procurement but instead to protect anatomists from the law.

Next, Blakey and Watkins (2022) detail the history of W. Montague Cobb, a giant in the fields of anatomy and biocultural anthropology, and who debunked racism using scientific methods. Cobb was the recipient of the 1980 AAA Henry Gray Scientific Achievement Award, the most prestigious research award given out by the Association. In 2020, the AAA first awarded the newly renamed W.M. Cobb Morphological Sciences award to an early career researcher after adopting the new name in 2019. Blakey and Watkins provide the context necessary to understand Cobb's influence on our discipline and our Association.

Following next is a moving personal reflection by Jeff Laitman (2022) about his experiences with antisemitism in his career. Laitman, an esteemed past president of the AAA (2011–2013) and the 2014 recipient of the AAA Henry Gray Distinguished Educator award, tells of his time as a graduate student at Yale, as a researcher traveling through Europe to collect data in museum collection, and his experiences as a leader in our field.

Closing out the history and ethics section of the special issue are two articles that examine the ethics of using research or teaching collections that contain human material. Williams and Ross (2022) examine how the Black Lives Matter movement necessitates a re-examination of the ethics of using skeletal collections. They outline the history of several specific collections and explore the issues surrounding repatriation of remains to descendent populations. And finally, El-Haddad et al. (2022) provide a narrative review of the literature to determine the describe the present location and profile of fetal and embryonic teaching and research collections in Australia, Germany, Japan, Spain, and the United States. The authors then call for the establishment of international standards for ethical and sustainable use of these collections.

3 | CHANGING THE FACE OF THE DISCIPLINE

The second section of the special issue includes nine articles that propose to shape the future of the anatomical

sciences. The first eight of these address how we can change the classroom environment to address historical transgressions against minoritized groups, how we can make the anatomical sciences and our classrooms more inclusive, and how we can incorporate effective communication training to have conversations about complex scientific and medical information with audiences outside of our field, including the public.

Hildebrandt (2022) briefly outlines the history of anatomy in Nazi Germany and the legacies of that history and their implications for anatomy education today. This article argues that by incorporating elements of the history of anatomy into the curriculum, medical educators can model an approach to medicine that is centered in the shared humanity of practitioners and patients.

Next is a critical look at the history of eugenics by Lisum and Garcia (2022). These authors outline a curriculum where students trace the timeline of how misapplication of scientific principles led to state-sanctioned eugenics, using four critical case studies. The goal of their approach is to equip the next generation of scientists and students of science with the tools they need to ask appropriate scientific questions of their fellow scientists, their medical practitioners, and their governmental officials.

Finn et al. (2022) detail how the movement to make education more inclusive has brought anatomy under the microscope because of limited diversity in representation among donors, illustrations, technology, and models. These authors offer a toolkit to help decolonize the anatomy curriculum and make the learning environment a more inclusive one.

Following next is a critique of clinical pelvimetry and the Caldwell–Moloy classification of pelvic capacity in pregnant patients by VanSickle et al. (2022), and their use in predicting the expected difficulty of labor. In this article, the authors trace the racist history of these techniques and call for them to be replaced with evidence-based practices rooted obstetrics and midwifery and not in the racist typologies that still dominate the educational landscape.

The next two articles complement one another in that they both address the need for more inclusive language in the anatomy classroom. Smith (2022) takes an important look at the intersection between queer history and the history of anatomy and reflects on how this intersection affects queer lives today. The article ends with a call for reform of the language we use to describe reproductive anatomy. Easterling and Byram (2022) also discuss anatomical language, emphasizing the intersection with gender identity, from two different perspectives: the perspective of a transgender patient and the perspective of an anatomy

educator. They share recommendations for how to use anatomical language that is inclusive of gender-diverse people in the context of health professional education.

Following on the theme of language, the next two articles focus on the importance of effective communication. Longtin et al. (2022) describe and evaluate the effectiveness of the inaugural AAA Science Communication Boot Camp that was held in the summer of 2019. The program is rooted in the application of improvisational theater techniques to enhance a communicator's ability to effectively share information with an audience of nonspecialists, like students, the public, and policymakers. Muldoon (2022) describes a curriculum for using the same applied improvisational theater approaches to communicate about diversity, equity, and inclusion in health professions education. These two articles represent one of the new pillars of the AAA strategic plan: to become leaders in effective science communication.

Finally, the special issue concludes with Carroll et al.'s (2022) assessment of the AAA's own challenges with diversity, equity, and inclusion. The article outlines several ways that our Association has attempted to address issues of limited diversity, inequities, and the marginalization of certain groups among the membership. Most importantly, it demonstrates where AAA has been effective already and makes recommendations for other societies who wish to make immediate impacts in addressing issues of diversity, equity, and inclusion.

We are so proud of all these contributions to this unique special issue of *The Anatomical Record*, and we hope you find them as stimulating as we do. The future of the Association and the discipline is bright, even considering the ethical issues we face because of the nature of what we do.

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ORCID

Jason M. Organ  <https://orcid.org/0000-0001-8462-0271>

Amber R. Comer  <https://orcid.org/0000-0001-6242-8940>

REFERENCES

- Atlas, M. C. (2001). Ethics and access to teaching materials in the medical library: The case of the Pernkopf atlas. *Bulletin of the Medical Library Association*, 89, 51.
- Blakey, M. L., & Watkins, R. (2022). William Montague Cobb: Near the African diasporic origins of activist and biocultural anthropology. *The Anatomical Record*. <https://doi.org/10.1002/ar.24818>
- Brenna, C. T. A. (2022). Bygone theatres of events: A history of human anatomy and dissection. *The Anatomical Record*. <https://doi.org/10.1002/ar.24764>
- Carroll, M. A., Boynes, S., Jerome-Majewska, L. A., & Topp, K. S. (2022). The imperative for scientific societies to change the face of academia: Recommendations for immediate action. *The Anatomical Record*. <https://doi.org/10.1002/ar.24735>
- Clemente, C. D. (1997). *Anatomy: A regional atlas of the human body* (4th ed.). Williams & Wilkins.
- Clemente, C. D. (2007). *Anatomy: A regional atlas of the human body* (5th ed.). Lippincott, Williams & Wilkins.
- Clemente, C. D. (2010). *Anatomy: A regional atlas of the human body* (6th ed.). Lippincott, Williams & Wilkins.
- Comer, A. R. (2022). The evolving ethics of anatomy: Dissecting an unethical past in order to prepare for a future of ethical anatomical practice. *The Anatomical Record*.
- Easterling, L., & Byram, J. (2022). Shifting language for shifting anatomy: Using inclusive anatomical language to support transgender and nonbinary identities. *The Anatomical Record*. <https://doi.org/10.1002/ar.24862>
- El-Haddad, J., Strkalj, G., & Pather, N. (2022). A global perspective on embryological and fetal collections: Where to from here? *The Anatomical Record*. <https://doi.org/10.1002/ar.24863>
- Finn, G. M., Danquah, A., & Matthan, J. (2022). Colonization, cadavers, and color: Considering decolonization of anatomy curricula. *The Anatomical Record*. <https://doi.org/10.1002/ar.24855>
- Ghosh, S. K. (2022). The evolution of epistemological methodologies in anatomy: From antiquity to modern times. *The Anatomical Record*. <https://doi.org/10.1002/ar.24781>
- Hildebrandt, S. (2006). How the Pernkopf controversy facilitated a historical and ethical analysis of the anatomical sciences in Austria and Germany: A recommendation for the continued use of the Pernkopf atlas. *Clinical Anatomy*, 19, 91–100.
- Hildebrandt, S. (2016). *The anatomy of murder: Ethical transgressions and anatomical science during the Third Reich*. Berghahn Books.
- Hildebrandt, S. (2022). Books, bones and bodies: The relevance of the history of anatomy in Nazi Germany for medical education today. *The Anatomical Record*. <https://doi.org/10.1002/ar.24691>
- Laitman, J. T. (2022). The anatomy of antisemitism and antisemitism in anatomy: A personal reflection. *The Anatomical Record*. <https://doi.org/10.1002/ar.24867>
- Liscum, M., & Garcia, M. L. (2022). You can't keep a bad idea down: Dark history, death, and potential rebirth of eugenics. *The Anatomical Record*. <https://doi.org/10.1002/ar.24849>
- Longtin, K., Wisner, R., & Organ, J. M. (2022). It is essential to connect: Evaluating a science communication boot camp. *The Anatomical Record*.
- Muldoon, K. M. (2022). IMPROVING communication about diversity, equity, and inclusion in health professions education. *The Anatomical Record*. <https://doi.org/10.1002/ar.24864>
- Paulsen, F., Waschke, J., & Hombach-Klonisch, S. (2011). *Sobotta atlas of human anatomy* (15th ed.). Elsevier.
- Pernkopf, E. (1963). *Atlas of topographical and applied human anatomy*. Volume 1: Head and neck, 1963. Volume 2: Thorax, abdomen and extremities, 1964. WB Saunders Co.
- Philp, J. (2022). Bodies and bureaucracy: The demise of the body snatchers in 19th century Britain. *The Anatomical Record*. <https://doi.org/10.1002/ar.24794>
- Smith, T. C. (2022). Re-examining our roots: Queer history and anatomy. *The Anatomical Record*. <https://doi.org/10.1002/ar.24859>
- Sumner, D. R., Hildebrandt, S., Nesbitt, A., Carroll, M., Smocovitis, V., Laitman, J., Beresheim, A., Ramnanan, C., & Blakey, M. (2022). Racism, structural racism and the American Association for Anatomy. *The Anatomical Record*.
- VanSickle, C., Liese, K. L., & Rutherford, J. N. (2022). Textbook typologies: Challenging the myth of the perfect obstetric pelvis. *The Anatomical Record*.
- Williams, D. J. (1988). The history of Eduard Pernkopf's topographische anatomie des menschen. *The Journal of Bio-communication*, 15, 2–12.
- Williams, S. E., & Ross, A. H. (2022). Ethical dilemmas in skeletal collection utilization: Implications of the black lives matter movement on the anatomical and anthropological sciences. *The Anatomical Record*. <https://doi.org/10.1002/ar.24839>

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