Review Article

ANATOMY EDUCATION: THE UNFORGETTABLE CONTRIBUTIONS OF HERMANN STIEVE

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Abstract

This article examines Hermann Philipp Rudolf Stieve's (1886–1952) contributions to anatomy education. The purpose of this piece was to remind us how he contributed to knowledge despite finding himself in a politically unfavourable situation. Articles about Stieve in PubMed journals and original archives on the internet were consulted for this piece. Hermann Stieve was a contemporary anatomist whose contributions were critical to the evolution of modern anatomy, albeit with contention, which sparked scientific debates on ethical concerns with some of his works. He was accused of exploiting the "Third Reich" for his benefit and thus indirectly supporting this Nazi system of injustice. However, Stieve showed that his primary interest was science by donating his body for research. He was eager to allow other anatomists to work on his remains, but his wife refused to release his body after his death. However, Stieve Hermann's research was methodologically accurate and contributed significantly to the development of anatomy education, though with ethical questions. He was the director of his university's Institute of Anatomy, and his work was only interrupted in 1952 by his death. During his lifetime, he was honoured with membership in the German Academy of Sciences in Berlin, the German Academy of Sciences in Leopoldina, and the Royal Swedish Academy of Sciences. He wrote multiple papers about the impact of stress on the female reproductive system, claiming that life-threatening stress reduces ovulation. Stieve was a brilliant anatomist who made significant contributions to anatomy education, but his work was marred by ethical issues.

Key words: German anatomist, menstrual cycle, histology, research ethics.

Cite this article: Oyinbo CA, Johnbull T, Atoni AD. Anatomy education: the unforgettable contributions of Hermann Stieve. Yen Med J. 2022;4(2):28–33.

INTRODUCTION

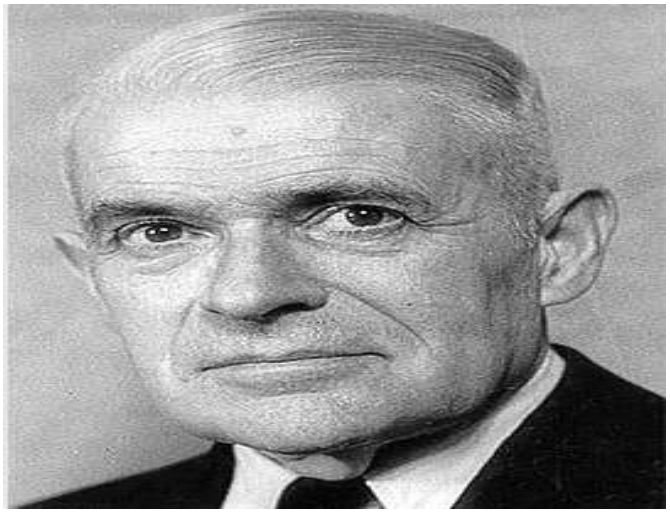
Anatomy education has come a long way, despite being a persistent portion of teaching from at least the renaissance; the format and the amount of information being taught have evolved and changed along with the demands of the profession.[1] However, its historical development is enshrined in marble. The first scientific dissections of the human body took place in Alexandria during the third century. [1] Anatomists in that period studied anatomy by dissecting animals, particularly pigs and monkeys. [2] The works of Claudius Galen (129–199 AD) were unquestionably the most significant contributions during these early periods. Galen based his conclusions solely on animal studies, and until the Renaissance, his incorrect beliefs about human anatomy prevailed and influenced medical knowledge and practice. [3] The refusal of the social authorities to allow the dissection of human bodies delayed progress in anatomical education in the 12th and 13th centuries.[4, 5] Although there was a significant change in attitude toward teaching anatomy in the 14th century, training was still centred on lectures based on Galen's canonical writings, with no actual dissections. [4, 5]

Leonardo da Vinci, Andreas Vesalius, John Hunter, and Wilhelm Conrad Rontgen,[6] who got the 1st Nobel Prize in Physics (1901) for the discovery of the X-ray, have all contributed to anatomy education (medical education). There is a wealth of knowledge in the history of anatomy, but we often overlook the fact that hundreds of people contributed to its evolution. We herein highlight the contributions of Hermann Philipp Rudolf Stieve (HS or Stieve).

EDUCATION

The physician, Hermann Philipp Rudolf Stieve, was a German anatomist who lived from May 22, 1886, until September 5, 1952. In 1905, Stieve received his diploma from Munich's *Wilhelmsgymnasium*.[7] He graduated as a physician in 1912 after a medical internship at *Rechts der Isar* Hospital, medical studies at Ludwig Maximilian University of Munich and the University of Innsbruck in Austria, and a year in the military. As a German medical officer and soldier during World War I, he gained interest in the effects of stress and other environmental conditions on the female reproductive system, which he later explored. He became the youngest doctor to head the medical department of a German university in 1921 as Professor of Anatomy and Histology at the University of Halle.[7] In 1935 he was Professor of Anatomy and Histology at the University of Berlin and Director of the Anatomical Institute and the Anatomical-Biological Institute of the University. In his later years, he was a professor of medicine at the University of Berlin.[8]

Before the outbreak of the First World War in 1914, he worked in anatomical studies for a year.[9] During World War 1, Stieve re-joined the army, where he treated patients on the front lines and lectured at the Munich military medical school. Several accolades were given to him for his service. He was habilitated after the war, authoring a study about the development of the jackdaw's ovary. He accepted a position at the University of Leipzig as a lecturer and researcher in anatomy and anthropology, where he usually wore a black academic robe to his lectures.[7]



Hermann Stieve (1886 – 1952)

CONTRIBUTIONS IN ANATOMY EDUCATION

After completing his doctoral dissertation, Stieve continued his research on ovaries and the female reproductive system. He was especially interested in the effects of stress on reproduction. In one experiment, he placed a caged fox near hens to test if they would lay eggs.[7] However, his ultimate goal was to conduct research on human organs. He was able to obtain uteruses and ovaries from accident victims' bodies as well as from doctors who had removed them. The bodies of condemned criminals, one of the richest historical sources of organs for research, were not available during the early years of his research since the Weimar government used the death sentence sparingly and did not execute any woman.[8] He remarked in a 1931 letter that getting a set of ovaries from a healthy woman was difficult, but he also conducted research on male subjects.[9, 10] By 1934, the Nazis had arrested a large number of perceived "enemies". They were all imprisoned, and a large number of them were executed, thus eliminating the scarcity of bodies to study.[11-14] However, Seidelman [15], unequivocally stated that "the execution rooms of prisoners throughout the Third Reich were virtual slaughterhouses, and the remains were conveyed to every university institute of anatomy in Germany (and perhaps Austria)."

In 1933, HS accepted a professorship and the directorship of the anatomical institute at what is now Humboldt University of Berlin and reached an agreement with administrators at Plotzensee Prison Berlin to accept the bodies of those shot, hanged, or beheaded, many of whom were political prisoners. According to Seidelman, others were "Polish and Russian slave labourers murdered for such offenses as associating with German women".[15] Throughout the Nazi regime, this amounted to about 3,000 victims, far more than Stieve required for his studies.[16] Nevertheless, before the National Socialists came to power in 1933, the bodies of execution victims were routinely given to medical institutions for teaching and research purposes.[17] The preserved registries of the Berlin anatomy institute reveal that this practice was followed till 1949, well into the post-war period when Berlin was under allied control.

It is alleged that throughout HS research, he claimed the bodies of 182 Nazi government victims, 174 of whom

were women aged 18 to 68, with two-thirds of the victims being of German descent.[16, 18 – 20] Approximately 12,000 to 16,000 German citizens were executed in Germany during the Nazi era, from 1933 to 1945.[8, 15, 16] Stieve made the best of the prison's documentation for the female bodies of particular interest. He obtained histories that detailed the women's reactions to their death sentences, their adjustment to prison life, and the timing of their menstrual cycles. He wrote 230 articles on the effects of stress on the female reproductive system. He noted that women facing death ovulated less predictably and occasionally experienced "shock bleedings".[15,16] He also contributed to our knowledge of histology, albeit with the Nazi connection. In his histology collection, a total of 36 personal names were found on the hundreds of histology slides. Fifteen of these might be linked to specific historical figures: twelve women and three men, all of whom were executed between 1937 and 1945 at Berlin's Plotzensee jail.[9]

It was alleged that HS had some clout with officials at the prison because he was in charge of all the bodies. They moved the executions to the evenings in 1942, but Stieve was able to persuade them to return to the mornings so he could process the bodies and tissue the same day. The claim that he authorized Nazi forces to rape certain female inmates to research sperm migration has not been proven and appears questionable because none of Stieve's papers mentioned sperm as a subject of investigation; yet, Seidelman, who initially reported it, insists it happened. Contrary to popular myth, Stieve did not make soap from the remains of the victims after they were dissected.[21]

Reports indicated that some renowned members of the Nazi era limited German resistance groups were among those who went to his dissection tables after their deaths.[8, 9, 16] After their executions near the end of 1942, the bodies of Harro Schulze-Boysen and his wife Libertas, as well as Arvid Harnack and Liane Berkowitz, all members of the Red Orchestra, who attempted to resist Germany's invasion of the USSR in 1941, were transferred there. The body of Elfriede Scholz, the sister of novelist Erich Maria Remarque, was also returned to Stieve the next year after she was executed for "undermining morale" after declaring the war to be lost.[8,16] The list of Stieve's study files was discovered 70 years later, and these materials are now housed at the Memorial Site for the German Resistance in Berlin. [8,16]

Hildebrandt reported that when Harnack and the Schulze-Boysens' bodies were discovered in Stieve's dissecting room, one of Libertas' companions, Charlotte Pommer, who had pursued medical studies, recognized them and abruptly left the program.[22] Pommer later became a dissident herself, harbouring a family member of one of those who engaged in the 1944 assassination attempt on Hitler and ending up in prison towards the end of the war. She is the only student or assistant reported to have quit Stieve's program for moral reasons. Stieve reportedly had no issue dissecting the body of Walter Arndt, a lifelong friend who was executed in 1944. He was rumoured to have kept Arndt's heart; however there has been no evidence from literature to support this allegation. [16, 23]

DISCUSSION

The scientific findings of Stieve's research on the female reproductive system are controversial, as they are based on histology analyses of executed women's genital organs. These investigations were made possible by the significant increase of executions under "Nazi Germany, 1933–1943." Stieve's research, on the other hand, was methodologically good and contributed significantly to current scientific concerns. We believe it is unreasonable to claim that Stieve benefited from the Nazi legal system by exploiting the organs of execution victims and resistance fighters, or that he assisted and abetted this terrible system in any way.[9] First and foremost, he is a learned biomedical scientist, and he risks dying at the hand of the Nazis if he refuses to serve in the army during the war. We reasoned that being an anatomist, the bodies of executed victims afforded him a means of rendering service to science. Although the Nazi regime may have seen it as further dehumanisation of the bodies, we believe Hermann Stieve capitalised on this ignorance and took advantage of the opportunity to provide critical anatomical knowledge. This view is supported by the fact that when the Nazi Party came to power in Germany, he did not join the party himself.[9] Another point in our argument was the fact that he had intended to donate his body to research, but his wife protested, and he was buried instead.[7] His interest, primarily, was science; he was willing to have other anatomists work on his remains. We are of the view that claims that Stieve directed the

execution of detainees based on their menstrual cycle appears to be false.[9] Traditional black-and-white categorization of research during the Nazi era should be avoided when evaluating Stieve's work, as there is no evidence. Stieve actively cooperated with the administration of justice to secure this source of human tissue for his studies, but there is no evidence from the literature that he had contact with any of these women before their death nor had any influence on their execution dates, a view also expressed by Winkelmann and Schagen.[9] In addition, Stieve obtained information about the executed women's medical history, menstrual cycle, and mental status to interpret his findings in terms of histological functioning. Although he most likely overestimated the accuracy of the clinical data, he released his findings without any apparent reservations. [24]

Stieve was able to amass an outstanding collection of high-quality histology slides of female reproductive organs from numerous sources throughout his scientific career, which he correlated with more or less trustworthy clinical data. Images of these specimens can be obtained not only in German textbooks but also in an American standard reproduction compendium.[9, 24] However, it is impossible to link these images to specific cases of executed women of other origins.

Stieve's research on this histology collection yielded two key discoveries: one about the timing of ovulation and the other about the influence of the nervous system on the ovaries. In his opinion, Stieve presented several cases that, in his opinion, demonstrated his firm belief that additional ovulations could occur at any time during the menstrual cycle (in his own words, "in rare cases, two follicles may rupture in the interval between two periods at shorter or longer intervals".[25] As a result, he concluded that there were no truly "safe periods" for contraception at any point during the menstrual cycle. In terms of the neurological system's impact, Stieve used cases from Plotzensee jail to show that the prolonged stress of a looming death sentence or approaching execution resulted in morphological and degenerative changes in the ovaries in the majority of the women who were executed. He also discovered what he named "Schreckblutungen," or uterine diapedesis bleeding triggered by a purely mental cause, in this case, often the announcement of the execution. These findings led Stieve to postulate what is now known as a psychosomatic impact, positing that autonomic nerves have a direct influence on the ovaries.

His conclusions led to a fierce argument with one of his contemporary researchers, Austrian gynaecologist Hermann Knaus, who is best known for promoting the "rhythm technique" of contraception (the Ogino-Knaus method), which is predicated on the assumption that ovulation time can be predicted. However, current knowledge suggests that Stieve was correct in his doubts about the practicality and safety of Knaus' contraception approach, maybe possibly for the wrong reasons; nobody knows, but because of the heterogeneity in the timing of a (single) ovulation, the fertile window is now widely accepted.[27]

Maybe Hermann Stieve was a coward and was too timid to stand against the Nazis, but he was a trained soldier, and we know that the military is not for the weak-hearted. It is plausible speculate that he could have reasoned that he would serve humanity better by being alive instead of a martyr. It is undeniable that Steve is perhaps one of the anatomists whose significant works continue to provoke moral and ethical questions. Advances in modern anatomical knowledge are not without controversies. A crippling knee issue was corrected by a group of surgeons a little less than ten years ago after hopelessness drove them to consult the Pernkopf Topographic Anatomy of Man, possibly the best anatomy atlas available, to figure out the saphenous nerve intricacy around the knee.[20] But, knowing the book's history, which is based in large part on the bodies of those slaughtered by the Nazis, they wonder if they had done the right thing soon after the 2014 operation.

Despite the horrors of the Nazi regime, we opined based on evidence from reputable scientific journals, that Stieve was neither a serial killer nor an ardent Nazi.[9, 28] Nonetheless, current ethical concerns about his research tainted his findings. Many execution victim biographies may include Stieve as a tragic footnote. His contributions to anatomy education, however, are undeniable, though contentious.

CONCLUSION

Is Hermann Stieve's story teaching us anything? Perhaps it does. We have all probably heard the phrase "publish or perish," which refers to the pressure academics face to

publish their results to remain relevant and successful. Researchers may be vulnerable to research misconduct because of this pressure to publish. However, we must uphold the ethic of research and reporting. Research ethics are moral standards that guide researchers in doing and reporting research without dishonesty or the purpose of harming study participants or society as a whole, whether intentionally or unintentionally. We must adhere to ethical principles or standards when conducting and reporting research to guarantee the validity of our findings. Adherence to ethical guidelines safeguards the study participants, the public, and the researchers. Following ethical rules will ensure that our study is genuine and provide us with credibility and public support. In science, the end may not justify the means; we must be guided by ethical standards. Our results or findings are only acceptable when the means are acceptable. Otherwise, we may publish and perish.

CONFLICT OF INTEREST

Authors declared that there is no conflict of interest.

AUTHOR CONTRIBUTIONS

All authors made substantial contribution in the preparation of this manuscript.

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