

## A GLIMPSE OF OUR PAST

---

# The Anatomist Hans Elias: A Jewish German in Exile

S. HILDEBRANDT\*

*Division of Anatomical Sciences, Department of Medical Education, University of Michigan Medical School, Ann Arbor, Michigan*

---

Hans Elias (1907 to 1985) was an anatomist, an educator, a mathematician, a cinematographer, a painter, and a sculptor. Above all, he was a German of Jewish descent, who had to leave his home country because of the policies of the National Socialist (NS) regime. He spent his life in exile, first in Italy and then in the United States. His biography is exemplary for a generation of younger expatriates from National Socialist Germany who had to find a new professional career under difficult circumstances. Elias was a greatly productive morphologist whose artistic talent led to the foundation of the new science of stereology and made him an expert in scientific cinematography. He struggled hard to fulfill his own high expectations of himself in terms of his effectiveness as a scientist, educator, and politically acting man in this world. Throughout his life this strong-willed and outspoken man never lost his great fondness for Germany and many of its people, while reserving some of his sharpest criticism for fellow anatomists who were active in National Socialist Germany, among them his friend Hermann Stieve, Max Clara, and Heinrich von Hayek. Hans Elias' life is well documented in his unpublished diaries and memoirs, and thus allows fresh insights into a time period when some anatomists were among the first victims of NS policies and other anatomists became involved in the execution of such policies. *Clin. Anat.* 25:284–294, 2012. © 2011 Wiley Periodicals, Inc.

**Key words:** Hans Elias; anatomy; National Socialism; Jews; emigrants

---

"Every German, whether Jew or Christian, has to account for his actions between 1933 and 1945."

—Elias, 1979, 2-2, translation by the author

## INTRODUCTION

An important part of the history of anatomy in the Third Reich is the fate of the scholars of anatomy, whose careers were disrupted by National Socialist (NS) policies. New laws introduced in 1933 and later discriminated against the employment of citizens of Jewish descent or those who held dissenting political views. Among the thousands of dismissed academics there were 86 persons who can at this point in time be identified as scholars of anatomy whose careers were disrupted by such policies (Hildebrandt, 2011). Some had barely begun their professional life whereas others were advanced in their careers and held distin-

guished positions. One of the youngest was Hans Elias, who left his country as an unemployed teacher and went on to become an internationally known leader in the field of anatomy. His life and perceptions, especially of his German colleagues as documented in his memoirs, offer a unique insight into this problematic time period in general and the history of anatomy specifically. This article will first present Elias' life and personality and then attempt to interpret his views of German contemporary anatomists.

\*Correspondence to: Dr. Sabine Hildebrandt, Division of Anatomical Sciences, Department of Medical Education, University of Michigan Medical School, 3767 Medical Science Building II, 1137 Catherine Street, Ann Arbor, MI 48109-5608, USA. E-mail: shilde@umich.edu

Received 2 August 2011; Revised 21 September 2011; Accepted 27 September 2011

Published online 28 October 2011 in Wiley Online Library (wileyonlinelibrary.com). DOI 10.1002/ca.21293

## MATERIAL

Hans Elias documented his life extensively, although none of his personal memoirs have been published. The largest collection of his papers is to be found in the manuscript division of the Staatsbibliothek Berlin-Stiftung Preussischer Kulturbesitz: Nachlass Hans Elias (papers of the estate of Hans Elias, 11 boxes). It includes manuscripts of published and unpublished papers; a handwritten memoir in English written 1948–1949 in Atlanta, Georgia; an autobiography in German dated 1979; calendars with personal notes and taped-in letters from 1931 to 1978; personal correspondence; diaries of his parents, photographs, newspaper cuttings, and fliers from his art exhibitions.

Another set of papers is held at the German and Jewish Intellectual Emigré Collection by the M. E. Grenander Department of Special Collections and Archives at the State University of New York (SUNY) library at Albany. Among these is a copy of Elias' 1979 autobiography: *Abenteuer in Emigration und Wissenschaft, ein Beitrag zur Aufklärung des Krebsproblems* (Adventures in Emigration and Science. A Contribution Towards the Understanding of the Cancer Problem). This copy is missing the important page 2–10 (see below), which however can be found in the complete copy at the Staatsbibliothek Berlin (Box 11). Elias wrote this autobiography based on his contemporary diary notes. The Grenander collection also holds audiotapes of Hans Elias and Anneliese Elias (wife) from 1979 and Thomas Elias (son) 2008. The tapes are part of an oral history project to interview German-speaking academics who immigrated to the United States in the 1930s. This project was initiated in the early 1970s by John M. Spalek, former Chair of the State University of New York at Albany's Department of Germanic Languages and Literatures.

In addition to these papers obituaries were used, as well as the author's correspondence in 2010/2011 with Hans Elias' sons Thomas Elias and Dr. Peter Elias and other relevant literature. Professor John E. Pauly, a former student and collaborator of Hans Elias, graciously agreed to share his memories of Hans Elias in a long telephone conversation on 11 July 2011.

A full bibliography of Hans Elias' work can be found in Haug (1986). A bibliography concerning the general history of the interaction between science, state and universities in Germany and other countries at the time can be found in these references: Weindling (1989), Hildebrandt (2009a), and Hildebrandt (2011).

Three images of examples of Elias' sculptures can be found in his publication "Simulacra anatomica" (Elias, 1971).

## GERMANY 1907–1934

Hans Elias was born in Darmstadt, Germany, on 28 June 1907, the son of Michal Elias, headmaster of the private Paedagogium Preparatory School, and his wife Anna Elias, née Oppenheimer, also a teacher



Fig. 1. Hans Elias in 1940.

(Elias, 1979, pp. 1-6; Pauly, 1987). The family was of Jewish descent and among his ancestors were teachers, tradesmen, a doctor, rabbinical scholars, and cantors (Elias, 1979, chapter 1). He grew up in a liberal and democratic atmosphere and had Jewish and Christian friends with whom he stayed in contact throughout his life. Elias later believed that his growing up as a democrat among German democrats who perceived Adolf Hitler and the rising National Socialism of the 1920s as "un-German" prevented him from hating his fatherland in later life (Elias, 1979, 2-2). In contrast, his wife had experienced overt anti-Semitism already in her childhood and was much less conciliatory toward Germany and Germans after her emigration (Elias, 1979, 2-3). In a manuscript entitled "The Germans" from ca. 1945 Elias wrote of his fellow countrymen: "Of course, there were some fervent liberals in Germany. The survivors of this minority, found today chiefly in concentration camps and as refugees in foreign countries are the only Germans on which we can rely" (Nachlass Elias, box 2).

After first focusing on the study of fine arts (Baron, 2011), Elias then pursued graduate studies in the natural sciences at the Technische Hochschule Darmstadt and the Universities of Berlin and Gießen, majoring in biology and mathematics with a minor in physics and education (Pauly, 1987). The choice of studies mirrors the wide range of Elias' interests, as he saw himself throughout his life as foremost a teacher, and then also as a scientist and artist (Elias, 1979, 2-1 ff). His 1931 doctoral thesis focused on the development of the coloring in frog

skin, work he had done at the zoological institute in Giessen under Professor W. E. Schmidt (Elias, 1931; Haug, 1986). He produced the most exquisite illustrations for his scientific papers (see Nachlass Elias, e.g., box 2 and box 4) and later encouraged his students to document their findings with their own drawings (Pauly, 1987).

In 1931 Elias had started his further training as a teacher at a high school in Frankfurt/Main (Elias, 1979, 5-2). He had to leave this position when his family ran into financial trouble some years after the death of his father. Elias had to seek a paying position and found it at the Jewish School for the Deaf in Berlin-Weissensee where he taught and pursued private research until 1933 (Elias, 1979, 3-1). Felix Reich, the headmaster of this school was himself of Jewish descent but also of strong nationalistic conviction, and after Hitler's ascent to power demanded from his employees that they greet their students with a raised right arm and the word "Heil" without the "Hitler." Elias was the only teacher to refuse the command and was fired. This was the first but not the last time that Hans Elias denied compliance with directions from superiors that ran counter to his principles, denials that led to the loss of his respective jobs. However, he adopted Felix Reich's advice for life: "Herr Doktor Elias, one does not give up. Never make [sic] your enemy the pleasure of admitting defeat. Keep on working! Behave as if nothing had happened!" (Elias, *Memoirs II*, Nachlass Elias, box 2).

Before he moved on to his next teaching position at a private Jewish school in Herrlingen, Swabia, Elias recognized the NS boycott against Jewish businesses on 1 April 1933 as a sign of worse things to come and initiated the emigration of his mother and sister Magda from Berlin to the Netherlands. Shortly after, the women moved on to Milan, Italy, where they founded a childcare facility. Elias stayed behind in Germany because he felt morally compelled to support German-Jewish youths. During the next year he taught and did private research in Herrlingen, but resigned from his job after protesting his superior's liberalistic pedagogic methods. By 1934 he had come to the conclusion that he would not be able to pursue his dream of educating Jewish students in Germany because of his "unemployability" in the German civil service and his lack of finances for a private enterprise; he decided to leave Germany (Elias, 1979, 3-1 to 3-7).

### ITALY 1934–1939

In early 1934 Hans Elias first joined his family in Milan but soon moved from there on to Turin, where he had found employment as the private teacher of the son of a wealthy family. His mornings were free so that he could continue his research on frog and toad skin at the Anatomical Institute of Turin University, where the renowned cell biologist Giuseppe Levi gave him working space. However, Elias' pedagogic ideas of hardening the mind and body of his ward did not agree with his employers' expectations, and so he lost another job and returned to Milan in the summer of 1934. Here he worked on a film about the



Fig. 2. Hans Elias in 1963, age 56.

embryonic development of the European tree frog. This idea stemmed from an embryology course he took during his studies in Berlin, where Richard Weissenberg had encouraged Elias' plans. His first successful cinematographic project had been a collaboration with Walter Schwarz (later known as Michael Evenari) at the Technische Hochschule Darmstadt and dealt with the development of flowers (Elias, 1933). In 1935 Elias was able to perfect his technique when he was granted a scholarship by the *Schweizer Hilfswerk für Deutsche Gelehrte* (Swiss aid organization for German scholars). This allowed him to work with Ernst Rüst at the Institute for Scientific Photography at the Eidgenössische Technische Hochschule in Zurich. The result was an educational film on the development of amphibian ova (Elias, 1979, 3-8 to 3-17). During his time in Zurich Elias also worked at the Anatomical Department of the University, where he made the acquaintance of Wilhelm von Möllendorf, chair of the department, and his assistant Wolfgang Bargmann (Elias, 1979, 2-9).

By 1936 Elias had moved to Venice, where his fiancé Anneliese Buchthal worked as a physiotherapist at the Municipal Hospital of Venice (Elias audio-tape, 2. Interview, 1979). He had first met her on a visit from Germany in 1933 (she had emigrated in early 1933), and they were married on 11 October 1936 in Venice. Because of an agreement between

Italy and Germany, the German racial laws of 1935 applied to German expatriates in Italy. Hans and Anneliese had to prove that they were of "pure Jewish descent" according to the 1935 Nuremberg laws to be granted a wedding license. Meanwhile Elias worked as an unpaid researcher at the Anatomical Institute of the University of Padua under the direction of Tullio Terni, and he commuted daily by train from Venice to Padua (Elias, 1979, 3-20, 3-24, 4-1). Throughout his early years in Italy Elias earned his income by painting portraits. His art was very successful: an image of the young Contessa Ifigenia Marini di Villafranca was accepted for the prestigious exhibition Biennale di Venezia in 1936.

In 1937 the couple moved to Rome, where Elias had found a paid position as director of the Laboratory for Scientific Cinematography and Histology at the *Consiglio Nazionale delle Ricerche* (Italian Research Counsel) and as consultant to the International Institute for Educative Cinematography of the League of Nations (Pauly, 1987). By summer 1938 Elias' wife, mother, and sister convinced him to obtain visas from the US embassy for the whole family, as newly emigrated friends from Germany had advised them about the increasingly aggressive persecution of Jews there. Elias was not yet ready to move, as he dreaded another emigration and consequent unemployment. However, on 14 July 1938, Italian fascist university professors had issued an anti-Semitic manifesto that ultimately led to new legislation (Bayer, 1972). On 1 September 1938, the Italian government issued a law that ordered all expatriate Jews to leave the country within 6 months. This was followed by the law of 2 September 1938, that commanded the dismissal of all Jewish teachers and academics. Elias received his notice on 6 September 1938. He was able to finish his current projects, and his last day at the *Consiglio Nazionale* was on 26 November 1938. He rejected an offer to teach at the University of Istanbul, Turkey, as he expected his emigration to the US within the coming months. The time until then was filled with more cinematographic work at the Biological Laboratory of the Atheneum Pontificium Lateranense in the Vatican State under Guiseppe Reverberi. Elias' friend Hans Bytinski-Salz, a zoologist, had arranged this employment. The Elias family left Italy for the US on 1 April 1939. At the beginning of the year Hans had written in his diary: "Per aspera ad astra. [...] Migration is disagreeable to me. I have seen enough already. And Darmstadt, the Odenwald and the Black Forest are entirely enough for me" (Nachlass Elias, box 6, diary of 1939; translation by author).

During his years in Italy and even after his second emigration to the US, Elias' scientific articles were still published by German anatomical journals (Elias, 1934, 1936, 1937a-d). Most of Elias' early mentors and collaborators shared his fate following the political developments in their respective countries: Wilhelm von Möllendorf, Richard Weissenberg, Hans Bytinski-Salz, and Walter Schwarz emigrated from Germany, while Guiseppe Levi and Tullio Terni lost their positions because of Italian racial discriminatory legislation in 1938 (Hildebrandt, 2011).

## US 1939–1985 (FIGS. 1,2)

After the family's arrival in New York City on 13 April 1939, Elias immediately started his search for a job. He found this difficult, as previous waves of academic emigrants had already been absorbed into the US educational system and there were only few positions available. After several trips along the East Coast, funded by aid committees for emigrants, he finally found employment as a Professor of Biology and Veterinary Histology at the Middlesex University in Waltham, Massachusetts (now: Brandeis University; Elias, 1979, 4-20-4-26). Middlesex was of particular help for anatomists, as it had become a home for many emigrants from Europe (Sachar, 1995). Apart from Elias, his former teacher Richard Weissenberg from Berlin and Louis Bergmann from Vienna worked here as Professors of Anatomy and Histology during most of the war and in the first years thereafter (NEJM, 1939; Sprague, 1975; Haug, 1986).

Once in the US, Elias felt free to share his original but highly controversial ideas on education and politics with the public. He published papers on education (e.g., Elias, 1940, 1942) and wrote letters to politicians and public figures like Chaim Weizmann, Heinrich Brüning, the psychologist Erich Fromm, and the German emigrant authors Klaus Mann and Thomas Mann, whose letters of response can be found among the Elias papers (Nachlass Elias, box 3). This activity ran in parallel with his continuing research and teaching responsibilities. During the 6 years at the Middlesex University his sons Thomas and Peter were born, and Hans and Anneliese became US citizens on 27 November 1944 (Nachlass Elias, diary 1944, box 7).

Elias now wanted a more profitable and secure position, preferably in the public health service, and found this at the Center for Communicable Diseases (CDC) in Atlanta, Georgia, in 1945. He was hired to produce medical educational films (Pauly, 1987). While working on a project about the human liver, Elias noticed clear discrepancies between the accepted view of liver histology as a set of "cords" and his own observations, which he described as a system of continuous "plates." He pursued his hypothesis in private research and intended to publish the results in 1948, when he was told by his supervisor that Elias' position at the CDC did not allow the pursuit or publication of scientific findings. However, Elias continued with his research and its publication (Elias 1948, 1949a-d). John Pauly summarized the results of Elias' actions aptly: "The papers made him famous, but they got him fired" (Pauly, 1987). During their four years in Atlanta, Hans and Anneliese were appalled by their white neighbors' treatment of African-American neighbors (Elias, 1979, 7-5 to 7-7). Later in his career Hans went out of his way to assist minority and disadvantaged students (Pauly, 1987).

The hepatologist Hans Popper of the Chicago Medical School had become aware of Elias' findings and facilitated his recruitment as an Assistant Professor of Microscopic Anatomy to this educational institution

in 1949. Many of the faculty members, like Hans Popper, were Jewish refugees. Elias was promoted to Associate Professor of Anatomy in 1953 and Full Professor in 1960 (Pauly, 1987). By this time he had long been fascinated by the challenge of creating scientific images that could convey the plasticity of the three dimensions in space. During his studies on the architecture of the liver he had worked with serial cuts of tissue, a highly time-consuming process. He assumed that it should be possible to evaluate two-dimensional images mathematically in a way that would help predict the three-dimensional structure of the tissue. In collaboration with mathematicians he developed geometric formulae that enabled him to predict structures from the two- to the three-dimensional space, a science he called stereology. His first study objects were noodles embedded in gelatin (Elias, 1979, 12-10/12-11), but he soon advanced to complex structures like cell organelles (Pauly, 1987). His first publication on stereology (Elias, 1951) led a decade later to the foundation of the International Society of Stereology in May 1961 (Elias, 1979, 8-8).

Elias not only defined the science of stereology, he also wrote books like his popular "Human Micro-anatomy" together with his former assistant John E. Pauly (Elias and Pauly, 1960), continued his collaboration with Hans Popper, volunteered teaching at an elementary school, painted, developed a new distinguished career as a sculptor (Baron, 2011), and supplemented his income as an illustrator for various pharmaceutical companies. In this capacity he developed a new technique of layered color transparencies (Elias T, Personal communication, Electronic mail 7/10/2011). In addition, Elias pursued various other innovative projects that did not always meet with the approval of his scientific colleagues. One of them was his initiative to re-introduce Latin as a common scientific language. He published two of his scientific papers written in Latin (Elias 1957a,b) but had to realize that they were neither read very widely, nor was he himself always able to understand letters of response that were written in classic Latin (Elias, 1979, 9-14/9-15)! The other subject that would keep him occupied for the rest of his life was the question of carcinogenesis. Hans Popper had encouraged him to study cancer of the liver to understand the relationship between embryonic and adult liver tissues. Elias' results led him to a theory of multicentric carcinogenesis and cancer cell recruitment, which ran counter to most other contemporary hypotheses on cancer development. In the following years, Elias was an avid defender of his idea, but when the funding of studies of his theory was repeatedly refused, he suspected a conspiracy by his opponents and became for a while rather bitter (Elias, 1979, chapter 9). This man, who at that time had already received many official recognitions of his work (Pauly, 1987), wrote in a letter to his friends in December 1963: "You may say that I am ungrateful. Yes, I should be content by not having been tortured and killed by the Nazis. I should be grateful for the many blessings I have received personally. Yet, in my opinion, what one gets is nothing. Only what one accomplishes in terms of permanent values given to

mankind counts. And my accomplishments are about one hundredth of what I have intended to do. [...] In summary, at the age of 56 I see my efforts in life (except in my immediate family) to have been practically useless" (Nachlass Elias, box 8, diary 1964). This strong self-critical attitude shows Elias' high expectations of himself in terms of his scientific and political effectiveness. However, he still adhered to Felix Reich's advice of not giving up and persisted in making his own liberal political convictions known. He did this sometimes in secrecy, as he noted in 1968: "Only people with money and tenure can be courageous" (Nachlass Elias, box 8, diary entry 12/10/68). On 13 August 1969, Elias sent a letter to President Richard Nixon, in which he urged the President to work on educational reform and to end the war in Vietnam. He wrote under an assumed name and with the return-address of a mailbox rented for the purpose, as he assumed that he might be fired from the Chicago Medical School if it became known that he was critical of the government (Nachlass Elias, box 8, diary entry 8/12/69).

Elias' work in Chicago ended in 1972, when he became Professor Emeritus at the age of 65 (Pauly, 1987). He and Anneliese moved to San Francisco to be closer to their sons. In 1973 they accepted an invitation for a sabbatical at Heidelberg University. Here Elias found support for his work on carcinogenesis and spent another productive and rewarding period of research. On his return to California in 1975 he became a Research Stereologist at the University of California Medical Center at San Francisco. At the same time he saw his wish fulfilled to teach younger students as a Lecturer of Anatomy at the City College of San Francisco (Pauly, 1987). He enjoyed these positions until his death on 11 April 1985, at the age of 77.

## HANS ELIAS AND HIS GERMAN COLLEAGUES

After his studies Hans Elias had his first professional encounters with German anatomists when he was already living in exile. As mentioned above, he met Wilhelm von Möllendorff and Wolfgang Bargmann in Zurich in 1935 and wrote in his 1948/49 memoirs: "Moellendorff, one of the greatest contemporary histologists was a tall man with close cropped hair. He was an East Prussian Junker [nobleman] who had, in spite of his origin, left his chair at the University of Freiburg because he was disgusted with the Nazi régime. He choose [sic] a less prominent position in free Switzerland" (Nachlass Elias, box 2, memoirs III). He was struck by Möllendorff's friendliness and helpfulness toward him and other colleagues. Wolfgang Bargmann was one of Möllendorff's senior assistants, and Elias described him as the most likeable among the German anatomists and as the intellectual leader of anatomy in the Federal Republic of Germany after the war (Elias, 1979, 2-9).

In September 1936 Elias attended the International Congress of Anatomy in Milan, where he met many of his German and international colleagues for

the first time. He was greatly impressed by the feeling of unity and friendship among his colleagues, and his diary entry and memoirs sound positively jubilant: "This congress was one of the greatest feasts ever held. Everyone sensed the imminent war. This subconscious knowledge that this was one of the last occasions for this big, world wide family of anatomists to meet intensified the glamour of this festival of companionship. [...] During this festival of international friendship and scientific brotherhood, I became strangely attracted to H Stieve, a professor of anatomy at Berlin and he to me. We spent as much time together as we could" (Nachlass Elias, box 2, memoirs III). Indeed, Stieve, the leader of the German contingent at this international congress, and Elias became great friends and remained in contact throughout Stieve's life. All German anatomists were very friendly toward their Jewish-German colleagues, as Elias recalled, even the active National Socialist Max Clara (Elias, 1979, 2-10). Also at this meeting, the Czech embryologist Jan Florian offered Elias a position in his institution (Nachlass Elias, Box 6, diary 1936). Elias never mentioned this offer again. During the war Florian fought for Czech independence and was executed after solitary confinement and torture at the concentration camp Mauthausen on May 7, 1942 (Studnicka, 1946; Kapeller and Tichy, 1985).

Stieve and Elias met again two years later in Zurich. After the war Stieve sent Elias a handwritten, four-page letter. In it he asked Elias for contributions to a journal edited by Stieve (*Zeitschrift für Mikroskopisch-Anatomische Forschung*, Journal for Microscopic and Anatomical Research). The other content of this letter enraged Anneliese Elias so much that she tore it in pieces. Elias later thought that the letter might have become an important document for the Nuremberg trials. There are two sources among Elias papers in which traces of the content of this letter can be found. It should be noted that the first passage was written about three years after reception of the letter and the second 33 years later:

1. Elias integrated some of the remembered contents of this letter in his 1948/49 memoir and wrote, starting with musings on the meeting in Milan 1936: "A strange pair: Stieve, the noted embryologist and little Hans Elias, a green horn in science. Stieve who wore a swastika and little Hans with the crooked nose. Stieve who later was to become a frequent user, for scientific purposes, of the bodies of massacred Jews and who is alleged (but denied it), to have ordered the removal of the womb from numerous healthy women in concentration camps, in order to study microscopically, the menstrual cycle. Of course, at that time I took his swastika only as a piece of enameled brass forcefully imposed upon his lapel. Well, I do not know why. But the fact remains the [sic] Stieve and I liked each other tremendously and stuck together throughout the meeting, and we renewed our friendship two years later in Zürich. The astonishing thing in this matter is that I have no valid reason to like Stieve partic-

ularly. As a scientist, I do not think that he amounts to much. He is one of those opinionated pseudoscientists who believe in a theory and then try to see only those facts which seem to support their theory. Also, his use of cadavers of the massacred which he freely admitted in a letter to me after the war, stating that these massacres, themselves deplorable, have contributed tremendously to the advancement of anatomy, was not a very commendable action. I will not form a judgement [sic] about his alleged use of uteri of healthy women, since he rigorously denies it" (Nachlass Elias, box 2, memoirs III).

2. Elias recalled some of the content of the letter in his 1979 autobiography (Elias, 1979, 2-10/2-11, translation by the author) and wrote in Stieve's voice: "Now that National Socialism, under which I have suffered greatly, has finally come to an end, I would like to again take up our friendship. Yes, we have lived through hard times under Hitler; however, for us anatomists this was a delightful period. We were able to receive completely fresh bodies of healthy persons, as many as we wanted. Such bodies make a glorious dissection material. Now we have to again contend with the use of dried up bodies of persons who died of disfiguring diseases in hospitals." Elias went on stating that Stieve, who had been working on reproductive organs of women, sent his assistants and students out to "spy on" sexual activity of women and had these women then executed by the *Gestapo* (secret police). As proof for this he quoted one of Stieve's publications from 1942 "*Der Einfluss von Angst und psychischer Erregung auf Bau und Funktion der weiblichen Geschlechtsorgane*" (The influence of fear and psychological stress on the structure and function of the female reproductive organs) in the journal *Zentralblatt für Gynäkologie* (Central Paper for Gynecology). However, the page number quoted by him (p. 1456) does not mark this paper but the report on a discussion entitled "*Die Wirkung von Gefangenschaft und Angst auf den Bau und die Funktion der weiblichen Geschlechtsorgane*" (The effect of imprisonment and fear on the structure and function of the female reproductive organs), a discussion held between Stieve and his colleagues. The correct page numbers are pp. 1698–1708.

It appears that Stieve's revelations in the letter did not deter Elias from contemplating the offer of a position as a Lecturer of Histology and Embryology in Stieve's department of anatomy in Berlin after the war. Stieve referred to this offer in a letter to Elias dated 18 August 1947. He feared however, that Elias' US citizenship might pose problems with the Soviet Military Administration, even though there was a desperate lack of anatomists in the Eastern part of Germany. In a letter from 27 August 1948, Stieve reiterated his hope of a continued scientific exchange with Elias and described the situation in Germany as growing continually worse. He reported

that for this reason the secretary of the *Anatomische Gesellschaft* (Anatomical Society) Heinrich von Eggeling had discontinued his collaboration on the *Anatomische Anzeiger* (Annals of Anatomy), the journal of the society. Instead, Eggeling planned on starting a new journal in the Western part of Germany. Finally on 21 March 1949, Stieve had to inform Elias that there was no position available for him in Berlin because of a lack of funds. He also believed that it might not be a good idea to bring a young family to live in the Eastern part of Germany at that time. Stieve remarked that he himself was frequently contemplating emigration but was held back by his age and the fact that he did not want to be separated from his anatomical collections (Nachlass Elias, letters from Stieve in box 3). This statement by Stieve about the reasons for remaining in Berlin was less than candid. He had applied for the chair of anatomy in Munich, but was refused by the US American Office of Military Government in 1946, since he was classified as politically compromised (personal information from T. Noack, Bayerisches Hauptstaatsarchiv. Akt MK 69378).

The question has to be asked how it was possible that Elias considered Stieve to be a murderer and still communicated and worked with him after the war. The explanation for this seeming contradiction probably lies in their first meeting in Milano and their common German background. German academic medicine was tightly ruled by a rigid authoritarian style, in which Stieve impersonated the perfect professor and Elias the perfect student, even if their encounter happened in exile. Elias respected the true authority of a knowledgeable and dedicated leader, and Stieve, however dubious his character was otherwise, was exactly that. On the other hand, Elias must have impressed Stieve as the ideal inquisitive and hard working student or younger colleague. Elias' diary entry about the meeting in Milano shows his great joy about Stieve's having become his friend. And while Stieve had been known to possess racist views (Stieve, 1926), his anti-Semitism seems to have been of the then "culturally accepted" kind pervasive during Germany's Imperial period and thereafter (Röhl, 2002). He believed in racial differences and held collective prejudices, but had no personal aversion to individual Jewish friends. The fact that Elias was so thrilled to have such a prominent friend and was proud of this friendship may be the explanation for his not being entirely able to break with Stieve after the war.

Elias must also have been in contact with Eggeling after the war, as three letters by Eggeling in 1949 attest to the fact that Elias was planning to work as a guest researcher in a German anatomical institute. Eggeling thought that any German institute would be happy to host Elias and suggested the institutes in Cologne with its chairman Otto Veit, Bonn with its chairman Philipp Stöhr Jr. or Marburg with its chairman Alfred Benninghoff. It can only be speculated that Eggeling selected these institutions on purpose based on the fact that Veit himself had been persecuted under the NS-regime because of his Jewish descent and Stöhr and Benninghoff had kept a certain distance from National Socialism (Hildebrandt, 2009a).

Elias was convinced that Stieve had caused the execution of human beings for use in his studies. He also believed this to be true for Heinrich von Hayek. Elias stated in his autobiography that Hayek had been made to leave the Federal Republic of Germany after the war because of his active political stance for National Socialism and because of "anatomische Morde" (anatomical murders). He later became chairman of anatomy in Vienna (Elias, 1979, 2-11). At the International Congress of Anatomy in New York in 1960, Hayek's invitation to the international community of anatomists to hold their next meeting in Vienna in 1965 was accepted. On hearing this, Elias mobilized his Swedish colleague Carl-Hermann Hörtjö and Gerhard Wolf-Heidegger from Basel, Switzerland (another Jewish refugee; Hildebrandt, 2011), to protest against this decision with Wolfgang Bargmann, one of the presidents of the *Anatomische Gesellschaft*. Bargmann agreed with their arguments, the decision was repealed and the next International Congress was held in Wiesbaden, Germany. When Elias gave a presentation at the Viennese Medical Academy in 1963 Hayek was friendly, but Elias did not talk to him. In an informal meeting with other Viennese physicians after the talk, Elias asked how it could have happened that "such a murderer could occupy the most important chair of the medical faculty." He remembered the answer as: "Well, back then it was legally sanctioned to have any number of persons imprisoned, even if they had committed the smallest crime. Thus Hayek's imprisonments were not crimes but happened in accordance with the law" (Elias, 1979, 2-12, translation by author). Elias obviously also counted Max Clara among the "anatomical murderers," as he remembered Clara's fate in his autobiography. He stated that after Clara "had made a fool of himself in Germany with his Nazi activities" he accepted a professorship in Istanbul, Turkey, where after the war former NS activists were employed, who had to leave Germany because of their "anatomical murders" (Elias, 1979, 2-12 and 4-11).

## DISCUSSION

### Hans Elias' Life and Personality

Hans Elias was an energetic, passionate, and multitalented man who held strong opinions. This combination of characteristics explains the great successes and joys in his life as well as his moments of defeat and despondency. Without his ability to shrewdly and fearlessly assess political situations he might not have been so decisive in moving his family out of Germany as early as 1933 and follow them himself a year later. His accurate judgment of the danger awaiting him and his family was later confirmed by the terrible fate of his favorite uncle Dr. Siegfried Oppenheimer. Oppenheimer, a physician at the Staatstheater Darmstadt, stayed behind in Germany and ultimately perished in Terezin concentration camp in February 1943 (T. Elias, Personal communication, Electronic mail 7/10/2011; Heer, 2011). Looking back Elias wrote: "I had the incredible luck of not having been persecuted personally. [...] I owe

my early and unencumbered emigration to my poverty and unemployment, as well as the utter hopelessness of my professional situation" (Elias, 1979, 2-6/2-7, translation by the author). Elias shared this fate of emigration because of poverty and/or a lack of professional prospects with other young anatomists, particularly those of Jewish descent, who "voluntarily" left Germany and the newly occupied Austria and Czechoslovakia. Among them were Robert Altschul, Louis Bergmann, Alfred Glücksmann, Hans Grueneberg, Werner Jacobson, Dimitri Kadanoff, Joseph Pick, Fritz Strauss and Gerhard Wolff-Heidegger. All of them went on to successful careers in their new countries. Many of their more established colleagues, who had much to lose by emigration, tried to stay behind as long as possible, sometimes risking their lives (Hildebrandt, 2011). Elias' life exemplifies the loss that German and Austrian anatomy sustained by these young academics' emigration after any hope of professional careers in their home countries had become impossible. In Elias' example, his ability of following his own insights completely and his fearlessness in rejecting accepted wisdom led him to an entirely new concept of liver architecture. The unique combination of his talents, his tendency to think across boundaries of disciplines and use his mathematical and artistic skills simultaneously to employ them for biological questions, led him to the foundation of the new science of stereology.

Hans Elias' fate clearly illustrates how hard life in exile was. He had to emigrate not only once, but twice, and endured years of unemployment and poverty while continuously developing his scientific, educational and political ideas, his artistic talents, and his personal life first with Anneliese and later his sons. In the 1950s he still had to supplement his academic income with employment as an artist. Also, his early experience of endangerment in Germany may have left Elias with a tendency to suspect conspiracies later in his life, e.g., when he felt that funding was withheld for his studies of carcinogenesis. His strong will and principles helped him to continue his work in the face of adversity, but they also lost him several jobs and made him sometimes a difficult person to live with, as he himself suspected. In 1979 he wrote: "Even at the age of 72 I am still moving ahead. Who knows, what the future holds? I am certainly not an easy partner for my dear wife Anneliese. But I do hope that life with me is not boring" (Elias, 1979, 13-9, translation by the author).

According to Elias' younger son Thomas, religion and being of Jewish descent were never of vital importance in his father's thinking, although they were certainly part of his identity and his family's history. He had had a religious education as a child, could chant the central Hebrew prayers "in a pronounced Ashkenazy accent" (T. Elias, Personal communication, email 7/10/2011), was proud of signing the certificate of marriage with his Hebrew name (Elias, 1979, pp. 3-26), and insisted on his sons' religious education. However, Thomas felt it was the National Socialists who imposed this Jewish identity on Elias as a central element of his being. Again, this was a fate that Elias shared with many of his fellow German emigrants of Jewish descent.

Elias' lifelong affection for Germany and the Germans was a contentious issue between him and his wife (T. Elias, Personal communication, email 7/10/2011). As mentioned earlier, Elias himself saw the roots of this attitude in his liberal democratic upbringing and the fact that he had never personally experienced any anti-Semitism. Anneliese's experience in her hometown of Witten had been very different, as she had been bullied because of her Jewish descent during her school years and had been in imminent danger on 1 April 1933 (Elias audiotope, 1979, 1. Interview). Elias longed to be back in Germany and made several efforts after the war to find a position as a guest researcher at a German anatomical department. He finally succeeded in his retirement. Elias reported in his autobiography that this temporary move to Heidelberg was at first very hard for his wife. However, through her new contacts with the German youth and Elias' old friends she learned that the Germany of the 1970s was different from the one she had left in 1933 (Elias, 1979, 2-3/2-4).

Elias saw himself as a German and never lost his love for German literature, art and ideas, as well as for his old friends and the countryside he grew up in. Referring to his diary entry from 1938 (quoted above), he wrote in his autobiography in 1979, after finally achieving financial security: "I still feel this way today, 41 years later. And even though I live in the most beautiful town of the Northern hemisphere (San Francisco) in a house on a mountain with an unbelievably grandiose view, I feel drawn towards the home country [original: *Heimat*] all the time. I have interesting work here, dear colleagues, co-workers and students. Even so, this here is exile [original: *die Fremde*]. Only Odenwald and Schwarzwald are home country" (Elias, 1979, pp. 4-12; translation by author). He never lost his local Hessian accent in his German; it even carried into his English (Elias audiotope, 1979, I. Interview). Like so many other emigrants he experienced *Heimweh* (homesickness), and more than that: he experienced what Hilde Spiel, herself an emigrant, called "exile as a disease," a state which included "agonizing experiences: of homesickness, feelings of being excluded and misunderstood, insurmountable language barriers, barriers of tradition, education, habit and familial connections" (Spiel, 1977, p. XXII and p. XXV; translation by the author). Yes, he had survived, but his life as a German had been disrupted forever.

### Hans Elias' Observations on German Anatomists

It is a curious fact then that Elias, who held no particular grudge against Germany and Germans and had become a member of the *Anatomische Gesellschaft* in 1956 (Hildebrandt, 2011), was at the same time ready to believe the worst of some of his colleagues, even when he liked them, as was the case with Stieve. He was convinced that the anatomists Hermann Stieve, Heinrich von Hayek, and Max Clara had committed murder during the Third Reich; that they had handpicked persons who might be interesting for their respective studies, had caused their execution by the National Socialists and then



used their bodies for anatomical studies. How did he come by these convictions and what is the truth behind these allegations?

Fact is that all anatomical departments in Germany from 1933 to 1945 used the bodies of executed victims of National Socialisms. Indeed, the use of the bodies of the executed had been legal in Germany and other countries for many centuries. However, the use of the bodies of the executed during the Third Reich differed in two essential points from the preceding years: bodies of the executed were often used without consent by relatives and the anatomists became part of a political strategy that aimed at the complete annihilation of the victims including the memory of them (Noack and Heyll, 2006; Noack, 2008; Winkelmann and Schagen, 2009; Winkelmann and Noack, 2010; Noack, in press). During the war years there was an unprecedented increase of executions up to several thousand per year, many of them executions of political dissidents. All anatomists used the bodies of the executed, regardless of their political convictions (Hildebrandt, 2009b). Stieve did not consider himself to be a National Socialist, held no membership with the party but only two minor NS organizations, the National Socialist League of Alumni (*NS-Altherrenbund*) and the National Socialist Warrior League (*NS-Reichskriegerbund*) (personal communication from T. Noack, Bayerisches Hauptstaatsarchiv. Akt MK 69378). Even though, Elias remembered a swastika on Stieve's lapel at the Milan meeting. His wearing a swastika pin may have had to do with the fact that Hermann Göring had made him the leader of the German delegation (Winkelmann, in press). Hayek and Clara however were party members, and Clara was a particularly active National Socialist (Hildebrandt, 2009a; Winkelmann and Noack, 2010).

Stieve, Hayek, and Clara not only used the bodies of NS victims for the increased teaching requirements during the war, but also for their research projects. All three published several articles during the war that left no doubt about the sources of their "material." While Stieve reported that his study subjects died of a "sudden death" (e.g., Stieve, 1942c), Hayek and Clara wrote openly about the use of bodies of the executed. Stieve of Berlin studied the influence of psychological stress on male and female reproductive organs (Stieve, 1942a,b, 1946). The department of anatomy in Berlin received several thousands of bodies of the executed directly from the two execution centers in Berlin, Plötzensee and Brandenburg-Görden (Winkelmann and Schagen, 2010). Hayek of Würzburg studied the microscopic structure of the lungs and recommended the bodies of younger executed persons as particularly suitable for this kind of work (Hayek, 1940a,b). In 1938 the department of anatomy in Würzburg had actively lobbied for the use of bodies of the executed from the execution center in Munich Stadelheim and this request was granted (Noack, in press). The department received 121 bodies of executed persons, including those of political dissidents, between 1935 and 1945, most of them between 1942 and 1944 (Blessing et al., 2011). Recent studies show that an unusual collaboration

seems to have existed between the chair of anatomy in Würzburg, Curt Elze, and Werner Heyde, chair of psychiatry and neurology in Würzburg since 1939 and later implicated in the so-called euthanasia killings. Heyde arranged the delivery of 80 bodies of persons who had obviously been killed with carbon monoxide and had Elze and Hayek pledge strict silence on the matter (Blessing et al., 2011). Max Clara was interested in mucus-producing cells and Vitamin C metabolism (Clara 1940, 1942). As chair of the anatomical department in Leipzig he had petitioned the Saxon state ministry to gain more liberal access to the bodies of the executed. The department received bodies of the executed from the execution center in Dresden, where altogether 1300 prisoners died. Many of these prisoners had been resistance fighters from Bohemia, Moravia, and Poland. There is also evidence that Clara experimented on at least one prisoner before his execution (Winkelmann and Noack, 2010).

These are the known facts about Stieve, Hayek, and Clara. The question is how they relate to Elias' allegations of "anatomical murder." As all three anatomists published their work in internationally received journals, any attentive reader could have recognized the fact that unusual numbers of bodies of the executed were mentioned in studies stemming from Germany at the time. While the bodies of the executed were also used for anatomical studies in other countries, the accumulation of German papers during the war was obvious (Hildebrandt, 2009c). Thus Elias or any of his colleagues could have known about the use of unusual numbers of the executed by German anatomists. He also had firsthand information shortly after the war through Stieve's handwritten letter, even if the exact wording of the letter is lost. However, there is no evidence that Stieve, Hayek, or Clara had directly had a hand in the murder of NS-victims. The only anatomists so far known to have committed murder were August Hirt and Johann Paul Kremer (Hildebrandt, 2009a).

In the case of Stieve, there seem to have been many rumors floating around post-war Berlin and the international scientific community (Winkelmann and Schagen, 2010). William Seidelman, one of the first scientists to address the history of anatomy in the Third Reich, remembered an informal conversation with a Holocaust survivor at a meeting in Oxford in 1988 (Seidelman W. Personal communication, email from June 17, 2010). This man, an American physician and personal acquaintance of Hans Elias, alleged that Stieve was involved in arranging the killing of a young couple who were engaged in a sexual encounter in order to obtain a specimen of the woman's vagina at the height of sexual passion. The man also said that a microphotograph of such a specimen was published in one of Elias' books and that Elias' wife, when she came across correspondence about this matter, was so upset that she had the correspondence destroyed. Seidelman's immediate response to this account was one of disbelief. While the story as a whole indeed sounds unlikely and does not align with the historical facts currently known about Stieve's activity (Noack, 2008; Winkelmann and Schagen, 2010), there is a nucleus of truth to be

found in it. First, Stieve did publish a case where he mentioned the topic of orgasm. It is the study on the reproductive organs of a woman who died shortly after being raped by three men, and he discussed in the text the pelvic vascular engorgement and the fact that it was unlikely that this woman experienced an orgasm during her ordeal. He then continued by talking about the relationship between orgasm and fertilization of ova. Stieve did not explain under which circumstances this woman was raped but mentioned that she was shot to death. There is no image with this case study (Stieve, 1952, p. 176). Second, Elias did indeed use one of Stieve's microphotographs in his book "Human microanatomy" (Elias and Pauly, 1966). It is Figure 18–29 and the legend reads: "Cervix uteri, showing mucous glands" and gives the source as "Stieve: Arch. Gynaek.183:178, 1952." The image originates from a posthumous publication by Stieve from *Archiv für Gynäkologie* 183: 178-203 (Archive for Gynecology), but the correct year is 1953 (Stieve, 1953). Elias used image 16, and the original legend reads "Mediansagittalschnitt durch die Cervix einer 17 Jahre alten Virgo intacta, Vergr. 4mal" (median-sagittal section through the cervix of a 17-year-old virgin, magnification 4 times). Stieve explained in the text that the girl had died during a bombing raid, so the specimen had nothing to do with the rape case. Third, in terms of Anneliese destroying correspondence from Stieve, Elias recalls her tearing up the handwritten letter from Stieve shortly after the war (see above). Other letters referring to collaborations remain intact within the Elias papers in Berlin and do not refer to any of these issues.

The same coexistence of fact and unproven allegation exists in the quotes from Elias' memoir and autobiography concerning Stieve. While Stieve's use of the bodies delivered from the Berlin execution chambers is clearly documented, there is no such evidence concerning bodies of Jewish citizens and others from concentration camps, or the mutilation of healthy women in camps by this anatomist (Winkelmann and Schagen, 2009). The story of Stieve's alleged use of bodies from concentration camps was also believed by one of his students, the gynecologist Hans Harald Bräutigam. He wrote in his biography that Stieve declared to have personally set the execution dates of Polish female inmates of concentration camps (Bräutigam, 1998, p. 9). Again, there is currently no evidence for such "anatomical murders" by Stieve. Also, Stieve had a large collection of uteri, many of them in various stages of pregnancy and placentae, but he had received them mostly from gynecological surgeons throughout his career. In addition, there is no indication that Stieve sent personnel out to "spy on" the sexual behavior of women, as he received his clinical information on the prisoners from the prison wardens and doctor's records (Winkelmann und Schagen, 2010).

On the whole it seems that the rumors surrounding Stieve and his work after the war, as well as Elias' allegations concerning "anatomical murders" by other German colleagues, were based on a mix of fact and fiction, the latter probably fueled by the psychological

need to fill a void of information with hypotheses on the possible course of events that were horrific to contemplate even in their mildest version. Because indeed, Stieve had dissected several hundreds of men and women who had been executed because of their political activities, and Hayek and Clara made extensive use of the bodies of the executed. Even if the accuracy of these rumors and of Elias' allegations is at the moment unlikely in the face of the currently known historical facts, it may have been the true facts at the center of these rumors that led Elias and others to firmly believe in them many years after the war. Further historical research can show whether the rumors were indeed only rumors.

## CONCLUSION

The anatomist Hans Elias was a German who spent his life in exile because of National Socialist discriminatory laws imposed on people of Jewish descent. His threefold talents as a teacher, scientist and artist made him a highly successful innovator in the anatomical field. While Elias' life in exile was hard, especially in the early years, and he deeply missed the landscape and friends of his youth through all of his life, he was never bitter about his fate as an emigrant, only sometimes about his perceived inability to fulfill his own very high expectations of himself. He continued loving his home country and many Germans. And while he was prone to believe the worst of some of his German colleagues and their activities during the Third Reich, he still pursued collaborations with others. The Staatsbibliothek Berlin holds not only Elias' scientific papers and correspondence but also one of his few surviving sculptures, a depiction of Prometheus as the bringer of light (Baron, 2011). Hans Elias' ambition in life was to enlighten the world, and he succeeded greatly in doing so.

## ACKNOWLEDGMENTS

The author is greatly indebted to Thomas Elias, son of Hans Elias, for his gracious help in understanding his father's life as well as for providing me with the photographs for this paper. More thanks go to his brother Dr. Peter Elias and to Dr. John E. Pauly for additional information. Finally the author would like to thank Gerald Cortright and William Seidelman for critical reading of the manuscript.

## REFERENCES

- Baron G. 2011. Die Prometheus-Skulptur von Hans Elias in der Staatsbibliothek zu Berlin. *Bibliotheksmagazin* 1/2011:35–38. URL: [http://staatsbibliothek-berlin.de/fileadmin/user\\_upload/zentrale\\_Seiten/ueber\\_uns/pdf/Bibliotheksmagazin/Magazin\\_lowRes\\_1\\_2011.pdf](http://staatsbibliothek-berlin.de/fileadmin/user_upload/zentrale_Seiten/ueber_uns/pdf/Bibliotheksmagazin/Magazin_lowRes_1_2011.pdf) [accessed September 2011].
- Bayor RH. 1972. Italians, Jews and ethnic conflict. *Int Migr Rev* 6:377–391.
- Blessing T, Stolberg M, Koepsell H. 2011. Herkunft und Schicksal der am Anatomischen Institut in Würzburg zwischen 1935 und 1945 seziierten Leichen. URL: <http://www.anatomie>

- uni-wuerzburg.de/anatomie\_im\_dritten\_reich/ [accessed September 2011].
- Bräutigam H. 1998. Beruf: Frauenarzt. Erfahrungen und Erkenntnisse eines Gynäkologen. Hamburg: Hoffmann und Campe. p 1–255.
- Clara M. 1940. Untersuchungen über den färberischen Nachweis des Schleimes in den Drüsenzellen beim Menschen. *Ztschr f Mikr-Anat Forsch* 47:183–246.
- Clara M. 1942. Beiträge zur Histotopochemie des Vitamin C im Nervensystem des Menschen. *Ztschr Mikr-Anat Forsch* 52:359–392.
- Elias H. 1931. Die Entwicklung des Farbkleides des Wasserfrosches (*Rana esculenta*). *Z Zellforsch* 14:55–72.
- Elias H. 1933. Entwicklungsgeschichtliche Trickfilme nebst Bemerkungen über die Verwendung des Semper-Präparates in der Botanik. *Ber Fr Verein Pflanzengeogr und System Bot* 41 (pages unavailable).
- Elias H. 1934. Über die Entwicklung der Chromatophoren and anderer Zellen in der Haut von *Bufo viridis*. *Z Zellforsch* 21:529–544.
- Elias H. 1936. Hautchromatophoren von *Bombinator pachypus* und ihre Entwicklung. *Z Zellforsch* 24:622–640.
- Elias H. 1937a. Zur vergleichenden Histologie und Entwicklungsgeschichte der Haut der Anuren. *Z Mikrosk-Anat Forsch* 41:359–416.
- Elias H. 1937b. Plastisch-kinematographische Rekonstruktion embryonaler Vorgänge. *Arch Exp Zellforsch* 19:507–510.
- Elias H. 1937c. Zur vergleichenden Histologie der Haut der Anuren. *Verh Anat Ges* 83:188–196.
- Elias H. 1937d. Plastisch-kinematographische Rekonstruktion. *Verh Anat Ges* 83:200–205.
- Elias H. 1940. Liberalistic education as the cause of Fascism. *Sch Soc* 51:593–598.
- Elias H. 1942. The education of the post-war generation. *Scholl Rev* 50:504–511.
- Elias H. 1948. Do liver cords exist? *Anat Rec* 100:23–24.
- Elias H. 1949a. Beobachtungen über den Bau der Säugerleber. *Anat Nachr* 1:8–19.
- Elias H. 1949b. A re-examination of the structure of the mammalian liver. I. Parenchymal architecture. *Am J Anat* 84:311–333.
- Elias H. 1949c. Re-examination of structure of mammalian liver. II. Hepatic lobule and its relation to vascular and biliary systems. *Am J Anat* 85:379–456.
- Elias H. 1949d. The liver cord concept after 100 years. *Science* 110:470–472.
- Elias H. 1951. A mathematical approach to microscopic anatomy. *Chic Med Sch Q* 12:98–103.
- Elias H. 1957a. De structura glomeruli renalis. *Anat Anz* 104:26–36.
- Elias H. 1957b. De morphologia carcinomatis primarii hepatis humani et de eius contextu cum evolutione phylogenetica et ontogenetica. *Acta Hepatol* 5:1–18.
- Elias H. 1971. *Simulacra anatomica*. *Verh Anat Ges* 66:649–651.
- Elias H. 1979. Abenteuer in Emigration und Wissenschaft, ein Beitrag zur Aufklärung des Krebsproblems. Manuscript. M. E. Grenander Department of Special Collections and Archives, University Libraries, University of Albany, New York.
- Elias H, Pauly JE. 1960. *Human Microanatomy*. Chicago: Da Vinci Pub Co. p 220.
- Elias H, Pauly JE. 1966. *Human Microanatomy*. Philadelphia, PA: F.A. Davis Company.
- Elias R. 1979. Audiotape 1. Interview. M. E. Grenander Department of Special Collections and Archives, University Libraries, University of Albany, New York.
- Elias R. 1979. Audiotape 2. Interview. M. E. Grenander Department of Special Collections and Archives, University Libraries, University of Albany, New York.
- Haug H. 1986. In memoriam Hans Elias. *Anat Anz* 161:185–195.
- Hayek H. 1940a. Die Läppchen und Septa interlobaria der menschlichen Lunge. *Z Anat Ent* 110:405–411.
- Hayek H. 1940b. Über die Präkapillaren, die Arteriolen und die Teilungsstellen der kleinen Arterien in der menschlichen Lunge. *Z Anat Entw* 110:587–596.
- Heer H. 2011. "Darmstädter Expressionismus." Gustav Hartung oder die Verteidigung der Republik mit den Mitteln des Theaters. *Tribune* 197:150–160. URL: [http://www.tribuene-verlag.de/T197\\_Heer.pdf](http://www.tribuene-verlag.de/T197_Heer.pdf) [accessed July 2011].
- Hildebrandt S. 2009a. Anatomy in the third Reich: An Outline, Part 1. National socialist politics, anatomical institutions, and anatomists. *Clin Anat* 22:883–893.
- Hildebrandt S. 2009b. Anatomy in the third Reich: An Outline, Part 2. Bodies for anatomy and related medical disciplines. *Clin Anat* 22:894–905.
- Hildebrandt S. 2009c. Anatomy in the third Reich: An outline, Part 3. The science and ethics of anatomy in national socialist Germany and postwar consequences. *Clin Anat* 22:906–915.
- Hildebrandt S. 2011. Anatomy in the Third Reich: Careers disrupted by national socialist policies. *Ann Anat* [DOI: 10.1016/j.aanat.2011.08.009].
- Kapeller K, Tichy M. 1985. Professor Jan Florian—A great personality. *Folia Morphol* 33:305–309.
- Nachlass Elias. Manuscript division of the Staatsbibliothek Berlin-Stiftung Preussischer Kulturbesitz: Nachlass Hans Elias (papers of the estate of Hans Elias), boxes 1–11. [accessed June 2011].
- NEJM. 1939. Correspondence: Transfusion of incompatible blood. *NEJM* 220:124.
- Noack T. 2008. Begehrte Leichen. Der Berliner Anatom Hermann Stieve (1886–1952) und die medizinische Verwertung Hingerichteter im Nationalsozialismus. *Med Gesell Gesch* 26:9–35.
- Noack T. Bavarian anatomical departments and the executed victims of National Socialism. *Ann Anat*, in press (permission for quote granted by T. Noack).
- Noack T, Heyll U. 2006. Der Streit der Fakultäten. Die medizinische Verwertung der Leichen Hingerichteter im Nationalsozialismus. In: Vögele J, Fangerau H, Noack T, editors. *Geschichte der Medizin- Geschichte in der Medizin*. Hamburg: Literatur Verlag. p 133–142.
- Pauly JE. 1987. M. Hans Elias 1907–1985. *Am J Anat* 180:123–125.
- Röhl JCG. 2002. Kaiser, Hof und Staat. Wilhelm II. Und die deutsche Politik. Munich: C.H.Beck. p 296.
- Sachar AL. 1995. *A Host at Last*. Hanover and London: Brandeis University Press. p 370.
- Spiel H. 1977. Psychologie des Exils. In: Dokumentationszentrum des österreichischen Widerstandes und Dokumentationsstelle für neuere österreichische Literatur, editor. *Österreicher im Exil 1934 bis 1945*. Protokoll des internationalen Symposiums zur Erforschung des österreichischen Exils von 1934 bis 1945. Wien: Österreichischer Bundesverlag. p XXII–XXXVI.
- Sprague V. 1975. J. Richard Weissenberg 1882–1974. *Anat Rec* 183:148–149.
- Stieve H. 1926. Unfruchtbarkeit als Folge unnatürlicher Lebensweise. München: Verlag von J.F. Bergmann. p 52.
- Stieve H. 1942a. Der Einfluss von Angst und psychischer Erregung auf Bau und Funktion der weiblichen Geschlechtsorgane. *Zentralblatt für Gynäkologie* 66:1698–1708.
- Stieve H. 1942b. Die Wirkung von Gefangenschaft und Angst auf den Bau und die Funktion der weiblichen Geschlechtsorgane. *Zentralblatt für Gynäkologie* 66:1456.
- Stieve H. 1942c. Der Einfluss des Nervensystems auf Bau und Leistungen der weiblichen Geschlechtsorgane de Menschen. *Zeitschr Mikr-Anat Forsch* 52:189–266.
- Stieve H. 1946. Über Wechselbeziehungen zwischen Keimdrüsen und Nebennierenrinde. *Das deutsche Gesundheitswesen* 18:537–545.
- Stieve H. 1952. Der Einfluss des Nervensystems auf Bau und Tätigkeit der Geschlechtsorgane des Menschen. Stuttgart: Thieme.
- Stieve H. 1953. *Cyclus, physiologie und pathologie (anatomie)*. *Arch Gynakol* 183:178–203.
- Studnicka FK. 1946. Prof. Jan Florian. *Nature* 157:257.
- Weindling P. 1989. *Health, Race and German Politics Between National Unification and NAZISM*. Cambridge: Cambridge University Press. p 641.
- Winkelmann A. The Anatomische Gesellschaft and National Socialism—A preliminary analysis based on its proceedings. *Ann Anat*, in press (permission of quote granted by A. Winkelmann).
- Winkelmann A, Noack T. 2010. The Clara cell: A "Third Reich eponym"? *Eur Respir J* 36:722–727.
- Winkelmann A, Schagen U. 2009. Hermann Stieve's clinical-anatomical research on executed women during the "Third Reich." *Clin Anat* 22:163–171.