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Gorjanović-Kramberger's Research on Krapina – Its Impact on Paleoanthropology in Germany

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Abstract

This paper attempts to characterize the scientific impact of Karl (Dragutin) Gorjanović-Kramberger's research on the initiation of German paleoanthropology. The Croatian paleontologist was born in 1856 in Zagreb. His father's German origins paved the way for his career. Gorjanović-Kramberger started studying in Zürich, but transferred quickly to Munich to study paleontology and geology at Karl von Zittel's Institute. He earned his doctoral degree in 1879 from the University of Tübingen. Gorjanović-Kramberger curated the Croatian National Museum in Zagreb from 1880 onwards. He was appointed as an assistant professor in 1884 and was promoted to full professor in 1896 in the Faculty of Philosophy at the University of Zagreb. From 1893 until 1923, he headed the Geological-Paleontological Department of the Croatian National Museum. Gorjanović-Kramberger's excavation, description and interpretation of the large Neandertal sample from Krapina earned him international esteem. As Gorjanović-Kramberger published his remarkable findings primarily in German and Austrian periodicals and associated mostly with German-speaking colleagues, it is of scientific-historical interest with which colleagues he had scientific cooperation, alliances and disputes and how his research influenced German paleoanthropology. The bibliographical analysis of the relevant literature demonstrates that the Croatian paleontologist was highly integrated in the German-Austrian scientific community. His intriguing Paleolithic fossils yielded great interest and his conclusions were met with both enthusiastic agreement and fierce objection, since Darwinism was only very skeptically adopted at the time. Gorjanović-Kramberger's innovative approach triggered paleoanthropological debate in Germany, but did not induce a paradigmatic change.

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1. GORJANOVIĆ-KRAMBERGER'S UNEXPECTED SUCCESS: *PER ASPERA AD ASTRA*

The year 1856 was remarkable. It saw not only the discovery and excavation of the classical Neandertal fossils from the Kleine Feldhofer Grotte but also the birth of Karl Kramberger (Figure 1) on October 25, 1856 in Zagreb (Agram), then part of the Austro-Hungarian Empire. A son of a shoemaker and innkeeper, Matija Kramberger, whose family originated in Germany but moved to Croatia via Slovenia in 1648, and a Croatian widow, Terezija Dušek, née Vrbanović, who already had three children from her first wedlock, Karl Kramberger was unlikely to have such an unparalleled career. His biography *(1–6)* illustrates the young boy's interest in natural history; he spent many hours

Figure 1. *D. Gorjanović-Kramberger from Trinkaus, E. & Shipman, P (1993): The Neanderthals. Changing the Image of Mankind. Knopf, New York, figure 29.*

in the National Museum and walked often to a nearby quarry, where he searched for fossils in the flagstones. In spite of his father's modest profession, Gorjanović--Kramberger attended a prestigious elementary school and, despite a mediocre ranking, continued on to secondary school. He attended thereafter the Teachers Academy and could have become a schoolmaster, but, goaded by his interests in natural history, he enrolled at Zürich University in 1874. Kramberger soon transferred to Munich to study paleontology and geology. He submitted a doctoral dissertation on fossil fishes of the Carpathians and, at the age of twenty-three, received his doctoral degree in natural sciences from the University of Tübingen. One year later, in 1880, he was appointed curator of the Geology Department of the National Museum in Zagreb. In 1882, inspired by flourishing Croatian nationalism, Karl Kramberger prefixed Gorjanović to his family name and often changed his first name Karl to Dragutin. Due to his excellent scientific work, he made a notable career at the young University of Zagreb. Gorjanović-Kramberger's *(7–15)* excavation, description and analysis of the Krapina fossils made him a world-renowned paleoanthropologist. His close contact with German colleagues raises the question of how his research influenced their human evolutionary thinking.

2. SCIENTIFIC-HISTORICAL GOAL

This paper aims to unravel the Karl Gorjanović--Kramberger's scientific relationships with his contemporaries in the German anthropological community. It attempts to reveal the particular impact of his Krapina research on German paleoanthropology using a bibliographical methodology *(16–18)*. Sources include relevant contemporary anthropological, archaeological, ethnological and anatomical periodicals, paleoanthropological and scientific historical monographs, encyclopedias, lexica, and separate reprints. Hundreds of references to Gorjanović-Kramberger have been checked, indexed and extracted. The relevant information was then networked, analyzed and interpreted. The following is only a summary of the research, focusing primarily on the interactions of Gorjanović-Kramberger with the leading German 'paleoanthropologists' *(18, 19)*.

3. HUMAN FOSSILS 'ENNOBLE' EVERY PALEONTOLOGICAL SITE

Gorjanović-Kramberger *(8)* nearly missed the chance to escape Croatian provincialism since he waited four years to visit Krapina after learning in 1895 that bones of Pleistocene ('diluvial') animals were being recovered there. In August 1899, he recognized charcoal levels and charred ashes at the site below a rock shelter, kindling his utmost interest. Recovering animal bones in association with Mousterian stone tools and a human molar, he soon became aware of the paleoanthropological sensation. Human fossils 'ennoble' every paleontological and archeological site, including Krapina. From 1899 to 1905, a total of 352 fossil specimens were excavated, including 70 counted Neandertal individuals *(20–22)*. Furthermore, Mousterian tools and animal remains made Krapina the richest Pleistocene Neandertal site identified *(21)*. It was due to his eminent merit that Gorjanović-Kramberger *(7–8, 15)* recognized the importance of the site and organized a highly competent, particular and precise excavation soon after the discovery.

4. BENEFIT OF AN EXCELLENT AND PROFOUND PROFESSIONAL TRAINING

It is less surprising that Gorjanović-Kramberger did the right thing at the right time if we recollect that he had been trained and supervised by the outstanding paleontologist and geologist Karl Alfred von Zittel (1839–1904) who made the Paleontological Institute and the State Collection at the University of Munich world-renowned *(24–28)*. Von Zittel associated very closely with anthropologists *(29–31)*. As Johannes Ranke (1836–1916), general secretary of the *Deutsche Gesellschaft für Anthropologie, Ethnologie und Urgeschichte*, mentions his death was a painful loss for the anthropological scientific community. Von Zittel was trained in Heidelberg by the geologist G. Leonhard and the zoologist H.G. Bronn (best--known for his translation of Darwin's *The Origin of Species*, in which he deleted the sentence »Light will be thrown on the origin of man and his history«). He continued his studies at the Sorbonne, where the famous French paleontologist Edmond Hébert was lecturing. Von Zittel habilitated at the University of Vienna and obtained a full professorship in Karlsruhe, Germany soon afterwards. At an age of only 27 years, he was appointed chair of the Institute of Paleontology at the University of Munich, where he also became conservator of the Paleontological State Collection and, after 1880, director of the Geological Institute and Collection.

Von Zittel was the president of the Munich Anthropological Society from 1874 to 1879. In 1875, he became co-managing director of the Sixth General Convention in Munich, and president of the Seventh General Con-

Figure 2. *K. von Zittel from Korrespondenzblatt der Deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte 51. Jg. 1920, H. 4:. Deutsche Anthropologische Gesellschaft 1870–1920. Vorsitzende und Generalsekretäre.*

vention in Jena in 1876. Regarding von Zittel's anthropological merits, Ranke (*29*, p. 8) stresses »*Wo es galt wissenschaftliche Ideale zu fördern, konnte man auf seine Hilfe rechnen, speciell auch die Bestrebungen der anthropologischen Gesellschaft hat er stets, wenn es nöthig war, mit Rath und Tath unterstützt.*«

It's probable that Gorjanović-Kramberger, whose years of study in Munich coincide with those of von Zittel, brought him into contact with prominent contemporaneous anthropologists. It is reasonable to surmise that von Zittel taught anthropological subjects since Johannes Ranke was given the first formal teaching position of anthropology at Munich no earlier than 1886 *(32, 33)*. Ranke had lectured on physiology since 1863 and became an associate professor of general natural history in 1869. He was active in founding the Münchner Anthropologische Gesellschaft *(34)*. The local society was established in 1870, and Ranke was its first secretary and chairman. The Munich Anthropological Society joined the *Deutsche Anthropologische Gesellschaft* (DAG) later *(35)*. With the anatomist Nicolaus Rüdinger (1832–1896), Ranke founded the *Beiträge zur Anthropologie und Urgeschichte in Bayern* in 1875. Starting in 1877, he edited the *Berichte der Allgemeinen Versammlungen der DAG* in cooperation with the anatomist Julius Kollmann. Gorjanović-Kramberger probably witnessed these anthropological activities as a graduate student.

5. PALEOANTHROPOLOGY IN EARLY POST-DARWINIAN TIMES – A STEPCHILD OF ANTHROPOLOGY

Despite the fact that the first recognized human fossil remains came from a German site *(36–38)* and the rapid growth of physical anthropology in Germany during the second half the 19th century, paleoanthropology remained a minor subject there *(16, 17, 39– 41)*. Since the discovery of the fossil bones from the Neander Valley and their description by the local teacher Johann Carl Fuhlrott (1803–1877) and the anatomist Herrmann Schaaffhausen (1816–1893) from Bonn University predated the publication of Darwin's *Origin of Species*, this specimen has often been regarded as the first evidence of human evolution *(38)*. However, both protagonists of paleoanthropological research in Germany were far away from a concise interpretation in an evolutionary sense *(16, 41)*. The slow progress of paleoanthropology in Germany was principally caused by the fact that the outstanding anthropologists, Rudolf Carl Virchow (1821–1902) and Ernst Heinrich Phillip August Haeckel (1834–1919), possessed little interest in human fossils and differed fundamentally in their acceptance of Darwin's theories.

Virchow, a famous German physician and anthropologist *sensu lato* best known for his guiding research in cell ular pathology and comparative pathology, was a universal scientist and liberal politician who founded the *Deutsche Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* (DAG) in 1870 and headed this institution till his death in 1902 *(35, 45)*. He included humankind in the chronicling of nature and came to the conclusion that *Homo sapiens* was »post-history« *(46)*. For that reason, he was highly skeptical about the validity of Darwinian theory concerning our own species and doubted the phylogenetic classification of the species *Homo neanderthalensis*, which the Irish zoologist William King *(47, 48)* had dubbed the Neandertal Man in 1864. Due to his 'pathologist view,' Virchow *(49)* interpreted the Neandertal derived features as pathological features resulting from arthritis *(50)*. In addition, he concluded that the Neandertal man must have lived in the Neolithic or recent times from the erroneous information that the skeletal remains were associated with polished stone tools *(50)*.

Unlike Virchow, the German geologist and paleontologist Friedrich Rolle (1827–1887) *(51)* and Carl Vogt (1817–1895) a reputable zoologist from the University of Bonn, vehemently advocated Darwin's theory of evolution and descent *(52, 53)*. Even more committed and sarcastic than the 'Affenvogt,' Ernst Haeckel *(54–59)* sagaciously fought against the »ape complex.« He is best known for his highly controversial »recapitulation law«. After reading *The Origin*, Haeckel became a powerful and eloquent supporter of evolution, albeit in a very idiosyncratic manner. Although Haeckel admired Darwin's theory concerning evolution, he remained an orthogradualist *(60)*. Haeckel did not endorse natural selection as the driving force of evolution and had little interest in fossils and paleoanthropology. He was convinced that, due to the inter-relatedness of phylogeny and ontogeny, ontogenetic structures were sufficient evidence for evolution *(61, 62)*. Despite Haeckel's tremendous biological merit, his naïve polygenism supported Social Darwinism, whose extreme manifestation became the core of eugenics *(14, 58, 61–64)*.

Neither Virchow nor Haeckel promoted paleoanthropological research – the former from misinterpretation of the facts and skepticism of Darwin and the latter from his conviction that ontogenetic research provided suffi-

cient information to demonstrate phylogenetic evolution. Virchow's interests lay more in prehistoric anthropology and ethnology and the variability of recent populations. The almost concurrent discovery of the Neandertal fossil remains and publication of Darwin's theory could have provided an excellent start for paleoanthropology in Germany. However, this opportunity was squandered by the leading anthropological authorities of the time. As Erik Trinkaus & Pat Shipman *(5)* remarked, »the man of the Neander Valley remained without honour, even in his own country.«

Gorjanović-Kramberger probably knew about the skepticism and even disinterest in human fossils, not only in Germany but in France as well. For example, the physician and founder of the Société d'Anthropologie de Paris in 1859, Paul Pierre Broca (1824–1880), never accepted the Neandertals as true fossils. Within this atmosphere of ignorance, none of the discoveries of human fossils in La Naulette (Belgium), Pontnewyydd (Wales), Riveaux (Southern France), and Šipka, Mladeč and Brno (Czech Republic) were able to convince the European scientific community of human antiquity *(65)*.

The analysis of the Spy fossils discovered in Belgium in 1886 did not slow the rejection of evolutionary thoughts as well. For instance, at the Convention of the DAG at Ulm in 1892, many experts denied the existence of human fossils. The transactions (Sitzungsberichte) of the DAG are a sad testimony to this kind of ignorance and arrogance (but notice where the proponents of »intelligent design« are today!). One reason for this conclusion may have been that, since the 1860s, the dominating evolutionary thought influencing European anthropology ignored both social (archaeology, prehistory, ethnology) and medical (anatomy and physiology) sciences. Neither biologists nor paleontologists influenced paleoanthropology at those times. What approach was needed to induce change? According to Sackett *(65)*, »discovering the Paleolithic became a matter of empirically demonstrating that human remains and artefacts could be found in association with the remains of extinct animals belonging to the deep time of earth history.«

This was the exact challenge for paleontologists and geologists. Immediately prior to being invited to inspect the fossiliferous site in the mountainous region near the Krapinica River, Gorjanović-Kramberger must have heard the sensational news about *Pithecanthropus*, a 'missing link' discovered by the Dutch physician Eugène Dubois (1898–1940) in a village near Trinil, Java *(66)*. Dubois *(66–68)* was the first to write a detailed monograph on a hominin fossil, and he applied metrical and mathematical procedures for the calculation of brain volumes and stature heights to a human fossil for the first time. His monograph on *Pithecanthropus erectus* was the principal paleoanthropological work at the turn of the century. It had surely not escaped Gorjanović-Kramberger notice.

The increased focus on human fossils is thanks to Dubois. The »question of all questions« received a new dimension, as the fossils from Java demonstrated time depth of the fossil record and geographical dilatation. Despite this evidence, Virchow *(69)*, Ranke *(70, 71)*, and many other anthropologists continued to misinterpret the fossils.

Gorjanović-Kramberger was, as evident from his illustrious career, an extremely ambitious and certified expert *(1–6)*. When a scientist of his quality gets the chance to advance his subject and improve his reputation, he will do his best, regardless of the obstacles. It may have been this disposition which triggered Gorjanović-Kramberger's special motivation. Although the sources do not indicate whether Croatian national attitudes influenced the excavator, his contemporary compatriot Nikola Tesla (1856–1943), a physicist and genial inventor, described a possibly affecting, nationalistic atmosphere.

6. SEIZING THE CHANCE TO BECOME »IMMORTAL«

Gorjanović-Kramberger must have recognized the scientific unrest when he was notified by the discoverers of the Pleistocene site. On August 23, 1899, he visited the bone site and began full-scale excavation there on September 2, 1899 *(8, 9)*. The chief-excavator hastened to present his fossils and findings as soon as possible after each annual campaign. Gorjanović-Kramberger *(15)* published the voluminous monograph *Der Diluviale Mensch von Krapina in Kroatien* shortly after the end of the excavation.

We can only speculate as to why Gorjanović-Kramberger's published preferentially in German and Austrian periodicals. It is possible that they would best communicate the relationships between the Krapina fossils and modern humans. Were the Krapina fossils direct ancestors of modern humans? Did they represent extinct side-branches to the human lineage? How were the fossils related to different modern 'races'? Wolpoff & Caspari *(6)* guess that the views researchers held on race inevitably influenced their interpretations of human fossils, and, in turn, the fossil record became a source for establishing racial histories. Racial questions, the main focus of turn-of-the-century German anthropology, could have been affected the Croatian excavator's decision. There could have been trivial factors too: the proximity of Vienna and Munich and his linguistic knowledge. As mentioned previously, Gorjanović-Kramberger probably knew Johannes Ranke from his years of study in Munich. The monthly publication and wide distribution throughout the European scientific community of the *Correpondenz-Blatt der deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte* may have been the rationale for Gorjanović-Kramberger's *(8)* letter to Ranke on October 18, 1899.

Beside the fact that the letter is highly informative and gives an excellent update of the successful excavation and first findings, its form is very polite and the German language is sophisticated, although not perfect. For instance, Gorjanović-Kramberger describes »*durch*gebrannte« (eloped) instead of *ver*brannte (burned) human bones. At the

end of his letter, he expresses his hope that the short contribution will be of interest and adds that the few lines shall only discuss the most important facts (»*das Allerwichtigste*«). The letter appeared in March 1900 – the floor was opened for discussion!

On December 19, 1899, two months after writing to Ranke, Gorjanović-Kramberger gave a lecture at an extraordinary meeting of the *Anthropologische Gesellschaft in Wien* on *Der paläolithische Mensch und seine Zeitgenossen aus dem Dilivium von Krapina in Croatien*. The manuscript appeared in den *Mittheilungen der Anthropologischen Gesellschaft in Wien* and is very rich in substance *(7)*. Convinced that he presented indubitable evidence of the fossils' antiquity, Gorjanović-Kramberger classified his calibration as »Moustérien« in the scheme of Mortillet. In a footnote, Gorjanović-Kramberger *(7)* writes »*Diese Abtheilung aber fällt nach Mortillet in die Eiszeit*« and adds provocatively in brackets »*Mortillet gibt nicht eine zweimalige Vereisung zu.*« The features of the fossils, determined from normal individuals (despite Virchow's contention that the Neandertals were pathological), the great age and large number of human and animal bones, and the conjecture that Krapina people practiced cannibalism were sensational and subjects of intense skepticism.

One has to admire Gorjanović-Kramberger for his accurate methodological approach, his creativity and commitment. In a footnote, Gorjanović-Kramberger *(7)* mentions that he has been in Vienna at the »k. k. Hofnaturalien-cabinetes« (later the Imperial Natural History Museum) to conduct detailed comparative research of the mastoid process and other details in fossil and recent skulls, acknowledging the custodian Josef Szombathy (1853–1943). In spite of many detailed morphological differences between the Mousterian population from Krapina and recent humans, Gorjanović-Kramberger *(7)* reasons that man must have existed in the Tertiary and concludes that »*der diluviale Bewohner der Gegend Krapinas dürfte allenfalls ein kräftig gebauter, sonst aber ein ganz normaler Mensch ohne jedwede »pithecoide« Merkmale gewesen sein.*«

7. SPREADING THE NEWS

The exciting paleoanthropological news of Krapina spread quickly. Although the *Archiv für Anthropologie* identified the site as »Kropina« in 1900, the correct name became immediately known through diverse references, citations and abstracts *(72)*. One of the review editors was Max Schlosser. He had known Gorjanović-Kramberger during the 1870s as Karl Kramberger. This may explain why Schlosser *(73, 74)* cites his former fellow student as »Kramberger, Karl Gorjanović« or »Kramberger, Gorjanović Karl«. Like 'Karl Kramberger,' Max Schlosser (1854–1932) was trained by von Zittel. He later became a custodian and professor of paleontology at the Ludwig Maximilians University in Munich. Schlosser retired in 1926. He was an outstanding expert on Pleistocene fauna *(75)* and fossil primates, specifically on Chinese material *(76)*.

Gorjanović-Kramberger *(11)* references Schlosser several times in his work. He states (*11*, p. 175) »*Meinem sehr geehrten Freunde Max Schlosser in München verdanke ich die Bestimmung mehrerer kleiner Thierreste,* […]*; auch bestimmte er mir einige Fötalknochen, welche sonst unbekannt geblieben wären*« and then later adds (*11*, p. 181) »*Die Fauna von Krapina entspricht fast genau jener von Taubach bei Weimar, was mir auch mein sehr geehrter Freund Dr. M. Schlosser nach Durchsicht der ihm zugesandten Knochenreste mit folgenden Worten aussprach*.« Schlosser's excellent advice to his Croatian friend is evident in a notable footnote in *Arch. Anthrop.* in which he helpfully notes that the taxon *Rhinoceros trichorhinus* was renamed *Rhinoceros mercki (73)*.

Soon after the presentation of the first results in Vienna, Gorjanović-Kramberger became a regular member of the local anthropological society. His name is first mentioned in the transactions of 1900 in the list of the members of the society on page 163 as *No. 75* under the heading (V.) *Wirkliche Mitglieder* (real or actual members). Gorjanović-Kramberger's titles and positions remained unchanged until 1912, when in volume 41 of the *MAGW*, he earned the additional honorable title *königlicher Hofrat* (royal adviser). Since the turn of the century, Gorjanović-Kramberger was obviously in permanent contact with his Viennese colleagues, especially Josef Szombathy (1853–1943), head of the valuable prehistoric and anthropological collection which he had founded and built up since 1882. Gorjanović-Kramberger describes him as highly supportive. Before the detailed publication of the first findings on Krapina, Gorjanović-Kramberger had sent a second pre-report for announcement and publication to Szombathy. The custodian presented it to the Anthropological Society of Vienna at a monthly meeting on December 11, 1900. The most interesting news concerned a frontal bone with special features of the supraorbital region. Gorjanović-Kramberger announced a comparative morphological study of this fossil with *Pithecanthropus erectus* Dubois and gave some preliminary results. One of the most essential statements was that the supraorbital region was not pathological, but rather a feature linking humans and non-human primates *(10, 11)*.

Contemporaneously with the excavation in Croatia, there was an ongoing discussion in the *DAG* concerning the place of man in the order Primates *(69, 70, 77)*. This especially becomes evident from the transactions of the General Convention of the German and Austrian anthropological societies in Lindau (September 4–7, 1899). The variety of opinions and the confusion about the diversity and variability within the primates and man's place in nature is unbelievable. There was a fundamental need for appropriate comparative biological research and a suitable taxonomic approach. Since anatomists and archaeologists were concentrating on case studies, while zoologists and anatomists were focusing on more topics

than *merely* paleoanthropology, there was no theoretical basis for elaborate paleoanthropological research.

The obvious lack of a sophisticated theoretical basis and methodological techniques in paleoanthropological research required intensive innovation and fossils to trigger the development of this field of evolutionary biology. Gorjanović-Kramberger's initial fossils and findings from Krapina helped solve these issues. However, the proponents of outdated hypotheses still had to be convinced of their veracity.

8. HOW TO CONVINCE STUBBORN 'EXPERTS'?

The central figures in German anthropology with whom Gorjanović-Kramberger had to grapple are characterized hereafter.

The celebrity was Rudolf Virchow (1812–1902, Figure 3). He perpetually rationalized his pathological assessment in which the Neandertal man was diseased with rickets as a child and arthritis as an adult (Trümper, unpublished). This explanation of the Neandertals' special bony features seemed far-fetched to many experts. With the discovery of the *Pithecanthropus* fossils, Virchow's ideas were harshly critiqued. Rudolf Virchow's untimely death on September 5, 1902 from the consequences of a traffic accident prevents us from knowing his interpretation of the Krapina fossils. However, it seems unlikely that he would have abandoned his pathology hypothesis due to the new evidence.

Figure 3. *R. Virchow from Eickstedt, Egon Frh. von (1940) Die Forschung am Menschen, Teil 1, Geschichte und Methoden der Anthropologie, F. Enke Verlag, Stuttgart*

Johannes Ranke (1836–1916, Figure 3), mentioned above, studied medicine with and was anthropologically 'infected' by Rudolf Virchow during his years of study in Berlin. His broad spectrum of interests in philosophical, historical, archaeological, biological and medical anthropology was ideal for his organizational and editorial functions in German anthropology (see above). He preferably studied craniology, morphometric methodology, and physical characteristics of recent populations *(32, 33, 70, 71, 78, 79)*. Ranke was a confirmed monogenist and was highly influenced by Adolf Bastian (1826–1905; »past master of ethnology«), who vehemently rejected Darwinism *(80)*. As colleague and friend of Rudolf Virchow, Ranke continued an anti-Darwinian concept. Like many others 'experts,' he believed that the human past differed from the present only in the 'primitiveness' of the ancient peoples, not in their very essence and being. Ranke did not believe fossil discoveries would reveal a history of humans and their ancestors longer than a few thousand years. His monograph *Der Mensch* appeared in three editions (1886–1912) *(70, 71)*. Ranke's classification of *Pithecanthropus erectus* as giant gibbon, a hypothesis which Rudolf Virchow also favored, exemplified his retrograde views. As general secretary of the anthropological society, he influenced anthropology greatly. However, Ranke also hindered evolutionary thinking *(6, 31)*.

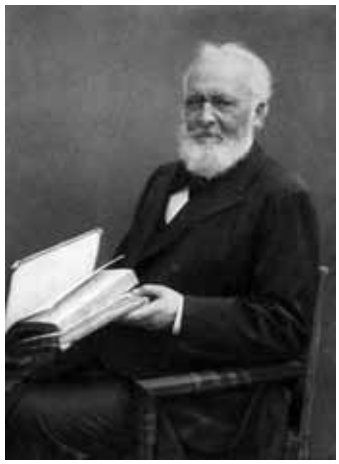

Figure 4. *J. Ranke.*

Unlike Virchow and Ranke, Gustav Schwalbe (1844–1916, Figure 4) was truly interested in paleoanthropology *(81, 82–96)*. He earned his M.D. from the University in Berlin in 1866 and was a well-regarded textbook writer on neurology (1881) and anatomy of sense organs (1883) before he was appointed in 1883 as professor at the University of Strasbourg in Alsace (German at the time), where he retired in 1914 shortly before his death. During the last decades of the 19th century, he became more and more interested in human phylogeny and developed sophisticated qualitative and quantitative morphological methods to study the variability. He referred to his approach as »*Formanalyse*« (the analysis of form and shape) and was a forerunner of standardized taxonomy. Schwalbe became best known as founding editor of the *Zeitschrift für Morphologie und Anthropologie* (1899), a periodical which explicitly aimed to improve methodologies in physical anthropology. By the turn of the century, he had made essential contributions to the discus-

sion of the phylogenetic role of the Neandertals and *Pithecanthropus*. While French contemporaries like Jules E. T. Hamy (1842–1908), Julien Fraipont (1857– 1910), Grabriel de Mortillet (1821–1898), Jean Louis and Armand Quatrefages de Breau (1810–1892) considered Neandertals to be nothing more than a 'primitive race' of *Homo sapiens*. Schwalbe identified major differences in the morphologies of Neandertals and modern humans. He classified the Neandertals according to the rules of systematic zoology as a separate species *Homo primigenius*. This term was coined by Haeckel and first time proposed by Ludwig Wilser (1850–1923) *(93)* in 1898 as a taxon referring to the Neandertals. In his famous work *Über die Schädelformen der ältesten Menschen mit besonderer Berücksichtigung des Schädels von Eguisheim*, Schwalbe *(86)* reasoned:

»Die Schädel von Spy und Neandertal bilden eine eigenartige Gruppe ältester Schädelformen, welche sich von denen aller anderen menschlichen Schädel weit unterscheiden, zwischen dem noch affenähnlichen Schädel des Pithekanthropus und den gewöhnlichen menschlichen Schädelformen etwa die Mitte halten, während das Schädeldach des Pithekanthropus wiederum die Spy-Neandertal-Gruppe mit den Affen verbindet. «

Schwalbe opposed Virchow's 'pathology hypothesis.' His morphological and morphometrical comparisons between the available fossils with modern humans convincingly demonstrated the Neandertals to be their own species. Schwalbe *(85, 90)* never drew any definitive conclusions regarding the phylogenetic relationship of *Homo primigenius* (*H. neanderthalensis*) and *H. sapiens*. Milford Wolpoff & Rachel Caspari *(6)* claim that »he vacillated throughout his career about the position of the Neandertals in human phylogeny.« As the Neandertals' fate is the trickiest controversy in paleoanthropology *(97–116)*, Schwalbe at least posed the right questions even without knowing the correct answers *(81, 94– 96)*.

An outstanding contemporary was Hermann Klaatsch (1863–1916, Figure 5) who was born in Berlin and graduated in medicine in 1885 after years of study in Heidelberg under the anatomist and vertebrate morphologist Karl Gegenbaur (1826–1903) and Berlin under the anatomist Wilhelm von Waldeyer-Hartz (1836–1921). Three years later, he was habilitated for anatomy and appointed associate professor in 1895. Between 1904 and 1907, Klaatsch completed anthropological research in south-east Asia and Australia. From 1907 until his sudden death, he was an associate professor at Breslau University (now Wroclaw, Poland) as well as a custodian in anatomy and the director of the Anthropological Institute *(117, 118)*.

Prior to the turn of the century, Klaatsch completed essential research on the human skeleton and skin. At the General Convention of the DAG in Lindau in 1899, he spoke for the first time in this scientific community on the phylogeny of primates *(119)*. Klaatsch's paper sparked hot debates over numerous topics, including the phylogeny of primates *(119–127)*, the Krapina fossils *(128–130)*, Australian aborigines *(131, 132)*, Le Moustier

Figure 5. *G. Schwalbe from Korrespondenzblatt der Deutschen Gesellschaft für Anthropologie, Ethnologie und Urgeschichte 51. Jg. 1920, H. 4:. Deutsche Anthropologische Gesellschaft 1870–1920. Vorsitzende und Generalsekretäre.*

(133–135), and Combe Capelle *(133, 136–138)*. Klaatsch's hypothesis that we share only common roots with extant primates and thus none of them can be regarded as direct ancestral to humans was absolutely correct, whereas his model of polygenism, which incorporated different ape species within human 'racial' lineages, was highly confusing *(125, 126)*. This phylogenetic scheme was filled with contradictions and fanciful reconstructions *(18, 81)*. Klaatsch was an *enfant terrible* – full of power and creative ideas, but very polemic and ambitious. Contemporaries characterized him as an »arrogant wind-bag« *(1, 5)*. It is enthralling to read the reports of the society meetings. His special interest in the Neandertal fossils from Krapina brought Klaatsch into personal contact with Gorjanović-Kramberger, which caused issues described below.

There is no explicit mention of Ernst Haeckel because by the beginning of the 20th century Haeckel's impact on phylogenetics was fading. As he became increasingly anti-Christian, his scientific influence decreased rapidly, especially after he developed his monistic theories and dabbled in esoteric fields *(63, 139)*

9. NEW FACTS AND NEW HYPOTHESES

Haeckel's opponent, Rudolf Virchow, was still active during the beginning of the discussion of the Krapina fossils. This is seen in Virchow's *(69)* contribution at a General Convention in Metz. Klaatsch's comment on this is tough and disrespectful *(140)*. Klaatsch cites fossils from La Naulette *(140)*, Malarnaud, Spy and adds »*Neuerdings kommt auch eine Nachricht über Schädelfragmente des gleichen Typs von der Fundstelle in Kroatien*« (*141*, p. 90). In the transactions, he wrote an extensive column in which he describes Gorjanović-Kramberger's morphological findings and interpretations precisely and mentions that he stayed in Zagreb for one week, studying the fossils in detail.

Figure 6. *H. Klaatsch from Eickstedt, Egon Frh. von (1940) Die Forschung am Menschen, Teil 1, Geschichte und Methoden der Anthropologie, F. Enke Verlag, Stuttgart.*

Klaatsch (*141*, p. 91) acknowledges »*Herrn Prof. Gorjanović-Kramberger* […] *für die liebenswürdige Bereitwilligkeit, mit welcher er mir nicht nur die werthvollen Objecte zugänglich machte, sondern mir auch die Mitarbeiterschaft an dem Studium derselben gestattete.*« He further indicates that he was successful in reconstructing some occipital fragments, which indicate associations with the Spy-type. Announcing his addendum to Gorjanović-Kramberger's first publication, Klaatsch (*141*, p. 91) concludes »*Es bedarf kaum eines Wortes über die eminente Bedeutung des Fundes von Krapina. Dieselbe ist derartig ausschlaggebend, dass die anthropologische Wissenschaft den Widerspruch der Gegner – falls derselbe auch jetzt noch aufrecht erhalten werden sollte – getrost ad acta legen und über denselben fort zur Tagesordnung schreiten kann.*«

Klaatsch immediately recognized the Krapina fossils strengthened his argument that the Neandertals were a separate lineage, and he flung the gauntlet to his opponents, first and foremost Virchow and Ranke. A socio – biological rule applies: never believe in positive reasons, if there could be also a negative one. Gorjanović-Kramberger had to deal with a free-loader. Describing Klaatsch's motives, Erik Trinkaus and Pat Shipman (*5*, p. 168) claim that »*the fossils were someone's ticket into the brightly lit heart of anthropology, and Klaatsch lusted after them*.«

Although Gorjanović-Kramberger never gave Klaatsch permission to either reconstruct or describe the Krapina fossils *(6)*, Klaatsch *(130)* published a single-author paper *Über die Occipitalia und Temporalia der Schädel von Spy, verglichen mit denen von Krapina* in 1902. He cites the Krapina fossils, »*welche wir den Bemühungen Prof. Gorjanovič-Krambergers verdanken.*« Besides this very subdued acknowledgement, he alternates the excavators name from Gorjanović-Kramberger to Kramberger and back again, and finally mentions that he would not trust the reconstructions without a personal inspection of the originals. What an arrogant statement to demonstrate superiority in the field of anatomical anthropology!

In the second part of Gorjanović-Kramberger's *(11)* extensive analysis, the author cooperatively mentions Klaatsch's participation, a masterpiece in diplomacy. Gorjanović-Kramberger (*11*, p. 189) states »*Die Veröffentlichung veranlaßte* […] *eingehende Studien* […] *der Schädelbruchstücke, welche näher zu untersuchen sich auch Herr Prof. Dr. H. Klaatsch aus Heidelberg zur Aufgabe machte.*« Klaatsch was clearly not invited. However, Gorjanović-Kramberger (*11*, p. 190) writes some pages later that he asked for the expertise (»*Auf mein Ansuchen hat Herr Dr. Klaatsch die Beschreibung der Occipitalpartie des Schädels freundlichst übernommen, und ich habe sie wörtlich in dieser Schrift repliciert.*«)

Klaatsch wrote a six-page evaluation, which he updated with a lengthy footnote. It appears that Gorjanović-Kramberger was adopting a brave front. His own work is of special interest, since he applied Schwalbe's comparative methods. Moreover, Gorjanović-Kramberger applied innovative x-ray methods *(142)* and acknowledged Otto Walkhoff several times, who helped him greatly. This demonstrates that Gorjanović-Kramberger was extremely cooperative with colleagues from different disciplines. As paleoanthropology requires a multidisciplinary approach, he developed very fruitful and innovative partnerships, especially with [Friedrich] Otto Walkhoff (1860–1934). Walkhoff was born in Braunschweig and had studied dental medicine in Berlin. After his approbation at the young age of 21 years, he ran a private laboratory alongside his dental practice and studied the anatomy and histology of the dental apparatus. Walkhoff analyzed the enamel and wrote an atlas on the histology of the teeth. He received several scientific awards. Very soon after Röntgen's ground-breaking invention, he pioneered in x-ray dental analysis. His intra-oral x-ray experiment on himself demonstrates his commitment to dentistry. Walkhoff performed further dangerous experiments on himself with radium-rays and invented radium therapy for tumor research. In 1901, he was appointed professor at the Dental Medicine Institute in Munich, where he met Gorjanović-Kramberger. Walkhoff transferred to Wurzburg in 1922 and became an expert on fine dental structure and tooth pathology. He was not restricted to dental research whatsoever. Walkhoff *(143)* was one of the first to bring together form and function (see below).

Gorjanović-Kramberger's concluded that the hominins from Krapina belonged to the »Formenkreis« of *Homo neanderthalensis* as described by Schwalbe, specifically a subgroup *varietas Krapinensis*, and described some features as 'pithecoid' characters. His findings differ from Klaatsch's in several regards. In one paper, Klaatsch mentions the similarities of the crown pattern of the third molar between Australian aborigines (»Australier«) and Neanderthals, i.e. the pattern is not a special feature of the Neandertals. Furthermore, he states that the distal phalanx of the thumb of Krapina does not significantly differ from that of modern humans. Klaatsch highly speculatively subjoins that the flint stone technique and industry of the Paleolithic suggests this too. The ambi-

tious, well-traveled anthropologist never stopped to zing his »*Agramer Freund*« (*110*, p. 571). The unexpected methodical responsibility of Gorjanović-Kramberger gave him life-long food for thought. From 1904 until 1907, Klaatsch was researching down-under, sending nice post-cards to the anthropological society. Afterwards he embarked in new, problematical joint-ventures. With Otto Hauser, he tried to prove the existence of «*Homo aurignacensis Hauseri*« at Krapina *(137)*. This change in the grumbling colleague was beneficial for Gorjanović--Kramberger, who became more and more 'autarkic.'

Gorjanović-Kramberger *(144)* lectured at important congresses, such as. the 75. *Versammlung der deutschen Naturforscher und Ärzte* in Kassel in 1903, and was greatly pleased by Schwalbe's parallel conclusion that two different varieties of *Homo primigenius* existed in the oldest diluvium. This concordance may have been the reason Gorjanović-Kramberger *(15)* devoted his brilliant monograph to Schwalbe. Correspondence between the two colleagues indicates that Schwalbe, remaining aloof, did not expect the honor, but became enthusiastic after reading the opus *(1, 5)*. The voluminous monograph, published in Walkhoff's 1906 series (Good to have allies!), was by far the best fossil documentation and analysis at that time. Schwalbe called the book »an astounding picture of one human species. I commend you in a work that delineates the important point that the *Homo primigenius* represents for all time« *(1, 5)*. Soon after entering the anthropological stage, Gorjanović-Kramberger was esteemed and courted by his colleagues. Between May 22 and May 24, 1904, his Viennese associates made an excursion to Zagreb and Krapina, and due to his honest and distinguished attitude, Gorjanović-Kramberger was a welcome participant, invited speaker and visiting lecturer at congresses and meetings in Beograd, Berlin, Budapest, Brussels, Cologne, Frankfurt, Kassel, Munich, Nuremberg, Prague, Salzburg, Strasbourg, and Vienna *(3)*. After the publication of Gorjanović-Kramberger's *magnum opus*, which Klaatsch (*136*, p 570) reluctantly praised as »Prachtwerk,« the Croatian scientist did not stop research. Gorjanović-Kramberger's numerous publications are a testament to his excellent new approaches and innovative ideas.

10. THE MORE DANGER, THE MORE HONOR

Fred Smith *(20)* notes correctly that Gorjanović-Kramberger made an amazing transition after the discovery of Krapina. His paleoanthropological work is especially remarkable since he was not trained as an anthropologist or even a human anatomist. Nevertheless, Gorjanović-Kramberger *(15, 145–161)* presented excellent analyses on the deciduous and permanent dentition, the cranium, the postcranial skeleton (specifically the femur and scapula), and anomalies and pathologies. As the Krapina collection contained numerous teeth, mandible and jaw fragments, they were the preferred research subjects, and Gorjanović-Kramberger's findings sometimes received savage criticism. Among those characteristics considered were the shape and morphology of the incisors, the enamel wrinkling pattern of the premolars and molars, cusp reduction in the molars, and taurodontism. Gorjanović-Kramberger described most of the features of the Krapina dentition as 'primitive' and indicative of an intermediate position of the Krapina *Homo* between the Anthropoids and modern humans, while Paul Adloff (1870–1944), a well-versed zoologist and anatomist at the University of Konigsberg, identified them as derived features, implying that the Krapina specimens composed a side branch of the hominid lineage excluded from our ancestry *(167–176)*.

Adloff was a tough disputant and, in some contentions (e.g. concrescence theory), he was justified *(20)*. In most arguments, however, he was wrong. This is not surprising since Gorjanović-Kramberger tended to analyze anatomical structures in an innovative adaptive framework. Walkhoff *(177, 178)*, who was inclined to recognize that morphology changes as environmental needs change and, as Fred Smith (*20*, p. 242) states, »[whose] concept of phylogeny was to search for patterns and to try to put them into a meaningful, adaptive, and evolutionary framework,« may have influenced Gorjanović-Kramberger's approach. Adloff, however, viewed everything in terms of specializations. Somewhat tragically, this holds true in Adloff's *(179)* posthumous paper on australopithecines, which Hans Weinert *(180)* impolitely exposes in an apodosis stating that experts no longer see an »*Eigenweg des Menschen*.«

Alongside his debate with Adloff, Gorjanović-Kramberger held an ungracious dispute with Max de Terra in Zürich and Carl Toldt in Vienna *(181–187)*. However, the Croatian newcomer in paleoanthropology did obtain helpful support from some colleagues. Max Schlosser provided him with excellent defense against Moriz von Hoernes' criticism concerning the identification of *Rhinoceros merckı(i) Jäg. (188)*. Gorjanović-Kramberger gave his profound gratitude to Walkhoff, who donated three complete milk dentitions and isolated deciduas and x-rayed the Krapina mandibles. David Paul von Hansemann (1858–1920), professor and prosector at Virchow's Hospital in Berlin, would not have sent 200 clavicles to Zagreb as 'payback' for only a kind citation had Gorjanović-Kramberger not formed strong partnerships while lecturing. Along with Schlosser, Walkhoff was another valuable ally. He not only published the 'opus,' but also strongly endorsed Gorjanović-Kramberger's ideas. Walkhoff *(177)* disputed with Klaatsch and Schwalbe over the age of the Neandertals and discussed ardently the development of the chin with Karl Toldt (1840–1920, Wien). With Max Schlosser and Otto Walkhoff's aid, Gorjanović-Kramberger defended himself well.

This was no easy task. In the early 20th century, there were some very bizarre opinions. Ludwig Wilser (1850–1923), a physician who, since the 1880s, was expounding on racial theories, was convinced that there was a vintage European race, *Homo primigenius (189)*. He soon included the Krapina fossils as additional proof of such an »Urrasse«. At a meeting in Worms, Wilser repeated the

criticisms he had given before in Globus on Gorjanović-Kramberger's hypothesis of a *varietas Krapinensis*. As Wilser's paper was confusing and boring, colleagues asked Klaatsch to formulate a protest against such lectures, which were beneath the dignity of science (*»der die Würde der Wissenschaft herabsetzt«* *(189)*. Wilser's immature, callow ideas on human phylogeny were not unique to him at the time; they were ubiquitous. The dominating themes became the fixity and inequality of races *(16, 19, 190)*. The supremacy of the Krapina collection faded with exciting finds at the sites of Grimaldi, Le Moustier, La Chapelle aux-Saints, La Ferrassie, and Combe Capelle in France *(134, 137, 191–195)* and Mauer in Germany *(196)* as well as possible fossils from Gibraltar and Piltdown in Great Britain *(197–201)*. Furthermore, Gorjanović-Kramberger's German colleagues Ranke, Schwalbe, and Klaatsch died in 1916. World War I and the politicization of anthropology (Social Darwinism, racial biology, and eugenics) became the central focus of anthropology in Germany *(18, 63)*. Paleoanthropology became a subject of only marginal interest. Discussions on Krapina and the brilliant research on the Neandertals from Croatia had reached a normal level of interest though Karl Gorjanović-Kramberger was also busy and active after his retirement until his death in 1936 *(161, 166, 202)*.

11. TICKING THE CHECKLIST ABOUT GORJANOVIĆ-KRAMBERGER'S IMPACT

Finally, two questions remain:

- Was Gorjanović-Kramberger sufficiently qualified to name him a founder of paleoanthropology?
- Did Gorjanović-Kramberger's research impact German anthropology?

Although Jakov Radovčić's research has answered the first question positively, we will tick off a check- -list given by Shipman & Storm *(39)*:

- Gorjanović-Kramberger made a pivotal discovery of fossils and artifacts.
- He developed and applied innovative techniques for the description and analysis of his discoveries.
- Gorjanović-Kramberger focused on new questions and invested all his power in a broad dissemination of information or debate about the subject, which serves to make it a matter of wide concern.
- He provoked a general reaction and intensive response from colleagues.

As this happened primarily in the German-Austrian anthropological scientific community, Gorjanović-Kramberger greatly impacted the formation of paleoanthropology in central Europe *(1, 5, 6, 203)*. However, he did not induce a paradigmatic shift in paleoanthropology *(16, 204, 205, 207)*. Still, if we name Gustav Schwalbe a founder of paleoanthropology *(81)*, there is no question that Gorjanović-Kramberger also merits this honor!

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