

Hermann Löns' "Quintär"

An Early Approach to the Geological Stratigraphy of the Age of Humans and its Significance in Geosciences

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Abstract

In 1908, Hermann Löns developed a concept to describe geological and biological manifestations of the period in Earth history in which humans became a dominant agent (the 'Age of Humans'). His "Quintär" ("Quintary", Löns, 1908) consists of two components: the geological ("Quintary deposits" or "Quintary stratum"), and the zoogeographical ("Quintary fauna"). The geological component was effectively a lithostratigraphic definition of anthropogenic geological bodies.

In this Löns already anticipated the 21st Century approach to establish a geological framework for the Age of Humans based on physical manifestations and geological evidence. Today this approach is reflected in attempts to define the Anthropocene as a chronostratigraphic unit (Fig. 3). As shown here Löns' lithostratigraphic concept can be useful in modern stratigraphic approaches to the 'geology of mankind'. To correspond with modern terminology, his "Quintary stratum" is defined as a

hierarchical lithostratigraphic unit (Quintary Lithosome, Fig. 3). It comprises of all geological bodies in which non-anthropogenic geological processes have been replaced or significantly modified by anthropogenic or technogenic activity.

The Quintary Lithosome has a diachronous base and intercalates in its lower part vertically and laterally with non-anthropogenic deposits of the Holocene Series. The upper part, that correlates with the Anthropocene Series, has a global distribution. The Quintary Lithosome is exclusively defined for geological stratigraphies on Planet Earth and based on its lithofacies. The biostratigraphical use of hominid fossils and cultural remains should be discouraged, because of the scarceness of such remains throughout the vast majority of their geological record. However, for the context of archaeological stratigraphy, it is suggested herein to define the phase of cultural manifestations of hominids and their corresponding deposits (that are currently known to date back to the Pliocene) as the Anthropian age and deposits, respectively (Fig. 3). In the realm of archaeological stratigraphy, the dominant manifestation of human presence and activities form the deposits of the archaeosphere, that largely (although not totally) overlaps with the geological Quintary Lithosome in extent.

Despite the need of gentle adaptations of the terminology and framework to the needs of modern geosciences, the core definition of the “Quintary” as lithostratigraphic unit can be adapted nearly unchanged from Löns. It remains free of conflicts or contradictions to other concepts and the “Quintary” can be seen as complementary improvement with a practical value. His contribution is therefore of greater significance than previously acknowledged and deserves more attention in the geosciences and other disciplines.



Fig. 1 Hermann Löns (1866–1914). Photography taken around 1900, in Public Domain.

Key Words: Quintär; Quintary; Quaternary; Lithostratigraphy; Anthropocene; Age of Humans; archaeological stratigraphy.

Note: This text is published concurrently in German language in the printed edition of *Naturhistorica* 164/165 (2022/2023), p. 95–121. For the sake of readability, the English translations of the original terms (e.g., “Quintary” instead of “Quintär”) will be used throughout the text whenever applicable.

Introduction

Following the perception that the planet Earth had a longer history before the appearance of humans, various attempts were made to characterize and define the age of Earth's history in which humans became a dominant species. In the light of the diversity of these approaches, I use herein the general term 'Age of Humans' (e.g., Kress and Stine, 2017) as independent from any underlying definition or philosophical concept. It shall not be confused with the calendaric Human Era (Emiliani, 1993, 1994).

Early considerations about an Age of Humans date back as early as the late 18th century CE (Common Era). They focused on the recognition of a last, concluding stage of Earth's history that is adorned by the "creation of man", and his alleged exceptional place within nature. The Italian geologist Antonio Stoppani (1867, 1873) is widely credited as the first to outline an extensive stratigraphic (geological) concept of an "Anthropozoic" based on these premises (Lewis and Maslin, 2015; Grinevald et al., 2019; Rull, 2021; Luciano and Zanoni, 2023). The idea remained largely obscure for more than a century. In the 20th century other suggestions, such as by Pierre Teilhard de Chardin and Vladimir Vernadsky, focused more on holistic, philosophical, or ecological approaches, rather than on a physical identification of the Age of Humans in the stratigraphic record (e.g., Steffen et al., 2011; Lewis and Maslin, 2015). The latter approach was only revived in the early 21st century, when it was suggested that the massive and global human impact on the Earth system signifies a geological unit or era of time in a broader sense (e.g.,

Crutzen, 2002; Steffen et al., 2011). It was proposed to define a new, most recent geological epoch, the Anthropocene, based upon the geological record of this massive influence (Crutzen and Stoermer, 2000; Crutzen, 2002). This suggestion resulted in the formation of the Anthropocene Working Group of the International Commission on Stratigraphy (ICS, Subcommittee on Quaternary Stratigraphy) that is currently outlining the formal definition of the Anthropocene as a geochronological epoch on the International Stratigraphic Chart (e.g., Zalasiewicz et al., 2008, 2012, 2017, 2019a; Waters et al., 2014). The idea of the Anthropocene raised wide interest with the media and public.

However, despite some reviews of the history of the concept (e.g., Steffen et al., 2011; Grinevald et al., 2019), the interesting contribution by the German journalist, poet, and amateur naturalist Hermann Löns (1866–1914) to this matter has been overlooked until now. Löns developed another approach for a new geological age defined by human interaction with nature that he named "Quintär" ("Quintary"), in allusion to the supposedly preceding Quaternary (Löns, 1908, 1910). While his ideas did not gain momentum and were largely forgotten in the aftermath, they complement the history of the definitions of the Age of Humans as a term and concept. Furthermore, it reveals a surprisingly progressive conceptual view for the early 20th century CE, and offers potential solutions on several ongoing and recently widely discussed issues in the geological definition of the Age of Humans.

The Author

Herman Löns (Fig. 1) was born 29 August 1866 in Culm, Western Prussia (today Chelmo, Poland). Financial constraints forced him to abandon his studies of medicine and natural sciences, and to take up work as a journalist. Finally, he settled in the area of Hanover, now Lower Saxony, in 1892. During this time, he found his passion for the local landscape of the Heath (Heide) and became a highly popular author of many essays, poems and books, romanticizing the beauty and appeal of this region, its nature and inhabitants. On the outbreak of WWI, he volunteered for the German Imperial Army, and was killed in action near Loivre, France, on 26 September 1914 (see Dupke, 1993, and Kaune, 2014 for extensive modern biographies and receptions).

Apart from belletristic, popular and educational texts about nature and wildlife (e.g., Wolterstorff, 1938), he published various articles on zoological subjects in local scientific journals. He intended to create an extensive faunistic study of vertebrates in southern Lower Saxony. In 1909 Löns destroyed the manuscript shortly before completion (Kaune, 2014). However, early fragments of this work survived and were published (Löns, 1905). The research was vital. It included the collection of extensive data on neozoans and hemerophiles, as well as historical local extinction patterns. This formed the foundation to the development of the concepts of “Quintär” (“Quintary”) and “Quintärfauna” (“Quintary fauna”) (Löns, 1908, 1910).

The Concept

Although Löns published his concept as a “zoogeographical suggestion”, as he described it in the subtitle, it consists of two components, a geological and a zoological one. The “Quintary [stratum]” was introduced as a stratigraphic term into geosciences together with the “Quintary fauna” into zoology.

The “Quintary” stratum

[Ich] nenne [...] diese vom Menschen geschaffene Erdschicht das Quintär als jüngste, dem Alluvium oder Quartär folgende Schicht. Selbstverständlich gibt es Quintär, das bedeutend älter ist als dieses oder jenes Quartär, denn manche kultivierte Gegenden sind als solche älter als die in ihnen liegenden

Moor- und Marschbildungen; im allgemeinen aber ist das Quintär geologisch die jüngste Erdschicht, denn erst nachdem die Quartärbildung begonnen hatte, schuf der Mensch das Quintär.

[...]

Unter dem Quintär verstehe ich **jenen Teil der Erdrinde, dem der Mensch unmittelbar oder mittelbar den Urlandscharakter nahm**, auch jedes Stück Land, auf dem ein Haus steht, oder das als Straße, Acker, Wiese, Weide, Garten, Park, Anlage, Kirchhof, Deich, Steinbruch usw. durch den Menschen sein von der Urform abweichendes Aussehen erhielt. Diese Umformung bedeutet vom geologischen Standpunkte aus die Schaffung von kleineren und größeren künstlichen Felspartien oder ganzen Gebirgen durch den Menschen, denn jedes Steinhaus ist ein Fels, jedes Dorf eine

Felsgruppe, und jede Stadt ein Gebirge, das viele Schluchten, nämlich die Straßen hat.

[I call] that man-made stratum, as youngest one, following above the alluvium or the Quaternary, the Quintary. Of course, there exists Quintary that is significantly older than this or that Quaternary, because some cultivated regions are older than swamps and marshes located within them; but in general, the Quintary is the youngest stratum, because man created the Quintary only after the beginning of the Quaternary.

[...]

As Quintary I define **that part of the Earth's crust which was changed directly or indirectly from the original and untouched state by man**, i.e. every piece of land on which is now a house, or that changed its appearance from the untouched natural state by humans with the appearance of a street, field, green, pasture, garden, park, installation, church yard, dike, quarry etc. From the perspective of geology, this transformation means the creation of smaller or larger, artificial rocky outcrop or whole mountain ranges by man, because every house built from stone is a rock, every village a group of rocks, and every city is a mountain range with many gorges, the streets.

(Löns, 1908, pp. 117–118,
translated from German by the author)

These quotations imply that, in modern terminology, Löns perceived the "Quintary" as

- a lithostratigraphic unit, that is composed by *geological bodies created or modified* by humans, and
- the *geomorphological features* associated to this unit, that resulted from human activity.

There is no indication that he intended the "Quintary" as a geochronological unit, but it is explicitly defined as an "Erd-schicht" ("geological stratum"), a physical manifestation of rock-forming processes. His diagnostic characteristics of this stratum can be summarized as following: It is created by human activity, and includes anthropogenically modified natural deposits (e.g., soil modified by agriculture), as well as those directly created by humans (buildings etc.). Later authors named such types of geological bodies and processes as "technogenic" (e.g., Fersman, 1934; Ter-Stepanian, 1988). It is not to be confused in its meaning with the interaction and interdependencies between human activities and geological factors, which became known as "Anthropogeologie" ("anthropogeology") in publications in the German language, (see Häusler, 2016 for a historical overview).

By remarking that they can vertically intercalate with deposits not modified by humans, and that he referred to as "Quaternary" (giving the example of former agricultural areas turned to wetland through natural processes), Löns recognized the "Quintary" deposits as a lithofacies with discontinuous vertical and lateral distribution. He felt some ambiguity to his previous notion, that the "Quintary" in general is the youngest period, relativating it by using the phrase "in general". This conflict can be explained by the lack of a clear separation between the geochronological-chronostratigraphic and lithostratigraphic approaches. However, such a separation can clearly be exposed by exegesis from his text, and underscores the identification of the "Quintary deposits" as a lithostratigraphic concept.

The “Quintary fauna”

It becomes apparent from the context, that the “Quintary” in a stratigraphic sense was more a tool for Löns to manifest the temporal element in his zoogeographical theory than a concept in its own right. The “Quintary” as a geological body, as he understood it, was a man-made substratum that controlled the extant distribution of fauna and flora. The “Quintary fauna” includes species that can only thrive in a certain region, after human activity created a “Quintary deposit”, i.e. the natural landscape was transformed anthropogenically to allow new niches to develop in the habitat. He explicitly distinguished his concept from that of neobiota (or neozoans) because the latter he regarded as immigrants that established themselves independently from human landscape modifications (though not necessarily from human activities, as e.g. deliberate introduction of species). He also explained that the “Quintary fauna” is not synonymous to domesticated species, especially as the latter in some cases thrive on “ancestral land” (i.e. in not anthropogenically modified habitats).

The “Quintary fauna” comprises a zoogeographical context, that was in parts defined by a historical and ecological component – the distribution of animal species in time and space depending on their relationship to anthropogenically modified landscapes. New to this approach was that

the “Quintary fauna” is not equal to species communities that have been willfully introduced or modified by humans (as e.g. mentioned in Stoppani, 1873), but those that are able to expand their zoogeographic range and/or abundance because of environmental changes that have been induced by human activity. Examples of these include changes in vegetation patterns due to agriculture, that favoured some mammal and bird biocoenoses (Kalela, 1942); or the provision of warm, sheltered environments in buildings, that allowed for the immigration and establishment of populations e.g. of some bat species into northern latitudes (Löns, 1908). The main problem with the “Quintary fauna” is that there is a lack of sufficient empirical evidence in the vast majority of species to clarify the relationship between their local ecological dominance and anthropogenic influence, especially through time. This problem was not ignored by Löns, who admitted a high degree of uncertainty in his categorisation of animal species with regard to their classification as members of the “Quintary fauna”.

In modern zoological terminology, “synanthropic fauna” (e.g., Klegarth, 2017) is used largely in an overlapping sense to the “Quintary fauna”. This expression has the advantage that it is free from the latter’s hypothetical inferences about the causes and chronology of historical faunal changes.

Are there conceptual precursors to Löns’ “Quintary”?

Löns did not quote any sources or references in his brief paper on the “Quintary”. It therefore remains uncertain which precursory works influenced his geological and biological concepts. In order to understand

the contemporary background to his ideas, important concepts for stratigraphic approaches to the Age of Humans up until the beginning of the 20th century CE are outlined chronologically below.

The earliest definition of an Age of Humans as a part of Earth history traces back to Georges-Louis L. de Buffon, who first introduced a "dernière époque" ("last epoch") that was characterized by the admixture of the "puissance de l'Homme" ("power of man") to the "power of nature" (de Buffon, 1779: iii). It was significant for being one of the earliest expressions of the idea that a very long period without the presence of humans preceded this "last epoch" (Heringman, 2016).

In the realm of stratigraphy (i.e. the manifestation of diagnostic geological bodies), the earliest attempt to define the Age of Humans can be credited to Henri Rebol (1833: 2). He suggests the terms "période néomastoniennne" and "période anthropéienne" as synonyms for the Quaternary, which was defined shortly before as a stratigraphic unit by Desnoyers (1829; based on Arduino, 1760; see Gibbard, 2019). The "période néomastoniennne" was based on the appearance of "espèces mammifères actuellement vivantes" (currently living mammal species), especially of the apes ("quadrumanes"; Rebol, 1833: 218), and the "période anthropéienne" on the presence of humans. Rebol did not favour a preference for any of these terms, but deliberately suggested them as alternatives. While, in a modern sense, the "période néomastoniennne" was rooted in a purely biostratigraphic concept, the proposal of an alternate "période anthropéienne" includes artifacts as potential indicators ("débris osseux ou les produits de quelque industrie grossière" – Rebol, 1833: 5). Most notably, Rebol did not invoke a distinct theological element in his reasoning. Unusually explicit for his times, he rejected attempts to utilise geological evidence to prove the historical accuracy of the bible (e.g., the universal deluge). Although he was unable to account for the "sudden

appearance" of new species, he explained faunal and floral changes as well as extinctions throughout Earth's history as a result of natural, gradual, and regional transformations of the environment (especially of the climate). Nonetheless, he underscored the outstanding position of man as "master of the Universe" that he attained through his intelligence, despite his relative physical weakness:

Le dernier terme de cette série a été l'apparition des espèces mammifères actuellement vivantes, et notamment des quadrumanes et de l'homme, que son intelligence a rendu aussitôt maître de l'Univers, quoiqu'il soit né faible et désarmé.

(Rebol 1833: 218).

Alexandre Vézian later suggested an "ère jovienne" ("jovian era", Vézian, 1863, 1865) that was defined to commence "with the existence of the man, who, after he appeared in this era, never ceased to inhabit the surface of the globe, and whose domination extended more and more." (Vézian, 1865: 450; translated from French). Despite the different terminology, the (bio-) stratigraphic definition of the "jovian era" is practically identical with Rebol's "période anthropéienne".

In the 19th century, other stratigraphic concepts (*sensu lato*) mainly centered around the exceptionalism of the human species within nature, sometimes with a strong theistic component (e.g., Whewell, 1853; Dana, 1863; Haughton, 1865; Stoppani, 1867, 1873; LeConte, 1877, 1878). Generally, these approaches often included a degree of recognition of the physical evidence for a human presence, however, they lack concrete, stratigraphically applicable definitions. From the middle of the 19th century, the contemporary and historical physical modifications of the geosphere

and biosphere through human activity and their potential for stratigraphy became aware (Jenky 1854; Suess, 1862; Marsh, 1864, 1874; Fischer, 1916; Sherlock, 1922; Häusler, 1959; 2016; Hohl, 1974). In a very extensive chapter of his book *Corso de Geologia*, Antonio Stoppani, an Italian geologist and priest, tried to link physical evidence with theological exceptionalism to define an “*era anthropozoica*” (Stoppani, 1867, 1873; compare Luciano and Zanoni 2023), often quoted as an early precursor to the modern Anthropocene concept (e.g., Crutzen, 2002; Rull, 2021; but see Hamilton and Grinevald, 2015).

Stoppani provided a comprehensive list of the human influence within the biosphere and geosphere, and his unprecedented environmental changes. He defined the “*anthropozoic era*” as starting with “the first trace of man”, and by that it is ongoing beyond today for “the number of centuries God is willing to concede to the triumph of intelligence and love” (Stoppani, 1873, translated from Italian in Federighi, 2013). Finally, he listed potential sedimentary deposits, their composition and fossil content to record the “*anthropozoic era*” geologically. Among stratigraphic indicators, he specified human remains and anthropogenic artefacts, aside of fossils of a modern fauna and flora, as diagnostic. Nevertheless, he saw the geological and ecological manifestations of the human presence as the result of the “*creation of man*”, as “a new element, a new telluric force” to the “*physical world*”, instead as an integral part of nature. As a result of divine premeditation, Stoppani’s “*anthropozoic*” does neither recognize the gradual phylogenetic changes that gave rise to the modern human nor the gradual rise in the technological capability of *Homo sapiens* to shape the face of the Earth. It is therefore deeply rooted in religious views, as it not only denies biological evolution

but also ignores the gradual development of human cultures and technology. The hypothesis of an immediate cosmopolitan appearance of the human species (by “*creation*”) was already unfounded and contradicted by known facts at Stoppani’s lifetime. Furthermore, he dated the beginning of the “*anthropozoic*” after the “*neozoic*”, the latter being characterized by the glaciations. Therefore, he implies that it roughly correlates to our current understanding of the Holocene. However, that the presence of humans and their “*traces*” (in the form of artifacts) reached further back within times of glaciation (i.e. into what is currently defined as Pleistocene) was a well-established fact already during Stoppani’s age (e.g., Vézian, 1865). In his own work he mentioned “[...] *archaeolithic strata*, where human relics appear as buried among cut firestones and bones of disappeared animals [...]” (Stoppani, 1873). The reasons for these contradictions are elusive from Stoppani’s work but it might emphasize the highly dogmatic and theoretical nature of his concept, that could not satisfactorily be brought in line with physical evidence in full, even at the time when it was conceived.

The only potential conceptual precursor to Löns “*Quintary*”, that roots strictly in stratigraphic methods and is therefore directly comparable, is a regional stratigraphic scheme that incorporated the presence of human fossil and cultural remains by Napoléon de Mercey (1877, here Fig. 2). This author defined a “*terrain humain*” as a regional lithostratigraphic unit in his study on the Quaternary of the Picardy (northeastern France), that was “*characterized by the human*” (de Mercey, 1877: 21, translated from French) Most interestingly, de Mercey clearly distinguished between litho- and chronostratigraphy:

CHRONOSTRATIGRAPHY		LITHOSTRATIGRAPHY	
ÉPOQUE HUMAINE	ÉPOQUE POSTDILUVIENNE	TERRAIN HUMAINE	ÉTAGE NÈERLANDIEN
	ÉPOQUE ANTÉDILUVIENNE		ÉTAGE HESBAYEN
ÉTAGE AMBIANIEN			
ÉTAGE CARNUTIEN			

Fig. 2 The elaborate stratigraphic scheme by de Mercey (1877) for the Quaternary of the Picardy, France. Note the distinction between chrono- and lithostratigraphy, and the usage of the presence

of humans as stratigraphic criteria. The boundary between the “*époque antédiluvienne*” and the “*époque postdiluvienne*” roughly corresponds to the Weichselian Last Glacial Maximum.

Les terrains ou grands groupes d'étages matériels dans l'espace correspondent eux-mêmes à de grands groupes de temps ou époques.

(“The terrains or large units of material stages in space [i.e. depositional successions] correspond to large units in time, or epochs, respectively.”)

De Mercey (1877: 21).

As the chronostratigraphic equivalent to the “*terrain humain*” he defined the “*époque humain*”. Remarkably, he indicated that human remains and artefacts

did not appear at the base of the “*terrain humain*” but only in the second stage, the “*ambianien*”. Therefore, his only regionally defined units lack a biostratigraphic definition based on physical remains of hominids, and their summarily assignment to a “*terrain humain*” remained theoretical. Similarly, he correlated the “*époque humain*” to the Quaternary, rendering the former chronostratigraphic unit name as younger synonym redundant. De Mercey’s stratigraphic concept did not prevail and is today entirely obsolete (compare e.g., Pilans and Gibbard, 2012).

Reception and significance of the “Quintary” concept

Contemporary reception

Neither the “Quintary fauna” nor the “Quintary” made a significant impact on the scientific literature after Löns. The term “Quintärfauna” was rejected first by Boettger (1912: 178), mainly for the – not entirely correct – reasoning that it is synonymous to the term “Adventivfauna” (“adventive fauna”). Similarly, in geosciences the “Quintary” did not get a foothold, though the term “Quintär” was used by a few studies on Quaternary mollusc faunas, denoting the youngest geological units (von Pávai-Vajna, 1911; Vohland, 1914; Petrbok, 1929, 1939). Petrbok (1929: 288) referred to the “Menzel’sche [sic] Quintär” as a “historical period” but without a bibliographic reference to his source (from the context it may have been Menzel, 1909). The “Quintär” was also mentioned in a study of human-related changes of the Recent avifauna in Europe by Kalela (1938, 1942) as “the period of rule of humankind” that “is to be seen as a new phase in the evolution of the organisms” (Kalela, 1942: 2, translated from German). Aside of these mentions the term cannot be traced further in the primary literature.

Historical significance

To summarize the above, definitions for the Age of Humans before Löns were heavily based on theoretical, theological, and philosophical arguments and incorporated only partially empiric methods, if at all. Although Löns’ sources of inspiration remain obscure, his concept reflects several ideas that have been formulated before.

The “Quintary” in a stratigraphic sense reflects the observations by Reboul (1833), Stoppani (1867, 1873), and especially de

Mercey (1877) that human remains, artefacts and traces of human activities define a distinct, widespread, and generally uppermost stratum in the geological succession. New is to define this stratum as explicitly and exclusively to be that part of the lithosphere that has been modified by human activity, including additions by anthropogenic structures, e.g. buildings.

Löns’ concept stands out for that it did not contain any reference to anthropocentric exceptionalism in nature, as was still common throughout the 19th century. Instead of staying with a vague definition as “the phase of Earth’s history in which humans dominated or existed”, he tries to make the stratigraphy of the Age of Humans empirically definable through introduction of diagnostic geological criteria. Most significantly, he explicitly included only those geological strata in his “Quintary” that show clear signs of modification by human activity. As he takes direct evidence for anthropogenic environmental changes as the foundation of his rationalization of a new phase in the Earth’s history, he makes his work more meaningful for practical application. Not the “appearance” or “creation” of humans, difficult to trace and date, was at the core of his reasoning but the physical documentation of their unprecedented ability to act as a major geological force. Furthermore, he recognized the interdependency between anthropogenic modifications of the geosphere and their manifestations in the biosphere, although both terms were not known or understood in his times in a modern sense. The “Quintary fauna” reflects the unique consequences that human activities have for global biogeography, an observation that was already addressed by Marsh (1864) and Stoppani (1873).

The suggestion to use empiric indicators of anthropogenic modification of natural sediments as stratigraphic markers is of special significance as it incorporates environmental factors, similar to modern approaches (Crutzen and Stoermer, 2000; Crutzen, 2002). While it is today a much-debated topic which environmental markers may be suitable to characterize the Anthropocene (e.g., Crutzen, 2002; Rudiman, 2013; Steffen et al., 2016; Zalasiewicz et al. 2019b; Head et al. 2022a), in the early 20th century this suggestion was dismissed entirely, as there were no methods and tools available to analyze these markers practically within the geological record (Menzel, 1909: 90). This problem may have contributed heavily to the negligence of Löns' concept in geosciences.

Löns did not elaborate further on potential geoscientific methods to recognize the anthropogenic influence in sediments. The suggested zoogeographical proxy indicators („Quintary fauna“) fall short to solve this problem, as in most cases species distribution patterns cannot be correlated

with human modifications of the environment in sufficient detail. It also does not allow for a distinction of transitional stages in the evolution of synanthropy. The zoogeographical approach lacks a historical perspective beyond hypotheses to assess the stratigraphic boundaries of the “Quintary”.

From a theoretical or philosophical point of view, Löns' concept may be considered unsophisticated or simplistic. However, this clear-cut approach explicitly, to rely exclusively on physical indicators, was undeniably progressive for its time. It reflects modern concepts of human evolutionary exceptionalism in the sense of unique intellectual capabilities and their rebound effects on the history of life, biological evolution, and the Earth system (e.g., Simpson, 1949). Concurrently, the theologically founded perception that the “appearance” of humans by itself is exceptional in nature is irrelevant to it. It anticipated considerations for a stratigraphic definition of the Age of Humans by evidence from the geological record by nearly 100 years.

Does the “Quintary” has a future?

The “Quintary”, the Anthropocene, and the archaeosphere

While various approaches – also beyond the geosciences – have been proposed for the Anthropocene (e.g., Maslin and Lewis, 2015; Barry and Maslin, 2016; Malhi, 2017; Toivanen et al., 2017; Nichols and Gogineni, 2018; Thober, 2019; Zalasiewicz et al., 2021), this paper will focus here on its stratigraphic meaning in the realm of geosciences for a meaningful comparison with the “Quintary”.

First conceived by Crutzen and Stoermer (2000), the Anthropocene aims at the definition of a chronostratigraphic unit with an isochronous lower boundary (Fig. 3). It was suggested to be defined by the appearance of global anthropogenic geochemical markers in the geological record, that give evidence to the profound changes that *Homo sapiens* causes to the Earth System (Crutzen, 2002; see also Rull, 2016a). While various suggestions for the type of marker and position of the lower boundary have been discussed (e.g., Crutzen, 2002;

Ruddiman, 2003; Ruddiman et al., 2020; Sümer et al., 2020; Gibbard et al., 2022), the Anthropocene Working Group of the ICS currently prefers the anthropogenic radionuclide spike (esp. ^{239}Pu) caused by the first nuclear bomb explosion around the middle of the 20th century CE as lower boundary marker (e.g., Waters et al., 2014a, b; Zalasiewicz et al., 2014, 2019a; Lewis and Maslin, 2015; Steffen et al., 2015; Waters and Turner, 2022). Such a timeframe also coincides with the Great Acceleration (e.g., Steffen et al., 2015; Head et al., 2022a), that is characterized by the massive change of many global parameters as a result of the exponential growth of the human population and its energy and resource usage (e.g., Kückens, 2018). The conceptualization of the Anthropocene follows strictly a stratigraphic approach, but is subject to ongoing controversial discussions (e.g., Gale and Hoare, 2012; Hamilton, 2016; Malhi, 2017; Ruddiman, 2018; Rull, 2016a, b, 2021; Nielsen 2021, 2022). A key problem is that significant anthropogenic markers in the geological record locally predate the 20th century CE, and even the onset of industrialization, by far (e.g., Jäger and Bernhardt, 1995; Jäger, 1997). This results in a diachronous lower boundary for geological bodies that are anthropogenic in origin or strongly anthropogenically influenced and complicates the definition of a meaningful isochronous lower boundary of the Anthropocene (e.g., Periman, 2006; Smith and Zeder, 2013; Oliveiro and Peloggia, 2014; Edgeworth et al., 2015, 2019; Ruddiman, 2018; Zalasiewicz et al., 2019b). Most recently, Gibbard et al. (2022) proposed to define the Anthropocene as a stratigraphic event (*sensu* Ager, 1973) rather than a formalized epoch, with the aim to better embrace its time-transgressive nature and the wide range of manifestations of the Age of

Humans (but see Head et al., 2022b, for a contrary opinion).

To the contrast, the “Quintary” is perceived as a lithostratigraphic, diachronous unit that is neither laterally nor vertically continuous and is not bound to a geochronological unit. As interpreted from its original definition (Löns, 1908), it comprises *all geological strata that have been formed by processes dominated or initiated by human activity (implicitly on planet Earth). Recognition of these strata in the geological record depends on the empirical identification of physicochemical markers of human activity.*

This dominance of human activity can be recognized by the presence of either one or both of the following two indicators:

1. modified or newly formed geological bodies, lithological textures, and geomorphological features resulting from the interruption and replacement of non-anthropogenic geological processes by human activity, or
2. by the presence of anthropogenic physicochemical markers, recording the global interaction of human activity with the lithosphere, atmosphere, and/or hydrosphere.

Exemplary discussions of such physicochemical markers can be found e.g., in Crutzen and Stoermer (2000), Crutzen (2002), Ford et al. (2014), Lane et al. (2019), and Mayoral et al. (2020). On the macroscopic scale, human activities show geological manifestations in a broad range of textural, compositional, and geomorphological phenomena within the respective deposits (e.g., Jäger, 1997; Zalasiewicz, 2013; Ford et al., 2014; Williams et al., 2014; Goudie and Viles, 2016).

Hamilton and Grinevald (2015) have argued that concepts for the Age of Humans preceding that of the Anthropocene (*sensu*

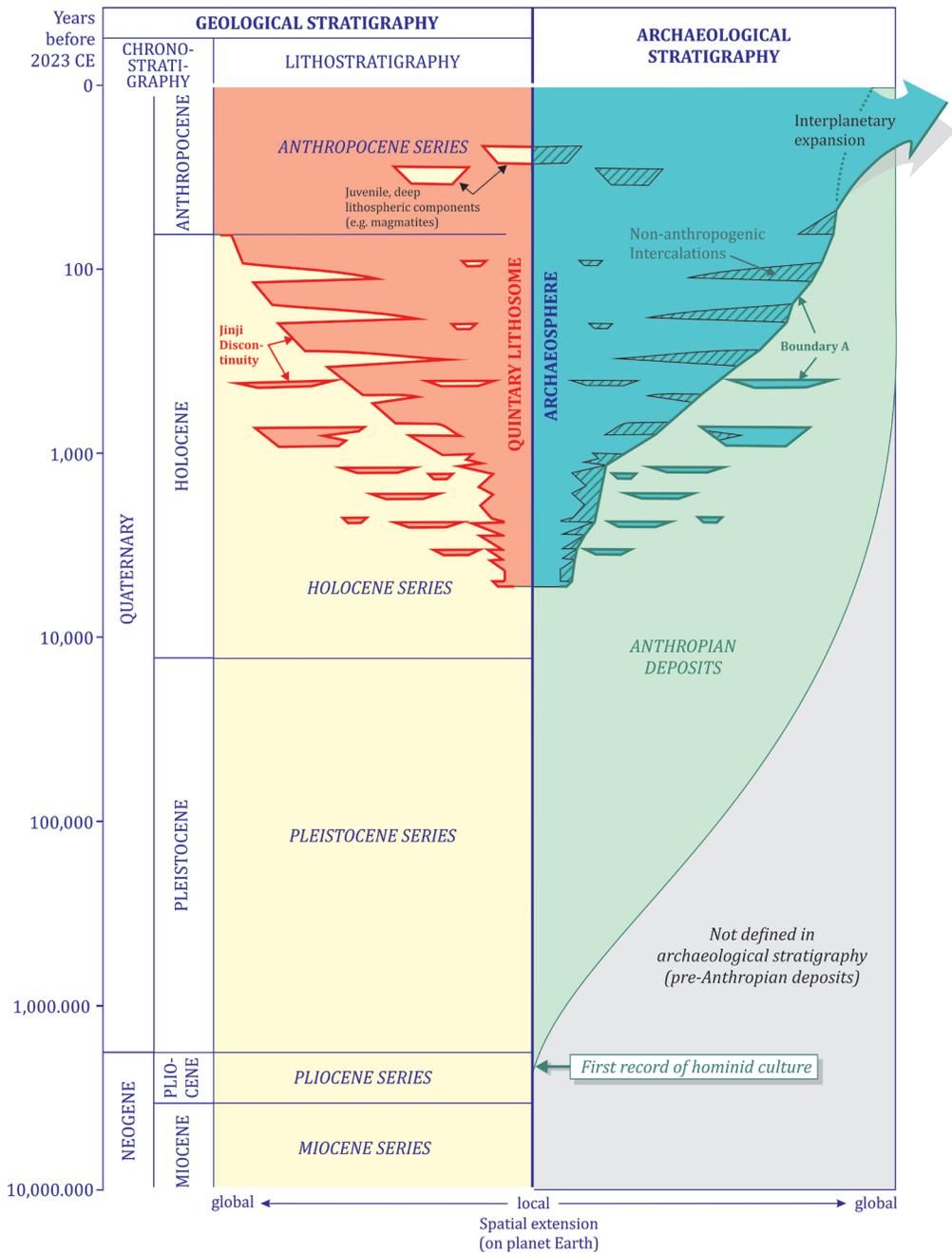


Fig. 3 Stratigraphy for the Age of Humans as suggested herein for the geological (left – Quintary Lithosome: orange) and archaeological realms (right – archaeosphere: turquoise, Anthropian deposits: green). Intercalated non-anthropogenic deposits in the archaeosphere are indicated by diagonal

hatching. See text for further explanations. Base of the Anthropocene epoch is assumed at 1945 AD, following Zalasiewicz et al. (2019a), other absolute ages after Cohen et al. (2013, updated 2021), note the logarithmic timescale.

Crutzen and Stoermer, 2000) should not be considered historical precursors of the latter. This view was justified by the radically different approach of the Anthropocene as a chronostratigraphic unit, defined by a distinct transition of humanity's capability to transform Earth's surface towards a modification of the Earth system, detached from the preceding gradual evolution of human culture and technology. However, the term "Quintary" relates to the geological products of human activity, and its recognition of the lateral and vertical intercalation of these products with non-anthropogenic strata. By this it defines a lithostratigraphic body (also termed more informally the "human stratum", Zalasiewicz, 2008), that is an expression of the processes that form the basis for diagnosis of the Anthropocene. It is therefore a complementary rather than a precursory or alternative approach.

For the entirety of the anthropogenic deposits the term *archaeosphere* (Fig. 3) has recently been proposed (Capelotti, 2009; Edgeworth, 2014). The archaeosphere globally overlies the non-anthropogenic deposits with a basal disconformity, that was named *Jinji disconformity* (Nirei et al., 2012; Fig. 3) or *Boundary A* (Edgeworth, 2014, 2018; Edgeworth et al., 2015; Fig. 3). It provides an alternative framework to interpret the geological record of human activities independently from the onset of a specific global date. However, a conceptual harmonization of the archaeosphere with the Anthropocene (Fig. 3) is not yet fully achieved. As mentioned above, the diachrony of anthropogenic or anthropogenically influenced deposits poses a methodical problem for the chronostratigraphic definition of the Anthropocene. Edgeworth et al. (2015, 2019) proposed a merger of the archaeosphere (as a stratigraphic unit) into the Anthropocene and

to accept a diachronous base for the latter, contrary to its current intention. Alternatively, they suggested that the archaeosphere may be established in parallel to the Anthropocene as a non-chronostratigraphic unit (similar to a biozone).

However, both approaches attempt to align two quite different stratigraphies: the geological and the archaeological. This proves to be difficult because a diachronously defined Anthropocene would lose the intention of the concept in a similar way as a re-definition of the archaeosphere as a bio- or culture zone would do. Such a stratigraphic zone needs to be globally definable, but its physical manifestations (in the sense of archaeological remains) might eventually not be present everywhere. In the remaining wildernesses of the Earth, global human impact can mostly only be measured by biogeochemical methods (e.g., markers in sediments and atmospheric gases) rather than in archaeological evidence or textural changes to geological bodies. Furthermore, the archaeosphere is explicitly defined to extend also to outer space, manifesting on non-terrestrial celestial bodies on which humans have left artefacts (Capelotti, 2009), while geological stratigraphic bodies and ages defined on Earth are bound to this planet.

In comparison it becomes clear that the concept of the "Quintary" is very similar to that of the archaeosphere. However, there are two tangible distinctions:

- in contrast to the "Quintary", the archaeosphere can contain interlayers devoid of anthropogenic influence (e.g., from natural floods),
- in contrast to the archaeosphere, the "Quintary" is not defined outside the limit of the terrestrial lithosphere (e.g., in interplanetary space or on extraterrestrial bodies).

The "Quintary", in a stratigraphic sense, has the advantage that it was completely bound to terrestrial geology, and recognizes the diachrony of the onset of this unit, as well as its lateral discontinuous distribution. It therefore recommends itself as a useful term within the framework of *geological stratigraphy* for geological units created or physically modified by human activities. The historically younger term archaeosphere should be restricted to the context of *archaeological stratigraphy* only. There it has the advantage to explicitly describe the physical extension of the human cultural influence sphere – even beyond planetary boundaries. The inhabited and growing parts of the archaeosphere (e.g., infrastructure, either active or under construction, urban developments, etc.) can be called *anthropostromes* (Passerini, 1984). The lower boundary of the archaeosphere is marked by Boundary A, a name that was introduced in an archaeological context (Edgeworth, 2014), and largely represents an equivalent to the Jinji disconformity (Fig. 3).

The idea to use the presence of human fossil or cultural remains as (bio-)stratigraphic indicators in geological stratigraphy date back to the 19th century (Stoppani, 1867, 1873; Pavlov, 1922; Gerasimov, 1979), and was recently revived by Rull (2021). However, the fossil record of hominids is comparatively exceedingly sparse (e.g., Catt and Maslin, 2012), and before the acquisition of advanced technological capabilities by *Homo sapiens*, their impact on processes of the Earth system was insignificant. It increased only gradually, and a dominant and increasingly cosmopolitical physical evidence for the presence of humans in the stratigraphic record only concurs with their latest phylogenetic stage during the late Holocene. From the current perspective, a biostratigraphy based on

fossil or cultural remains of hominins does therefore not serve a practical purpose in geosciences. Therefore, it is also not useful to re-define the Quaternary as "Anthropogene" (Pavlov, 1922), or to create a new, geochronological "Quinary" or "Quinary Period" (Ter-Stepanian, 1988) for the Anthropocene epoch. The Anthropocene can be included rightfully within the Quaternary as, despite the incipient mass extinction event (e.g., Cowie et al., 2022), no global faunal or floral change has yet occurred that would demonstrably justify to define a new period boundary (compare also Rull, 2022; Marshall, 2023). Similarly, hypothetical future stratigraphic boundaries, as suggested to define a "Technogene" succeeding the Holocene (Ter-Stepanian, 1988), are not recommendable in geological stratigraphy.

Nonetheless, human (hominid) culture is much older than its ability to significantly influence geological processes, and several million years of sentient human existence had passed already before the creation of Boundary A and the archaeosphere. Accordingly, is therefore proposed herein to define this interval in archaeological stratigraphy as the *phase of cultural expression of hominids*, and to locate its lower boundary with the appearance of the oldest anthropogenic artefacts in the stratigraphic record (i.e. the base of the Lower Paleolithic, e.g., Catt and Maslin, 2012). Such an overarching definition for the phase of cultural activity of humans has been anticipated already by Reboul (1833), and it is recommended herein to adopt his term "période anthropéienne" as the *Anthropian* (suggested translations: French – *Anthropéien*, German – *Anthropium*, Italian – *Anthropeano*). The Anthropian (Fig. 3) can be defined to span as temporal bracket *all periods of hominid prehistory and history through the present*, i.e., for the entire time during which

exists material human culture. Currently, the lower boundary is marked by the oldest known stone implements, found in Pliocene deposits of Kenya dated to 3.3 ma, and are by this significantly older than the oldest skeletal record of the genus *Homo* (see Harmand et al., 2015). The archaeological forms part of the deposits of the Anthropian. Furthermore, the base of the Anthropian deposits is diachronous, in line with the dispersion of hominids and their technology across the globe. In comparison while it dates back to the Pliocene in Africa, in the Americas it is not older than the Late Pleistocene, and not older than the latest Holocene (late 19th century CE) in Antarctica.

The Quintary Lithosome

If considered as a lithostratigraphic unit, the “Quintary” deposits are difficult to establish in the formal scheme of hierarchical stratigraphic nomenclature for various reasons. First, they are diachronous and partially laterally discontinuous in extent, as well as intercalating with non-anthropogenic/non-technogenic deposits. Second, anthropogenically/technogenically modified deposits encompass an enormous range of lithofacies, from anthropogenic landscapes (e.g., edifices) to the macroscopically invisible admixture of anthropogenic components (e.g., anthropogenic radionuclides or microplastic particles) in non-anthropogenically formed sediments (e.g., deep sea deposits, Abel et al., 2021). The variation of geological bodies that are either formed or influenced by human activity is so broad, that a single, formal lithostratigraphic unit as a formation or a group would be inadequate. However, if the Anthropocene as a geochronological unit is defined by the global presence of anthropogenic physicochemical

tracers in contemporary sedimentary systems, it might be argued that the *Anthropocene Series* is equivalent to the “Quintary” deposits. That the date of definition of the “Quintary” succession (1908 CE) would predate the proposed onset of deposition of the Anthropocene Series (1945 CE) by nearly half a century could be considered a quirk of the discussions. Such an approach is discouraged herein, as it would not solve the dilemma of the diachronous nature of Holocene anthropogenic/technogenic deposits and underutilize the potential of the concept. Alternatively, the restriction of the “Quintary” succession to pre-Anthropocene anthropogenic deposits would also not be adequate as the majority of anthropogenic processes that creates this succession (e.g., soil modification by agriculture) continues seamlessly from the Holocene into the Anthropocene. A solution to these dilemmas may be the formal recognition of the Quintary succession as a *lithosome*. The lithosome as an informal lithostratigraphic unit was suggested first by Wheeler and Mallory (in Fischer et al., 1954, Wheeler and Mallory, 1957) and modified by Sando (1989) to the following definition:

A vertically and horizontally segregated body of sedimentary rock, characterized by its lithic content and inferred genetic significance, which mutually intertongues with one or more bodies of different lithic constitution. A lithosome may or may not be demonstrably diachronous as measured by its transgression of time planes based on biozones or physical means of measuring time.

Lithosomes are independent in extension from formal lithostratigraphic units although they often coincide with the latter. The age relationships of their vertical boundaries are determined biostratigraphically, geochronologically, or lithostratigraphically, and their lateral boundaries “by regional lithostratigraphic analysis of the total time interval

occupied by the lithosome throughout its lateral extent.

Sando (1989: E3)

By formalization as the "Quintary Lithosome" (Fig. 3), this succession can be defined by containing components or textures that are linked to human activity as significant genetic factors. It is diachronous, beginning with the oldest anthropogenically modified or created deposits. As a deviation from the current definition of a lithosome it might be perceived that isolated bodies of anthropogenic deposits (e.g., debris around temporary Holocene human settlements) can occur isolated from other anthropogenic deposits (i.e., being underlain, overlain, and/or laterally bounded by non-anthropogenic successions) and therefore be detached from a continuous anthropogenic sedimentary body. However, the definition of a lithosome does not strictly exclude such a configuration. Presuming its unique genetic significance and mode of formation, there is a good argument to include such detached occurrences into the Quintary Lithosome. There is also no objection to the name itself, as Löns (1908) alluded to the succession to the Quaternary, though not in a geochronological sense; this is in accordance with the perception that the Quintary Lithosome was exclusively formed by a "novel agent" in Earth's history: humankind. The term has also the advantage to be semantically and culturally neutral.

For the lower boundary of the Quintary Lithosome the term *Jinji discontinuity* is appropriate, as it was introduced in a geological context (Nirei et al., 2012; Fig. 3). In yet untouched wilderness areas, the *Jinji discontinuity* corresponds to the first appearance of geochemical indicators for the Anthropocene (i.e., anthropogenic radionuclides) in the sedimentary record. The boundary surface in these regions can

be expected to be mostly stratigraphically conformable, hence the proposal to define it as a discontinuity rather than as a disconformity.

While the Quintary Lithosome is largely identical to the archaeosphere on planet Earth in its extent, some differences exist: the pre-Anthropocene archaeosphere is largely corresponding in extent to the Holocene part of the Quintary Lithosome, while it may include non-anthropogenic interlayers (e.g., flood deposits), that are by definition not part of the pre-Anthropocene Quintary Lithosome. In contrast to the extent of the Anthropocene section of the Quintary Lithosome, the archaeosphere might be restricted geographically during the Anthropocene for those regions (on Earth and beyond) that underwent intentional modification by humans (e.g., building, excavation, landfills, plowing, etc...). The Anthropocene part of the Quintary Lithosome attains global distribution on planet Earth and represents nearly entirely the Anthropocene Series – only juvenile, deep lithospheric components (e.g., magmatites) should be excluded from the Quintary Lithosome, as they can be assumed to be practically free from anthropogenic influence. The Anthropocene succession of the Quintary Lithosome is characterized by the global presence of biogeochemical tracers in sedimentary deposits, demonstrating global influence of human activity on the geological record. The boundary between the Holocene and the Anthropocene Series is even recognizable in entirely anthropogenic urban deposits by geochemical tracing (Meszar et al., 2021).

Finally, a recognition of the Quintary Lithosome would not affect the reclassification of the Anthropocene as a stratigraphic event, rather than a geochronological unit, as recently suggested by Gibbard et al. (2022).

Conclusions

In a brief paper, Löns (1908) outlined the concept of a “Quintary period” to describe geological and biological manifestations of the Age of Humans. His approach was twofold: lithostratigraphic (“Quintary deposits” or “Quintary stratum”), and faunistic/zoogeographical (“Quintary fauna”).

While the zoogeographical concept of the “Quintary fauna” was impractical to transfer into appliance, its lithostratigraphic definition is useful and still meaningful within the framework of modern stratigraphic concepts under discussion for the Age of Humans. The “Quintary stratum” fills a gap in defining diachronous, anthropogenic or anthropogenically influenced deposits of Holocene to Anthropocene age within chrono- and lithostratigraphy. Therefore, the “Quintary” can have a future, as a term, and as the product of ongoing geological processes in the Earth System. The concept was ahead of its time at the beginning of the 20th century in the call for physical evidence of the human impact on geology. However, probably because of the unavailability of analytical techniques to provide such evidence, it was largely ignored at the time of its invention. Today’s geological and archaeological techniques allow to fulfill these prerequisites and make the concept applicable.

To assess its modern significance, the following conclusions can be drawn from a reassessment of Löns’ “Quintary”:

- The Quintary Lithosome has a diachronous base (marked by the Jinji discontinuity) and intercalates in its lower part vertically and laterally with non-anthropogenic deposits of the Holocene Series. The upper part forms the majority of the Anthropocene Series (with the

exception of juvenile deep lithospheric components), has a global distribution, and is characterized by the incorporation of anthropogenic components (macroscopically to microscopically and molecular, e.g., microplastics, anthropogenic radionuclides, etc.) in anthropogenic as well as non-anthropogenic geological systems.

- The Quintary Lithosome is largely equivalent to the archaeosphere in archaeological stratigraphy on planet Earth. The archaeosphere represents strata that have been formed by significant interruption and replacement of non-anthropogenic by anthropogenic/technogenic geological processes. In contrast to the Quintary Lithosome, within the archaeosphere these strata may intercalate with those that formed as result of non-anthropogenic sedimentary processes. While its lower boundary (Boundary A) largely coincides with the Jinji discontinuity, it extends beyond planet Earth through human artifacts and activities in outer space. Contrastingly, geographically it may be more constrained on planet Earth than the Quintary Lithosome, because there are still areas on Earth that were not subject to a significant modification of their natural sedimentary processes through technogenic interference (e.g., wilderness regions). Concurrently, and as a consequence, the archaeosphere is expansive (during the time interval in which human civilization will be expanding on Earth and beyond), while the Quintary Lithosome has, by definition, already extended to a global distribution on planet Earth during the Anthropocene.
- There is no stratigraphic justification to define a subsequent period to the

Quaternary for the Recent. The Anthropocene epoch (to be formalized as Anthropocene) is rightfully nested within the Quaternary.

- Previous suggestions to redefine the most recent period of Earth history by adopting a biostratigraphic scheme based on hominid fossils and their cultural manifestations, are rejected herein for the realm of geological stratigraphy. Hominid fossils and anthropogenic artefacts are not suitable for reliable or practicable biostratigraphic zonation. However, in the context of archaeological stratigraphy it is suggested herein to define the phase of cultural manifestations of hominids (starting with the Lower Palaeolithic during the Pliocene) as the Anthropian age.

While the above suggestions represent modernized terminologies and adaptations to current conventions, it has to be stressed that these adaptations are minor in

comparison to the original concept. Therefore, the contribution of Hermann Löns to scientific debates that still have relevance more than a century later in geosciences, as well as in fields spanning from ecology to philosophy, deserves more attention than it has been historically received.

Contrasting with precursors, Löns already anticipated the approach of the 21st century for definitions based on physical manifestations and geological evidence. His theoretical framework is also free from anthropocentric and theistic components that were dominant in discussions of human exceptionalism in nature during the 19th century. Originally, his geoscientific considerations were merely a supporting framework for his aim of a zoogeographical interpretation of the local fauna. But in their focus on factual description they form a valuable and novel contrast to many precursors, and allow for a nearly seamless integration to modern concepts that likewise aim to base themselves in factual evidence.

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Preface picture p. 3:
A footwall of the Hohkönigsburg Castle (Château du Haut-Koenigsbourg, Alsace, France) that is intercalating with the eroded surface of the sandstone (Grés vosgien, Lower Triassic) beneath, illustrating a typical example of the Quintary Lithosome, hereby represented by the anthropogenic edifice, and of the Jinji discontinuity as the boundary surface. From a geologic perspective, the castle is a newly formed anthropogenic lithic body, that is composed of technogenically altered and redeposited sandstone components. Concurrently, it is part of the archaeosphere, bounded below by Boundary A, within the archaeological terminology. Image: J. Hornung, 2019.

Die Naturhistorische Gesellschaft Hannover

Gesellschaft zur Pflege der Naturwissenschaften · Gegründet 1797

Die Naturhistorische Gesellschaft Hannover versteht sich als eine Vereinigung von Menschen jeden Alters mit besonderem Interesse an der Natur und den Naturwissenschaften.



Ein kurzer Blick zurück

Im Jahr 1797 gründeten 25 Herren und eine Dame aus der Bürgerschaft der Stadt Hannover eine Lesegesellschaft. Sie schafften gemeinsam kostspielige Bücher an, die den Mitgliedern dann reichum zur Verfügung standen. Daraus entstand im Laufe des 19. Jahrhunderts eine

umfangreiche Bibliothek.

Aus dieser Lesegesellschaft ging 1801 die „Naturhistorische Gesellschaft in Hannover“ hervor. Sie hatte sich das Ziel gesetzt, „bei allen Bevölkerungsschichten eine genauere Kenntnis der Naturproducte hiesiger Lande zu befördern“.

Initiativen der NGH

- Treibende Kraft für die Errichtung des „Museums für Kunst und Wissenschaft“ (das heutige Künstlerhaus)
- Gründungsmitglied des Niedersächsischen Landesmuseums Hannover
- Gründung des Zoologischen Gartens
- Bau eines Schlachthofs in Hannover
- Mitwirkung in einer „Commission für die allgemeine Gesundheitspflege“
- Gründungsmitglied des Niedersächsischen Heimatbundes
- Aufstellung des Naturdenkmals „Schweden-Findling“ am Deisterkamm

Die NGH heute

Nach über 220 Jahren verfolgt die NGH immer noch die gleichen Ziele.

Sie bedient sich dabei allerdings zeitgemäßer Methoden und beschäftigt sich mit aktuellen Fragen. In Berichten, Exkursionen und Vorträgen geht es um naturwissenschaftliche Themen – unter anderem aus der

- Geologie
- Paläontologie
- Archäologie
- Botanik
- Zoologie
- Landschaftskunde
- Umweltforschung
- Technik

Die *Naturhistorica – Berichte der Naturhistorischen Gesellschaft Hannover* ist das wissenschaftliche Sprachrohr der NGH. Sie befasst sich mit den verschiedensten Bereichen der Naturwissenschaften und nicht zuletzt mit dem Schutz der Umwelt. Dabei werden auch die besonderen Verhältnisse in Hannover berücksichtigt. Besonders begehrt sind die geologischen Wanderkarten.

Der Natur unmittelbar begegnen kann man auf den etwa zehn pro Jahr stattfindenden Exkursionen. Vom Frühjahr bis

in den Herbst führen sie zu den unterschiedlichsten Zielen und werden von Fachleuten geleitet. Dabei kommen biologische, geologische sowie technologische Themen zur Sprache, aber auch kulturgeschichtlich interessante Stätten werden besichtigt.

Die NGH möchte dazu beitragen, über die Notwendigkeit und die Ergebnisse naturwissenschaftlicher Forschung zu informieren. Dies geschieht vor allem durch Vorträge im Winterhalbjahr, denen sich spannende Diskussionen anschließen.

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