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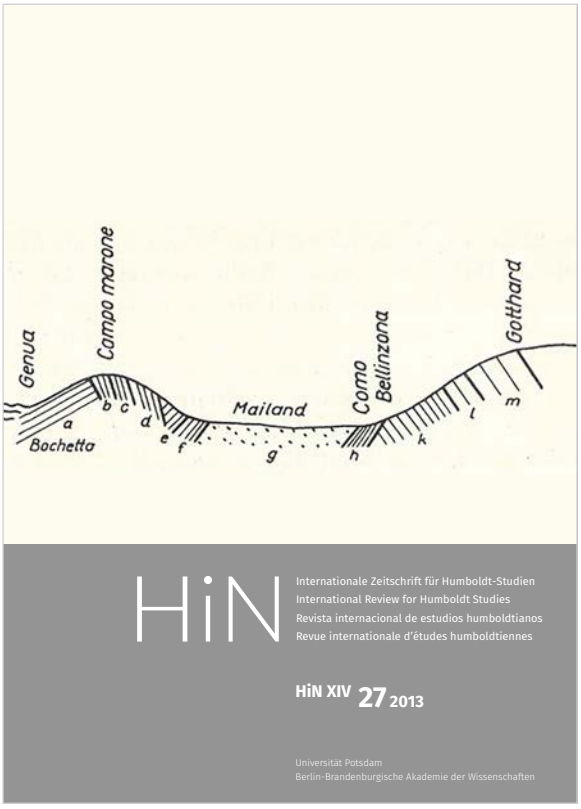

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Björn Kröger

Remarks on a scene, depicting the primeval world – A talk given by Leopold von Buch in 1831, popularizing the *Duria antiquior*

Zusammenfassung

Der Geologe Leopold von Buch war lebenslanger Freund Alexander von Humboldts und hatte wesentlichen Anteil an dessen Verständnis erdgeschichtlicher Prozesse. In einem hier erstmals veröffentlichten Vortrag, gehalten 1831 in Berlin, stellt von Buch die 1830 publizierte Duria Antiquior des englischen Geologen Henry De La Beche vor. Das Bild gilt als erste wissenschaftliche Rekonstruktion einer vorzeitlichen Welt und warf mit seinem Erscheinen neue Fragen zu den Prozessen erdgeschichtlicher Veränderungen auf. Leopold von Buch zeigt sich in dem Vortrag als Forscher der Romantik, der mit der *Duria Antiquior* vorhandene bildhafte Vorstellungen organismischer Transformation aus der Literatur aufgriff, um geohistorische Veränderungen der Lebewesen zu beschreiben. Mit dem Vortrag wird der große Einfluss deutlich, den die Engländer auf die zeitgenössischen Erzählungen der Erdgeschichte in Deutschland hatten.

Abstract

The Prussian geologist Leopold von Buch was a lifelong friend of Alexander von Humboldt and had a significant influence on Humboldt's geological ideas. In a talk, held in Berlin in 1831, which is published here for the first time, von Buch presented the *Duria Antiquio*r of 1830 by the English geologist Henry De La Beche. The *Duria Antiquior* is widely regarded as the earliest depiction of a scene of prehistoric life from deep time. The print raised new questions about the processes of geohistorical change. The talk reveals that Leopold von Buch was a true scientist of the Romantic Age. His descriptions of geohistorical organismic transformations are taken from pictorial examples of organismic transformation from the classical literature. The talk also illustrates how influential English geologists were for geo-historical reconstructions in Germany.

Résumé

Le géologue prussien Leopold von Buch a noué une longue amitié avec Alexander von Humboldt, il a grandement influencé les idées dans le domaine de la géologie. Dans une conférence donnée en 1831 à Berlin et dont le texte est publié ici pour la première fois, von Buch a présenté le *Duria Antiquior* du géologue anglais Henry de la Beche. Cette oeuvre est très largement considérée comme la plus ancienne représentation d'une scène de vie préhistorique. Elle a contribué à initier de nombreuses réflexions à propos des processus de changement géohistorique. L'exposé de 1831 à Berlin permet de mettre en évidence que von Buch était un scientifique influencé par le romantisme. Ses descriptions des transformations organismiques géohistoriques s'appuient sur des exemples figurés dans la littérature classique. Son exposé illustre également combien l'influence des géologues anglais sur les reconstitutions géohistoriques était forte alors en Allemagne.

The complete works of Leopold von Buch were first published in a series of four monographs (Buch, von 1867, 1870, 1877, 1885; in the following referred to as LvB I–IV).

Introduction

Among the legacy of the Prussian geologist Leopold von Buch (1774–1853), reposited in the *Museum für Naturkunde Berlin*, there are a number of unpublished manuscripts of speeches which he delivered at the *Berliner Gesellschaft der Freunde der Humanität*[1] (Society of Friends of Humanity). In one of these talks, given on 5th of February 1831, Leopold von Buch presented to his audience a lithographic print of *Duria Antiquior, a more ancient Dorset* made by George Johann Scharf (1788–1860). The original watercolour had been published only a year earlier, in 1830, by the geologist and paleontologist Henry Thomas De La Beche (1796–1855). The print (measuring c. 30x40 cm) depicts a scene of Liassic[2] organisms in an idealised marine and terrestrial landscape. It is widely regarded as the earliest depiction of a scene of prehistoric life from deep time (see Rudwick 1992). De La Beche and the geologist and paleontologist William Buckland (1784–1856) sold copies of the print to friends and scientists in order to provide financial support for the British fossil collector and dealer Mary Anning (1799–1847) (see Rudwick 1992, 42–47)[3].

Within the framework of a reunion at the Society of Friends of Humanity von Buch was able to present his talk in a rather less formal way, which lends us an invaluable insight into the thinking of this famous geologist. The talk also is remarkable, inasmuch as it underscores the huge impact British geologists William Smith (1769–1839) and William Buckland had on von Buch's work. Moreover, the talk constitutes one of only a few documents that display Buch's conception about the History of Life and its natural laws. In addition, it is a rare evidence of the crucial role played by visual presentations and scenic descriptions of the History of Life in the process of popularizing research results during the first half of the 19th century.

Leopold von Buch

Leopold von Buch was one of the most eminent early geologists in Germany. During his lifetime, ideas about the history of the Earth and about the history of life underwent a radical change. This included the conception of mountain structure, assumptions about the origin of mountains, and about the time dimensions of the Earth's history. It was a significant change and von Buch became a major protagonist of that change[4].

Von Buch was a lifelong friend of Alexander von Humboldt (1769–1859) and had a profound influence on Humboldt's geological ideas (Engelhardt 2001; Werner 2004, 119–123).

A clear indication of this impact is to be found in two of Humboldt's publications of 1853, the very same year of Leopold von Buch's death. Humboldt dedicated both his *Umrisse von Vulkanen aus den Cordilleren von Quito und Mexico* (Humboldt 1853b) and his *Kleinere Schriften* (Humboldt 1853a) to Leopold von Buch and called him the *„grössten Geognosten unseres Zeitalters"* („the greatest geologist of our age").The first of these books was published in January -shortly before von Buch's death in March 1853 - the latter in September 1853.

The pivotal role of von Buch's work for geology in Germany was reflected in the obituaries written by his contemporaries. Thus, the Bonn-based mining officer Heinrich von Dechen (1800–1889) praised him in Humboldt's very words as the *„grössten Geognosten unseres Zeitalters"* ("the greatest geologist of our age")[5], and Professor Hans Bruno Geinitz (1814–1900) of Dresden counted him among the *„hervorragendsten Größen menschlicher Wissenschaft überhaupt*[6]" („one of the most outstanding men of science").

Between 1790–1793 von Buch studied at the Freiberger Bergakademie (Mining Academy of Freiberg/ Saxony) alongside his fellow friends Alexander von Humboldt and Johann Carl Freiesleben (1774–1846). Here the three of them got acquainted with the doctrine of Abraham Gottlob Werner (1749–1817)[7]. As a consequence, von Buch's first works were substantially influenced by Wernerian concepts (see Ewald 1867, I–XLVIII; Fritscher 2008). During his journeys to the Auvergne (1802), Italy (1805), Norway (1806–1808), and the Canary Isles (1815), however, von Buch developed his own theory on mountain building: the Theory of Elevation Craters[8]. In doing so, he abandoned Werner's the-

1 A semi-public, state independent and confession-free intellectual society of Berlin, see Motschmann (2009), and below.

2 The period of the Lias is equivalent to the Lower Jurassic which extends from c. 200–176 mya.

3 There is no copy of the *Duria Antiquior*

4 See Rudwick (2005, 2008) for a general review.

5 „The greatest geognost of our age", Dechen (1853, 4).

6 „[...] most outstanding scientists of all times", Geinitz (1853, 7).

7 Werner is often regarded as the father of German geology.

8 This theory was first published in a coherent form in his paper *Ueber die Zusammensetzung der basaltischen Inseln und über Erhebungskratere*

ory of neptunianism and later also opposed the ideas of Scottish Geologist Charles Lyell (1797–1875) (see Geinitz 1853, Engelhardt 2001). From the 1820s on, von Buch developed an increasing interest in paleontology. For von Buch, a thorough knowledge of fossil forms constituted an indispensable prerequisite to determine the relative age of rock layers. As a result of his stratigraphical research, he created large panorama-like geological overviews of Germany[9]. Furthermore, he is considered to have produced the first geological map of Germany[10].

The works of Leopold von Buch can be considered a typical example of „Humboldtian Science[11]": Thematically diverse, they cover a wide range of topics, from mineralogical to paleontological issues. Today, the greater part of von Buch's work could be classified as physical geography. Distinguishing marks of his work are the specific focus on the spatial connections of his investigated natural phenomena, and the aesthetic quality of his presentations. A large number of his papers can be read both as entertaining travel accounts and as scientific papers. Like Alexander von Humboldt, he was an untiring traveller. Often, he would return to Berlin just for the winter months. He travelled dozens of times to the alps, twice throughout Italy (1798, and 1805 with A. v. Humboldt and Joseph Luis Gay-Lussac (1778–1805) as travel companions), twice throughout Scandinavia (1806–1808, 1841), and embarked on an extended journey to the Canary Isles with the British botanist Christian Smith (1735–1816).

Field work constituted such an important aspect of his research, that he was called, with good reason, Germany's „first field geologist" by Geinitz (1853: 28). Although at times described as a headstrong and rather introverted man (Schmidt-Weissenfels 1862: 197–204), von Buch also was an enthusiastic member of the German and European intellectual community - especially during the second half of his life. He actively participated in the social and intellectual life of Berlin. Under the umbrella of the Society of Friends of Humanity he presented altogether 14 talks between 1828 and 1836 [12].

In addition, he was a member of the *Gesellschaft der Naturforschenden Freunde zu Berlin*[13], a member of the *Montagsklub*[14], of the *Gesetzlose Gesellschaft*[15], and a member of the *Berliner Philomatische Gesellschaft*[16].

The talk given by Leopold von Buch on the 5th February 1831 at the Meeting of The Friends of Humanity demonstrates his involvement with the society. Its tone, its content, its references to literature and its allusions to other members of the scientific community reflects the atmosphere of intellectual Berlin during the early 19th century. Additionally, the manuscript offers an unique insight into the thinking of Leopold von Buch during this crucial period of his work, an insight not afforded elsewhere in his published work or academic lectures.

Leopold von Buch and his geological programme

At first glance the manuscript of the talk of February 5th, 1831 reveals an astonishing lack of references to von Buch's personal work. At no point von Buch mentions aspects or research results of his own scientific endeavours. Until the late 1820s, his work had been predominantly concerned with two issues: (1) putting forward arguments against the Wernerian doctrine of the neptunian origin of rocks[17] and (2) advancing his own theory of mountain building: the Theory of Elevation Craters[18]. In contrast, the geohistorical dimension of the history of life and its environments, played but a marginal role.

1828, however, marked a turning point, when a third major theme appeared in his work. That year von Buch read two papers at the Prussian Academy of Scienc-

(published 1820, LvB III, 3–19). The theory assumed a blister-like elevation of the ground above magmatic masses, which causes the elevation of volcanoes, islands and even mountain ranges.

9 See for example *Ueber die geognostischen Systeme von Deutschland* (published 1824, LvB III, 218–221).

10 *Geognostische Karte von Ganz Deutschland*, Schropp, Berlin (published 1824), see Hoffmann (1838: 155).

11 See Dettelbach (1996, 287–304) for the term „Humboldtian Science", see also Fritscher (2008, XIX–XX).

12 Motschmann (2009, 520–521).

13 See Herter and Bickerich (1973).

14 See Keeton (1961); http://www.berliner-klassik.de/publikationen/werkvertraege/panwitzvereine/06.html.

15 See Solger, Friedrich: Naturforscher in der Gesetzlosen Gesellschaft. Ansprache am 2. November 1956 zur Feier des Stiftungstages der Gesetzlosen Gesellschaft. http://www.gesetzlose-gesellschaft.de/vortraege/1956.phtml; Motschmann (2009, 122–124); vom Bruch (2006, 176–178).

16 See Klemm (1958).

17 Important publications include: *Reise nach Norwegen und Lappland* (published 1810, LvB II, 109–564), *Physialische Beschreibung der kanarischen Inseln* (von Buch 1825).

18 Important publications include: *Ueber die Ursachen der Verbreitung grosser Alpengeschiebe* (published 1811, LvB II, 597–623), *Von den geognostischen Verhältnissen des Trapp-Phorphyrs* (published 1816, LvB II, 629–654), *Ueber die Zusammensetzung der basaltischen Inseln und über Erhebungskratere* (published 1820, LvB III, 3–19), *Ueber geognostische Erscheinungen im Fassatal* (published 1824, LvB III, 141–165). See also: Fritscher (2008, I–XXV).

es (*Akademie der Wissenschaften*) that exclusively dealt with fossils. The first paper was a peculiar compilation of different topics, comprising aspects of fossilisation and systematic classification of fossils from erratic boulders of Northern Germany[19]. The second was a small work on root-like fossil hippuritid bivalves[20]. Both papers reveal the motivation behind his engagement with fossils: For Buch, fossils were indicators of the relative age and the geographic provenance of the rocks in which they were contained; they clearly identified certain rock formations. But they also were the remains of organisms for which the systematic position and mode of life could be determined.

In one of his early papers on paleontology von Buch expressed his motives for his paleontological research for the first time:

> La géologie et la zoologie y sont également intéressées: la première, parce que les différentes espèces d'Ammonites, les familles mêmes, caractérisent très bien les différentes formations géologiques; la dernière, parce que l'ensemble des caractères, qui seuls peuvent établir une famille, doit toujours jeter du jour sur la nature de l'animal, qui jadis a habité ces singulières coquilles.[21]

Between 1830–1834 Leopold von Buch published almost exclusively on fossils; in December 1831 he read his *Ueber die Goniatiten*[22], and in March 1833 his paper *Ueber die Terebrateln*[23],these publications established von Buch as a respected palaeontologist. The ostensible purpose of these papers was to describe and to classify said fossils in a „*natürliches System*[24]"; here he explicitly referred to the ideas of Jean Baptiste de Lamarck (1744–1829), and only implicitly, did the fossils serve to identify and differentiate the „mountain beds". This can clearly be seen in a letter von Buch wrote to Heinrich Georg Bronn (1800–1862) in 1832:

> Mein Zweck ist, die Species so deutlich und klar hervortreten zu lassen, dass jeder aufmerksame Beobachter nicht schwanken soll, zu wissen, was er unter den Händen habe[25]

He also complained about difficulties in interpreting fossil lists in the ever- growing literature of the time with its endless synonymy lists, and its imprudent practice of „*Speciesmacherei*.[26]"

The question remains: What made the „*ersten deutschen Feldgeologen*[27]" („first field-geologist") and restless traveller devote himself to the painstaking work of classification? Where did this new interest come from? Was it simply a consequence of his advancing age, of less intense periods of field-work, as suggested by Fritscher (2008, XVII)? Did it serve a higher purpose? Did it constitute a new underlying research objective? Or did it simply reflect the *Zeitgeist*?

Reexamining Leopold von Buch's complete works reveals that his paleontological work formed part of a more or less explicit personal research programme, which can be traced back to his earliest papers of the late 18th century, but can also be found in his last publications of almost 50 years later. Von Buch's principal topic was succinctly delineated in his opening paper at the *Königliche Akademie der Wissenschaften* in Berlin in April 1806[28]. It is a geologist's programme[29], striving to understand the laws that govern the formation of the Earth, of its surface and of the life upon it. Remarkably, this programme is included in the closing remarks of his first paper on fossils from 1828:

> Es ist sehr glaublich, dass die Untersuchung der organischen Formen uns ihre ursprünglichen Fundorte [der norddeutschen Geschiebe, BK] noch viel genauer angeben wird, dass man daraus einzelne Local-Richtungen und somit auch ihre Ursachen würde auffinden können. Jeder Schritt aber zur Enthüllung eines solchen Problems ist ein Fortschritt in der Erkennung der Gesetze, welche

19 *Ueber Silification organischer Körper nebst einigen anderen Beerkungen über wenig bekannte Versteinerungen* (published February 1828, LvB IV, 5–23).

20 *Ueber die bei Reichenhall entdeckten Hippuriten* (published September 1828, LvB III, 668–672).

21 „Sur la Distribution des Ammonites en familles" (published 1829, LvB IV, 53–59, here 53). „Geology and zoology are equally involved: the first because different species of ammonites, the families themselves, characterise very well the different geological formations; the latter, because all the characters which alone can establish a family should always throw light on the nature of the animal, which once inhabited the singular shells."

22 LvB IV, 103–136.

23 LvB IV, 167–288.

24 *Ueber die Ammoniten in den älteren Gebirgsschichten* (published 1830, LvB IV, 70).

25 „It is my aim, to let the species emerge, distinctly and clearly, so that every attentive observer will not falter to know what he has in his hands." (LvB IV, 161–162).

26 „Species manufacture" (LvB IV, 160).

27 Fritscher (2008, IX).

28 LvB I, 4–13.

29 On the origin and contemporaneous meaning of the concept of „geology", see Rudwick (2005, 327).

> die Bildung der ganzen Oberfläche der Erde bestimmt haben.[30]

It is in his talk to the Friends of Humanity in February 1831, though, where it becomes evident, that it was not by coincidence that von Buch turned his attention to fossils in the late 1820s. In his published work Leopold von Buch frequently cites Jean-Baptiste de Lamarck, in particular his work on fossils found in the vicinity of Paris (Lamarck 1802). In addition, the influence of the work of Ernst Friedrich von Schlotheim (1764–1832) and of James Sowerby (1757–1822) was noted by Geinitz (1853). Yet in the talk transcribed and translated below, a further significant influence can be discerned. It illustrates, how deep was the fascination von Buch held for the work of William Smith (1769–1839) and William Buckland (1784-1856), and what a profound knowledge he had of their ideas.

Against this backdrop, the lively description of the former habitat of the strange hippuritid bivalves in his paper of 1828 gains significance (LvB IV, 669–670). The tone of that paper anticipates the figurative language of the talk read at the Friends of Humanity in 1831. In the latter, then, the extinct organisms are described in their environment and their typical interactions: The *Plesiosaurus* with its long neck combs through the crevices of the cliff, even seizes for a *Pterodactylus* flying above in the air, fish feed on one another, and *Encrinites* grow on top of bivalve shells.

This description clearly echoes the palaeobiological and paleoecological perspective of Buckland. In Buckland's work the world of the Jurassic became alive in an entirely unprecedented way (Boylan 1997). In his talk at the Friends of Humanity von Buch clearly conveyed to his audience the amazement and awe in face of this strange, and unknown world – feelings he certainly experienced himself on first reading the papers of Buckland and on first seeing the drawing of De La Beche[31].

The way of describing and depicting deep time must have struck a chord with von Buch, because he himself had often invoked pictorial scenes of the history of the Earth. The first of such scenes was included in his hypothesis on the origin of the Lower Silesian landscape at Kotlina Kłodzka. He assumed that in primeval times there had been a large lake which later dried up, due to the disruption of the surrounding mountains[32]. In a paper written four decades later, he presented a description of said geological process, where the reader is taken on a virtual flight above the landscape, history literally unfolding itself from mountain chain to mountain chain and from river to river. Along the same lines, in his paper *Ueber den Jura in Deutschland* (published 1837, LvB IV, 388–471) von Buch described a panorama of Central Europe during the Jurassic with widespread coral-banks along the margins of old land-masses, narrow bays and wide and deep marine basins. This image is not a static one either; it is in motion, representing a developing scenery, e.g. in the case of the Bohemian Forest, which, he assumed, had formed gigantic chasms in which corals settled, and from where eventually the Alps erupted, caused by a catastrophic event (LvB IV, 397). Evidence for these hypotheses was provided by determining the relative age of the various rock formations, which was rendered possible by examining their fossil content.

Von Buch's paper on the Jurassic of Germany is one of his major contributions, in which he established the tripartite division of the Jurassic in a Lower „Black", a Mid „Brown" and an Upper „White" Jurassic; a division that remains valid to this day. The purpose of this opus was twofold: to examine the distribution of fossils within these rock formations and to compare the German formations with those of France and England. Very much in the style of Schlotheim and Smith von Buch used fossil faunas as indicators for the relative position of the strata, introducing the term *„Leit-Muschel"* (LvB IV, 403) into German, which in its modern form as *„Leitfossil"* is still used today. Among those he introduced as index fossils, figure the large reptiles *Ichthyosaurus communis*, *I. tenuirostris*, and *I. platyodon* (LvB IV, 427) for the Lower Jurassic, precisely those creatures that dominate the *Duria Antiquior* of De La Beche.

Leopold von Buch first mentioned his work on the German Jurassic in a letter written in December 1832 (LvB IV, 162–163) and termed it *„mein Bild des Deutschen Jura*[33]*"* (LvB IV, 162). This work, best described as a *tableau*, was von Buch's method of summarizing his knowledge and assembling his hypotheses about aspects of the formation of a landscape. The organisms inhabiting

30 „It is very believable, that a close examination of the organic remains will give a more accurate information about the original localities [of the erratic blocks of northern Germany, BK], so that specific local-directions and thus, their origins, could be found. But every step toward the solution of such a problem is a progress in understanding the laws that governed the formation of the entire surface of the earth" (LvB IV, 22). The question of what had caused the transportation of the erratic blocks was in all probability one of the v principal topics of Leopold von Buch's work. This might be explained by the fact that von Buch grew up at manor Stolpe at the banks of the Oder river in Northern Germany, a landscape of pleistocene origin. He started to speculate about the reasons as early as 1811 (LvB II, 597–623). See also Rudwick (2005, 571–585).

31 Rudwick (1992, 241) mentions this nearly sceptical amazement, the experience of strangeness with regard to other men of science, among them William Buckland himself.

32 *Versuch einer mineralogischen Beschreibung von Landeck* (published 1797, LvB I, 70–73).

33 "My tableau of the German Jurassic".

these landscapes, as they were depicted in the scene of De La Beche and in the descriptions of Buckland, did not occupy centre stage in Leopold von Buch's landscape-tableaus. Yet, it can be speculated that the visualisations of the living environments produced by the British scientists, may well have inspired Leopold von Buch to produce his own synoptic view of the Jurassic. The talk at the Friends of Humanity might have shown von Buch, how inspiring and intriguing it could be to assemble diverse research results in one single presentation, e.g. the discovery of ichthyosaurs in Dorset and Franconia, and that of the grypheate-bivalves in the Alps, England and Southern Germany. In this regard, the *Duria Antiquior* might well have served as a stimulus for his 1837 paper on the German Jurassic.

Leopold von Buch and the visualisation of the history of the Earth

Buckland was once sketched by William Conybeare (1787–1857) in a cave scene: crawling on all fours, with a lamp and his hammer in his hands, he approaches the skeletons of re-awakening hyenas, thus virtually penetrating into a time long bygone.[34]. There is a counterpart of this scene in German Romantic Literature: it is the description of the old miner in the cave in the novel *Heinrich von Ofterdingen* by Novalis, another Werner-scholar[35]. In the novel the miner is called *„verkehrter Astrologe*[36]*"*. Unlike an astrologer, who reads the future in the stars, by looking up to the skies, the miner (that is: the geognost or geologist) reads the past out of fossils, by exploring the depths of the earth.

Buckland climbs down into the caves, goes for a time-travel, arrives in the midst of events in the deep past and directly faces the extinct creatures. In contrast, von Buch's time travel is far more prosaic. Von Buch relates histories of landscapes, as if they were seen from high above; individual creatures are out of view, and so too are their features and their interactions[37]. Hence it is astonishing, how buoyantly von Buch described the scene depicted in the *Duria Antiquior.*

Certainly, the vivaciousness of von Buch's presentation was inspired by the picture itself, a scene in which:

> die meisten der neu entdeckten Geschöpfe im lustigen Treiben dargestellt sind, wie sie alle ihrer Bestimmung nachgehen, nehmlich sich gegenseitig zu fressen[38] (see below)

There is one aspect, however, that von Buch added to his description, an aspect neither contained in the work of Buckland, nor to be found in the *Duria Antiquior:* he integrated the scene from deep time into a narrative about the geohistorical transformation of organisms. He did this in a remarkably vivid way, probably inspired by the completely new form of pictorial representation created by De La Beche. He wrote:

> Die bisher verbunden Vorderfüsse, um sich in dießem Element zu erhalten breiten sich von einander, der eine Zeh verlängert sich unmässig, denn die zum Fliegen notwendige Haut muß sich ausgespannt erhalten. Alle Kraft wirft sich aus dem Vorderteil, der Leib verschwindet fast gegen den Hals und dießen unterstützen die Wirbel die je mehr sie sich vom Körper entfernen um so mehr ihre Fischform verlieren.[39] (see below)

or:

> Noch nicht genug, die Schuppen der Wasserthiere zertheilen sich in der Luft zu Haaren, die Haut bedeckt sich mit einem behaartem Fell. Endlich der Vogelnatur noch näher, erhält die Eidechse nicht bloß Flügel, sondern auch sogar Federn.[40]

Such scenes are not to be mistaken as evolutionary; in the first place, they merely describe a metamorphosis. In von Buch's lifetime, the stories of Ovid's Metamorphoses were common knowledge[41], and it can be assumed that von Buch and most scientists in the audience were familiar with Johann Wolfgang Goethe's

34 See Rudwick (1992, 40-41, fig. 17 + 71–117).

35 Novalis; pseudonym of Georg Philipp Friedrich Freiherr von Hardenberg (1772–1801). Novalis studied in Freiberg between 1797–1799 (Wagenbreth 1967). The cave is a common Romantic motif when it comes to illustrating deep time, see Sommer (2005).

36 „Inverted astrologer", Novalis (1981, 87).

37 His short description of hippuritid bivalve environments of 1828 is the only exception, see above.

38 "Most of the recently discovered creatures are represented in a charming hustle and bustle; all following their destiny, which is devouring eachother". Von Buch, „Remarks on a scene depicting the primeval world", see below.

39 "The formerly jointed front limbs that were necessary to survive in this element, separate from eachother, one toe becomes a great deal longer, as the skin indispensable for flying needs to be spread out. All strength disappears from the front part, the body nearly vanishes towards the neck, while the latter is supported by vertebrae which the farer away they are from the trunk, the more they lose the form of a fish." Von Buch, „Remarks on a scene depicting the primeval world", see below.

40 „And as if this were not yet enough, up in the air the scales of the aquaric animals divide into hairs; the skin covers itself with a hairy fur. At long last a bit closer to the nature of a bird, the lizard grows wings and even feathers." Von Buch, „Remarks on a scene depicting the primeval world", see below.

41 Vance (1988), however, demonstrates the decreasing importance of the Ovid reception during the 19th century.

(1749–1832) Theory of Metamorphosis[42]. It is also likely that von Buch's description of organismal transformations alludes to scenes from Dante's Divine Comedy. In his work, Leopold von Buch repeatedly and explicitly referred to scenes from the Divine Comedy[43] and certainly most of the Friends of Humanity in the audience were familiar with and keenly interested in Dante's masterpiece. As early as 1828 (and again in 1830) Adolph F. C. Streckfuß (1779–1844) had presented three papers at the Friends of Humanity about aspects of his own translation of the Divine Comedy into German[44]. The passage in von Buch's talk, describing a metamorphosis from fish to reptile and reptile to bird, distinctly recalls the transformation of thieves into snakes and snakes into thieves in the Inferno's, 25. Canto. It can be assumed that the Friends of Humanity controversially discussed these Dantescan transformations of deep time at their reunion and certainly at dinner, following the talk.

Von Buch in any case did not present the scene of the *Duria Antiquior* as a single, exceptional image, but as a still frame taken from a continuously changing panorama; as one moment in the history of the earth. It is self-evident, that the concept of a still frame, borrowed here from cinematography, did not yet exist in the 1830s. However, as Martin Rudwick has pointed out, by the early 19th century there were a variety of instruments which generated the illusion of a movement based on a sequence of stills[45]. Such apparatuses were widely distributed. Rudwick also demonstrated that the pictorial visualisation of prehistoric time, first realised in the *Duria Antiquior*, became a powerful means of popularizing the Theory of Evolution during the later 19th century. Still, Leopold von Buch's presentation of the *Duria Antiquior* at The Friends of Humanity reveals that the pictorial visualisation of deep time powerfully evoked transformational descriptions and images. The *Duria Antiquior* effectively fuels the audience's imagination and inspires them to picture or describe incidents of organismal transformation. In this regard, the print sets into motion the mental pictures and hence, dynamises the notions of the history of the earth.

Leopold von Buch and the idea of transmutation

Leopold von Buch has been described as an advocate of Lamarckism (Wagenbreth 1979, 44), as an early proponent of the descension theory (Hölder 1975), and even as a „Darwinian before Darwin" (Günther, 1900 from Glaubrecht 2004). Leopold von Buch's talk on the *Duria Antiquior,* however, offers an opportunity to reexamine these labels. For the scene of Jurassic Dorset he described was not, indeed, a static picture of a lost world. He rather conceived the scene as representing just one moment in a much longer history; a history, in which continents emerged from the sea, animals progressively colonised the sea, the land and the air, and plants grew in the initially mild, and later harsher climates of the islands. It is obvious, then, that in his talk, Leopold von Buch evokes the image of an ever-changing world, with animal and plant populations submitted to continous change over extended periods of time.

As clearly and vividly as never before or after, he commented on the transformation of animals, such as the one from reptile to bird (see above). He even offers explanations for these transformations: e.g. reptiles conquered the skies, for they had to escape the predators in the sea; higher plants appeared, as the climate on the continents detoriated; and sealilies grew in specific places on the sea floor, because bivalves had made the ground calcareous. These explanations, which did not rely on physico-chemical changes alone, are based on the assumption that the organism itself contributed to the transformation process, and are thus Lamarckian.

Lamarckian ideas also appear in von Buch's published works, although such references are to be found only later on. Yet again, the years around 1830 seem to mark a turning point with reference to his notions about the history of life.

In his inaugural talk at the *Königliche Akademie der Wissenschaften zu Berlin* in 1806 he had outlined a history of life on earth, titled *Ueber das Fortschreiten der Bildungen in der Natur*[46] (LvB II, 4–12), in which he described said history as a progression of *Bildungen* (formations) in nature, disrupted repeatedly by massive catastrophes. After each cataclysmic occurrence, new and higher life forms would come into being, ultimately leading to mankind. This talk is strongly influenced by Friedrich W. J. Schelling's (1775–1854) Naturphilosophie[47], which in turn refers to passages in Herder's *Ideen zur Philosophie der Menschheit* (e.g., Herder 1784). Another recurrent element in this talk are the numerous references to Johann Friedrich Blumenbach's (1752–1840) concept of *Bildungstrieb*, which he termed „*Trieb zur Selbstständig-*

42 See Lichtenstern (1990, 1-10), Ingensiep (1998, 259–275).

43 E.g., Brief an von Leonhard, published 1842, LvB IV, 715; see also Kröger (2011, 349–350).

44 Dante (1824), see also Motschmann (2009, 841).

45 Rudwick (1992, 248–249).

46 „On the progression of the formations of nature".

47 This was not an uncommon reference. Christa Lichtenstern (1990, 13) has emphasised the strong impulses that Schelling's Naturphilosophie had on Romantic German scientists like Carl Gustav Carus (1789–1869), Alexander von Humboldt, Lorenz Oken (1779–1851), and Henrik Steffens (1773-1845).

keitsbildung" (LvB II, 6), „*organische Triebkraft*" (LvB II, 6), or „*Productionskraft*" (LvB II, 10)[48].

The influence of the great Frenchmen, most significantly, of Cuvier and Lamarck did not become evident before the 1830s and 1840s, when von Buch started to seriously devote himself to describing fossils. His classification of brachiopods from 1835 (LvB IV, 192–195), for instance, is strongly influenced by Cuvier's methods of comparative anatomy.

Probably the most striking aspect of his work published after c. 1830 is the apparent absence of references to catastrophic events. In his earlier work catastrophic occurrences played a central role and were correlated to major events in the history of life: as seen above, in the paper of 1806 von Buch interpreted catastrophes as driving forces of organismal progress. In another paper on the distribution of erratic blocks from the Alps (LvB II, 622–623), written in 1811, he implicitly referred to Cuvier (1796) and speculated that massive mountain building impulses had caused the extinction of elephants in Europe.

These notions stand in stark contrast with his work after 1830. Thus, for instance, in his paper on ceratite ammonoids of 1848 (LvB IV, 860) von Buch seems to be entirely divorced from the earlier idea that catastrophes and extinctions played a productive role in the history of life. Instead, he explains the disappearance of species as a mere consequence of the transformation process („*Bildungen*")[49].

It needs to be stressed, that at no point in his talk about the *Duria Antiquior* von Buch refers to the extinction of species due to catastrophes. True, he touches upon the subject in a short passage:

The formerly living „gehören nicht zu unserer, sondern zu einer uns fremden unbekanten Welt" and „*man kennt [...] nichts ähnliches lebend*". He does not, however, explain where the formerly living went and – most significantly - he does not mention the word 'extinction'. In this respect, the most explicit passage in the talk regards the ammonoids:

> mit jeder Formation verschwinden Ammonitenspecies, sogar ganze Familien und erscheinen nicht wieder.[50]

This lack of explicit references to catastrophes and extinction is probably best understood in the context of the „Cuvier–Geoffrey Debate" of 1830[51]. The debate sparked off early in 1830 between Georges Cuvier and Etienne Geoffroy Saint-Hilaire (1772–1844) at the *Académie des Sciences Paris*. Geoffroy argued in favour of a common structural animal *Bauplan* and assumed that organisms could transform. Cuvier, on the contrary, argued that organisms differed fundamentally from one another, that their form was fixed by functional adaption, and that they went extinct by geohistorical catastrophes. The discussion was widely followed in Germany (Jahn 1973; Zabka 1998, 163-169). In his talk Leopold von Buch seems to refer to this debate with the following phrase:

> Wie würde, fragt Cuvier vor zwanzig Jahren ein Naturforscher es nur für möglich gehalten haben, eine Delphinen Schnauze mit Crocodilzähnen vereinigt zu sehen, mit Kopf und Schwanz der Eidechsen, mit Füssen von Wallfischen, und das alles auf einem Gerip, das nur einem Fische angehört; oder das eben solches Gerippe, Füsse und Hintertheil sich an einen Schlangenlaib haften, der am Ende einen Eydechsenkopf trägt. Das sind doch, die uns jetzt bis in die kleinsten Einzelheiten genau bekanten, Ichthyosaurea und Plesiosauren.[52]

48 "Drive toward the formation of autonomy"; „organic driving power"; „power of production".

49 „Diese Erscheinung [Probleme bei der Bestimmung des Vorkommens der Fossilien in den Gebirgsschichten, BK] ist mehr erfreulich als betrübend; denn sie belehrt uns, dass die organischen Formen, welche jetzt auf der Erdfläche nicht mehr gefunden werden, nicht plötzlich und auf einmal verschwinden, sondern nach und nach in andere Bildungen übertreten, wo sie zwar nicht als dieselben Arten erkannt werden können, doch aber als solche, welche zu einer gleichen Abtheilung von Thierformen gehören. Wir lernen hieraus, dass dieses Verschwinden, das Erscheinen neuer Formen, keine Folge einer gänzlichen Zerstörung der verschwundenen, einer neuen Schöpfung der neu hervortretenden ist, sondern dass die Arten wahrscheinlich aus sehr veränderten Lebensbedingungen hervorgehen." published 1848 (LvB IV, 860). „This phenomenon [problems in the determination of occurrence of fossils in the rock-beds, BK] is more pleasing than afflictive; because it teaches us, that organic forms which cannot be found on the surface of the earth anymore, do not suddenly disappear once and for all, but slowly trespass into other formations [„*Bildungen*"], where they, although not regarded as the same species, can be recognised as belonging to the same division of animal forms. From this we learn, that this disappearance, this appearance of new forms, is not a result of a total destruction of the disappeared, a new creation of the new emerged, but that new species probably arise from living conditions that changed very much."

50 „They do not belong to our, but to a world which is unknown and strange to us", „ nothing similar is known [..] from the living", „with every Formation ammonoid-species disappear, even entire families do not appear again".

51 See e.g. Appel (1987), Gould (2002, 291–312).

52 „How could a natural scientist, as Cuvier asked 20 years ago, have considered possible to see a dolphin's snout made into a unit with a crocodile's teeth, the head and tail of a lizard, with feet of a whale and all of this upon a skeleton, belonging to a fish. Or that such a skeleton, feet and back part would be attached to a snake's body, bearing a lizard's head at one end. And yet, these are precisely the ichthyosaurs and plesiosaurs, known to

Here von Buch implicitly takes up the position of Geoffroy, questioning the fixation of types. Furthermore, in the following paragraphs, von Buch vividly describes scenes of such transformations.

However, he does not elaborate on the mechanisms or underlying laws, governing these transformations. So the question remains: What mechanisms had Leopold von Buch mind, when he referred to the transformation of organisms? Did he refer to a notion of a steadily changing organismic world along an ontological continuum, in terms of a „chain of being" and thus in a Lamarckian sense[53]? Did he belief transformation to be the unravelling of a divine plan, as Georg August Goldfuß suggests(1782–1848)[54]? Did he conceive transformation as being propelled by an ideal *Urtypus* as in Goethes Theory of Metamorphosis[55]? Or did he interpret it as the secular course of a contingent history of inheritance, mutation and natural selection as in Charles Darwins Theory of Evolution?

Buch's published work does not provide conclusive evidence for any such stance, not least, because Buch's research interest did not focus on exploring the mechanisms behind organismal transformation. The last paragraph of his talk to the Friends of Humanity, however, insinuates that he probably had a genealogical lineage in mind, when talking about geohistorical transformations:

> es wird aber [dann als] ein vollkommenes Geschlecht aus dem Organismus des Menschen hervorgehen [accentuation, BK][56]

The notion of genealogical lineage differs fundamentally from Goethe's theory, or that of the idealistic Naturphilosophen[57]. Nonetheless, Leopold von Buch can hardly be seen as a forerunner of the descension theory (Hölder 1975) or even as „Darwinian before Darwin" (Günther 1900, Glaubrecht 2004). The latter interpretation derives from a passage of Buch's *Physicalische Beschreibung der Kanarischen Inseln* (Buch, von 1825):

> Die Individuen der Gattungen auf Continenten breiten sich aus, entfernen sich weit, bilden durch Verschiedenheit der Standörter, der Nahrung und des Bodens Varietäten, welche, in ihrer Entfernung nie von anderen Varietäten gekreuzt und dadurch zum Haupttypus zurückgebracht, endlich constant und zur eigenen Art werden. Dann erreichen sie vielleicht auf anderen Wegen auf das Neue die ebenfalls veränderte vorige Varietät, beide nun als sehr verschiedene und sich nicht wieder miteinander vermischende Arten.[58] (Buch, von 1825, 132–133).

Although this brief passage can be regarded as the earliest expression of the concept of allopatric speciation, von Buch never recurred to this subject in later publications, nor did he at any point establish a connection between this concept and his transformationalist ideas in his papers on fossils. In fact, like Lamarck, von Buch rejected the idea of extinction, as can be seen from a letter written in 1848 (see above). Additionally, Buch's ideas about transformation in organisms are, like those of Lamarck, characterised by an emphasis on vitalism and by the assumption of a linear progess. Sometimes, said vitalism was directly referred to (as in his inaugural talk at the Akademie der Wissenschaften of 1806), sometimes it simply formed an underlying principle (as in his talk about the *Duria Antiquior*).

Leopold von Buch's presentation of the *Duria Antiquior* illustrates that by the beginning of the 1830s, the belief had spread that life-forms dramatically changed over the long course of the Earth's history, and that this change had not yet come to an end. Leopold von Buch, however, never asked himself, what were the principles or laws causing such change. He seems not to have been interested in this question; maybe because existing explanations, such as Blumenbach's *Bildungstrieb,* provided an answer. What with his rejection of extinction - which is a basis for natural selection and thus one of the fundamental assumptions of evolutionary theory - , his emphasis on vitalism, and his neglect of the question which were the mechanism governing organismic transformation, von Buch was certainly not a „Darwinian before Darwin". Instead, he appears to have been more of a Lamarckian scientist and a true representative of the Romantic Age.

us today down to the smallest Von Buch, "Remarks on a scene depicting the primeval world", see below.

53 See Lovejoy (1936), Foucault (1974, 336-337), Rudwick (2005, 390–391).

54 See Goldfuß (1831).

55 See Breidbach (2006).

56 „ However, then, a perfect lineage will rise out of the organism of man".

57 See von Engelhardt (1998, 68–69).

58 „The individuals of a genus spread out over the continents, move to far-distant places, form varieties (on account of differences of the localities, of the food, and the soil), which owing to their segregation cannot interbreed with other varieties and thus be returned to the original main type. Finally these varieties become constant and turn into separate species. Later they may reach again the range of other varieties which have changed in a like manner, and the two will now no longer cross and thus they behave as two very different species" English translation cited from Glaubrecht (2004, 114).

The audience

The talk was not of an academic nature. In other words, von Buch's presentation did not form part of that extended list of papers read at the *Berliner Akademie der Wissenschaften*, but was given in front of an enlightened, mostly bourgeois audience to provide stimulating recreation before a social dinner. The talk was given on Saturday, February 5th in 1831 in Berlin. The *Gesellschaft der Freunde der Humanität*, or The Friends of Humanity, was one of the many clubs and societies founded in Berlin around 1800 and formed an important component of contemporaneous civic, metropolitan life. Between 1797 – 1850 members of the society reunited every Saturday in the Villa Kameke, a magnificent building in baroque style, belonging to the freemason lodge Royal York. For many intellectual, male Berliners, these meetings represented a kind of private refuge, a place of enlivened recreation, where ideas could be presented and discussed with a certain freedom[59]. Unlike other societies or clubs the Friends of Humanity were relatively open to accept new members no matter what their social status. In principle, not even the number of members was limited[60]. The aim of the Friends of Humanity was the well-informed, well-educated citizen[61]. Although during its existence it increasingly became a melting pot of Berlin's academic elite, it never was a purely academic society of scholars[62]. Members were obliged to give talks on a regular basis, yet were asked to refrain from using technical terms and specialist's language. Moreover, speakers were not necessarily supposed to talk about their field of expertise[63]. The talks and discussions had a length of not more than one hour; but at the following dinner, which was often accompanied by music, the discussion could be continued in an informal atmosphere[64]. The talks covered a wide range of topics: art, literature, the classics, philosophy, education, theology, architecture, medicine and natural science[65]. Experiments were run on a regular basis; objects of art and illustrations were shown; translations from Greek and Latin were presented. Natural sciences, in particular chemistry, often took centre stage[66]. It was prohibited, though, to talk about politics. Quite often, members would not refer to their own research at all, but read papers from journals and newspapers or point out interesting new publications.

This practice can clearly be seen in the talks of Leopold von Buch, who between 1820–1838 spoke in front of the Friends of Humanity more than a dozen times, covering topics as exotic as „About the telegraphs, advantages and deficiencies of different languages and language-forms" (1833), or about the medical effects of distilled water (1828)[67]. His talk about the *Duria Antiquior* is no exception to this rule, although its topic is comparatively close to his own research interests.

In contrast with most other societies or salons, the Society of the Friends of Humanity selected topics of alleged public interest for their reunions. Invited guests could form an additional audience[68]; a greater public, though, would usually be reached by the subsequent publication of the talks held at the meetings or by repeated readings of papers on other occasions[69]. Leopold von Buch, for instance, repeated one of his talks originally presented at the Friends of Humanity at the meetings of the Versammlung deutscher Naturforscher und Ärzte[70]. And his paper *Was vom Brocken zu holen ist*[71], originally read *c*. 1831 at the The Friends of Humanity, was later published in several journals and books. In this regard, Conrad Wiedeman in Motschmann (2009, XXXII) has pointed out, that the reunions of the Friends of Humanity in part could be compared to editorial meetings.

Against this backdrop, the talk of Leopold von Buch on *Duria Antiquior* can be regarded as one of the first public presentations of the spectacular new findings of the British geologists William Buckland and Henry Thomas De La Beche, and the first public presentation of their *Duria Antiquior* in Germany.

Although the obvious purpose of the talk was to provide a pleasurable presentation of a scene from deep time by an expert in the field, there may have been another underlying motive. Leopold von Buch concludes his paper with a quotation from Heinrich Friedrich Link's *Handbuch der physikalischen Erdbeschreibung* (Link 1826).

59 The society was by their constitution state independent, confession-free, and exclusively male Motschmann (2009, 4, 54, 100–114).

60 In the complete time of their existence the society had more than 300 members, the climax was reached in 1835 with 80 members, in 1831 the number of members was 73, see Motschmann (2009, 8, 906).

61 see Motschmann (2009, 19)

62 In fact the group of teachers was the largest in the society, see Motschmann (2009, 15, 31).

63 See Motschmann (2009, 53).

64 See Motschmann (2009, 19).

65 See Motschmann (2009, 33).

66 See Motschmann (2009, 30).

67 See Motschmann (2009, 521).

68 See Motschmann (2009, 76).

69 See Motschmann (2009, 34).

70 See Kröger (2011, 347).

71 „What is to be taken from the Brocken".

Like Leopold von Buch, Link was not only a member of the Friends of Humanity and of the *Montagsklub*[72], but also of the exclusive *Gesetzlose Gesellschaft*, founded in 1809 by Philipp Buttmann (1764–1829)[73]. From a letter by Carl Friedrich Zelter (1785–1832) to Johann Wolfgang Goethe of July 18th 1830 one learns that Leopold von Buch and Heinrich Friedrich Link, together with Karl Asmund Rudolphi (1771–1831) regularly had controversial debates in the *Montagsklub*[74] (Riemer 1834, 459–461). Zelter called them a heatedly debating „*Trifolium*[75]".

A few years later, Link (1834) published a second, completely revised issue of his Theory of the Earth entitled: *Die Urwelt und das Alterthum, erläutert duch die Naturkunde* [76]. Probably, it is no coincidence that Leopold von Buch (1834) presented a paper at the Friends of Humanity with the title „*Über eine neue Theorie der Erde*.[77]" No manuscripts have been preserved of this talk, but it is likely that it directly referred to the book of Link. This is why Leopold von Buch's talk about the *Duria Antiquior* can be seen as a contribution to his discussions with Heinrich Friedrich Link during the years 1831–1834.

With this in mind, it is evident that the *Duria Antiquior* represented an occasion for Leopold von Buch to give a talk about the world of the Jurassic Age: a talk in which he could allude to debates with Berlin friends and colleagues. More importantly, it was an ideal medium to provide a pleasurable presentation at The Friends of Humanity.

Conclusion

The recently discovered manuscript of the talk „Remarks on a scene, depicting the primeval world" presented by Leopold von Buch on February 5th, 1831 at The Society of Friends of Humanity Berlin is an important historical document. It provides evidence of how quickly the scientific insights and new perspectives of British geologists such as William Smith and William Buckland reached Germany. It also illustrates the scope of their impact on important German geologists such as Leopold von Buch, and how promptly their discoveries were integrated into the contemporaneous German narratives on the history of life on Earth.

It is of prime importance that the prehistoric creatures in the *Duria Antiquior* were represented within a reconstructed environment and in dynamic interaction. Probably, the print - and the accumulated knowledge it represented - , strengthened Leopold von Buch's resolve to produce a panoramic view on Jurassic Germany. In addition, the picture triggered new conceptions of organismic transformation that at times were intertwined with more ancient ideas of metamorphoses, such as the ones put forward by Ovid and Dante. Leopold von Buch used the presentation of the print to take a stance in the Cuvier–Geoffrey Debate: he argued against the fixism of Cuvier and favoured the idea of organismic transformation.

Leopold von Buch's talk closes with a futuristic scene: a post-human lineage that moves effortlessly through the skies and through the depths of the Earth, thus strangely resembling the inverted astrologs of Novalis, will look down on mankind, like man does on apes these days. The last paragraphe not only clearly indicates that the idea of transmutation played a crucial role in the thoughts Leopold von Buch, but also that he was a true scientist of the Romantic Age. This is probably why Leopold von Buch never raised the issue of the mechanisms behind transformation, an issue that eventually led to the Theory of Evolution.

Editorial remarks

The manuscript „Bemerkungen über ein Bild, welches die Urwelt vorstellt" was found in the written archive of Leopold von Buch in the *Bild- und Schriftgutsammlung* of the *Historische Arbeitsstelle des Museum für Naturkunde Berlin*. The handwritten manuscript comprises two sheets of paper (four pages). The sheets form part of an omnibus volume which contains miscellaneous manuscripts of speeches held at the reunions of the Friends of Humanity (Signature: MfN, HBSB, Pal. Mus., S I Buch, L. v. III). All these manuscripts are drafts and were jotted down rather carelessly, which accounts for frequent misspellings, deletions, corrections, and subsequent insertions. Single passages of the text seem to be mere outlines of thoughts. They are not always carefully worded, much less polished for publication, and rather served as a memory aid for the presentation.

72 See Motschmann (2009, 696, 796).

73 See Motschmann (2009, 122–124).

74 The club was one of the first in the history of societies of Berlin. Meetings were held every Monday between seven and half-past eight and included a dinner. Guests were welcome, but the number of members was limited to 30. Leopold von Buch was member of the club since 1818. Compare *Fortsetzung des Verzeichnisses der Mitglieder des Montags-Klubbs nach den Jahren der Aufnahme als Ergänzung zum Kalender von 1828*, Januar 1843, Berlin, 8 pp.

75 See Riemer (1834, 459–460).

76 The book is a typical example of the genre of the „Theory of the Earth", see Rudwick (2005, 133–139). In this work, the history of life is described in a - by then already old-fashioned - way, as a successive expression of the chain of life, see Link (1834, 197–252).

77 See Motschmann (2009, 521).

The version presented below takes into account all of von Buch's insertions, corrections and deletions. Obvious misspellings and ambiguous capitalizations have been corrected without notation. Some of his insertions and corrections remain illegible and are marked as [##?]. Italicised sections were originally written in Suetterlin script. Underlined text sections were underlined in the original version. An English translation of the manuscript is added.

Transcript

BEMERKUNGEN ÜBER EIN BILD, WELCHES DIE URWELT VORSTELLT.

5 Febr 1831.

Man hat seit ohngefähr zwanzig Jahren eine Menge von Thieren entdeckt die denen, welche um uns her Leben so unähnlich sind, so abentheuerlich, daß man schon bey ihrem Anblick sich leicht überzeugt, sie gehören nicht zu unßerer, sondern einer uns fremden unbekanten Welt. Dieße Geschöpfe, sind, wie es mir vorkomt, weniger bekannt, als sie es seien sollten, ohnerachtet anatomischer Scharfsinn sich in allen Ländern von Europa, an ihnen in Meister.abhandlungen geübt hat. = Über einige dießer Thiere und ihr Beyßammenleben, werde ich mir einige Worte erlauben.=

Es gab einst in London einen curiosithetsSammler, er hieß Sir *Ashton Lever*[78]. Ihm war nichts zu kostbar, was nur immer ein ausserordentliches Ansehen hatte, und daher bekam er eine Menge sonderbarer Gestallten zugeschickt. Da durch unvorsichtes Kaufen endlich sein Vermögen zerrüttet wurde, mussten seine Sammlungen verkauft werden, und der größte Theil davon fiel einem Herrn *Bullock*[79] in die Hände der dieße Sache in *Pall Mall*[80] einer der ersten Strassen von London für Geld sehen ließ. Da erregte vorzüglich ein monstruenter Kopf fünf Fuß lang die Aufmerksamkeit der Besuchenden; ein Drachenkopf mit ungeheuern Augen, wie man sie nie vorher gesehen hatte[81]. Der Kopf war aus englischen Gebirgsschichten ausgegraben und bewieß jedem, der seine Schilling gegeben hatte, daß England einst von Drachen bewohnt geweßen sey. Indeß war dieße Ansicht dem berühmten Anatomen *Sir Everhard Home*[82]

78 Ashton Lever (1729–1788), see Waterfield & King (2006) on the biography of Lever and the history of the collection.

79 William Bullock (1773–1849), English traveller and collector of naturalia.

80 Avenue in City of Westminster, London. Leopold von Buch probably refers to the Egyptian Hall of Picadilly, City of Westminster, London, an exhibition hall built by William Bullock in 1812 in Egyptian style. Until its disposal at 1819 it contained a collection of natural objects that were shown against admission, see Iredale (1948).

81 The head of the ichthyosaur *Temnodontosaurus platyodon* (Conybeare 1822a). The fossil had been found by A. Manning in Lymes Regis and was the first well-examined, scientifically described specimen. The specimen today forms part of the collection of the British Museum of Natural History, see Evans (2010, 14).

82 Sir Everard Home 1814a (1756–1842), British physician and naturalist, described the ichthyosaur for the first time. His decription was based on the specimen of *T. platyodon* (Conybeare 1822a), mentioned above. Leopold von

nicht sehr genügend. Er meinte der Kopf sey doch mehr einem Fische als einem, auf Füssen gehenden Land.ungeheuer ähnlich, und da er doch auch kein Fisch seyn konnte, so unterwarf er dießen Kopf einer sehr genauen, vergleichenden Untersuchung. Dies war der Anfang einer Reyhe von Entdeckungen, welche immer noch fortgesezt wird, und die uns Gestallten hat kennen lehren Geschöpfe, wie uns auch die ausschweifendste Einbildungskraft sie sich nicht zusammengesetzt haben würde.

Wie würde, fragt Cuvier[83] vor zwanzig Jahren ein Naturforscher es nur für möglich gehalten haben, eine Delphinen Schnauze mit *Crocodil*zähnen vereinigt zu sehen, mit Kopf und Schwanz der Eidechsen, mit Füssen von Wallfischen, und das alles auf einem Geripp, das nur einem Fische angehört; oder das eben solches Gerippe, Füsse und Hintertheil sich an einen Schlangenlaib haften, der am Ende einen Eydechsenkopf trägt. Das sind doch, die uns jezt bis in die kleinsten Einzelheiten genau bekanten, *Ichthyosaurea*[84] und *Plesiosauren*[85]. Aber noch mehr, dieße gefräßigen Ungeheuer, welche am *Mososaurus*[86] bis zu 45 Fuß Länge anwachßen, verfolgen und zerstören sich in dem Meer, das sie bewohnen. Die Angst treibt die schwächeren und kleineren sich, wie noch jezt die fliegenden Fische, in das, dem Freßlustigen unerreichbare Element über die Oberfläche des Wassers zu flüchten. Die bisher verbunden Vorderfüsse, um sich in dießem Element zu erhalten breiten sich von einander, der eine Zeh verlängert sich unmässig denn die zum Fliegen notwendige Haut muß sich ausgespannt erhalten. Alle Kraft wirft sich aus dem Vorderteil, der Leib verschwindet fast gegen den Hals und dießen unterstützen die Wirbel die je mehr sie sich vom Körper entfernen um so mehr ihre Fischform verlieren. = So wird die Eydechße aus einem Seethier ein Bewohner der Lüfte.– Sie kehrt nicht wieder zurück wo die Feinde warten.

Sie schwebt fort in der Luft. Und nun, der neuen Lebensart angemessen, verschwindet das ungeheure nur im Wasser brauchbare Auge; die Delphinschnauze wird zum völligen Vogelkopf, der aber noch dem Vogel so fremd mit langen und spitzen Zähnen besetzt ist. Vorn ist das Haupt ein Vogel, hinten, wo er mit dem Halß vereinigt ist, ein ausgezeichnetes *Crocodil*. = Das ist der *Pterodactylus*[87], den Soemmering[88] vor fünfzehn Jahren in Aichstedt[89] entdeckte. Noch nicht genug, die Schuppen der Wasserthiere zertheilen sich in der Luft zu Haaren; die Haut bedeckt sich mit einem behaartem Fell. Endlich der Vogelnatur noch näher, erhält die Eydechße nicht bloß Flügel, sondern auch sogar Federn. So ist die Entdeckung die Herr Goldfuß[90] in Bonn, die noch wenig über ein Jahr alt seyn wird. Ein Reptil mit Federn, das fliegt!!=

Um sich von dießer wunderbaren, fast möchte man sagen, abentheuerlichen Welt eine etwas deutlichere Vorstellung zu machen haben die Herren Buckland[91] in Oxford und De laBeche[92] in London alles in eine Zeichnung gebracht, aus welcher die meisten der neu entdeckten Geschöpfe im lustigen Treiben dargestellt sind, wie sie alle ihrer Bestimmung nachgehen, der nehmlich sich gegenseitig zu fressen[93]. Es ist die Periode der Liasformation[94] dargestellt, in welcher noch wenige Gebirge, sogar nur wenig festes Land sich über die Oberfläche des Wassers erhoben hatten. Daher fehlen dießer Zeit Landthiere faßt ganz und an vierfüssigen Thieren der höheren Ordnungen ist noch gar nicht zu denken. Wie viel weniger daher an eine Menschenbewohnung! Zu dießer Zeit ward das Lob des Herrn nicht durch Lun-

Buch refers to Home (1814b). See also in Rudwick (2008, 25–34) about the debate within the Geological Society.

83 Leopold von Buch refers to the section „Discours préliminaire" in Cuvier (1812, 1–116). This reference is probably related to the „Cuvier-Geoffroy Debate " (Appel 1987) of 1830, see above.

84 De La Beche & Conybeare (1822) provided a first detailed description of an ichtyosaur, see Evans (2010).

85 The first Plesiosaurus was described by De La Beche & Conybeare (1821) from Lyme Regis and interpreted as transitional between Ichthyosaurus and a crocodile, see Evans, 2010).

86 *Mososaurus* Conybeare, 1822a, the genus was first described from the Cretacaeous of the Netherlands, see Bardet & Jagt (1996).

87 *Pterodactylus* Cuvier, 1809, is a genus of Pterosaurs.

88 Samuel Thomas von Soemmerring (1755–1830), naturalist and inventor. Leopold von Buch probably refers to Soemmerring (1817, 1820). Soemmerring interpreted the fossil as remains of a gigantic bat-like mammal. On the early research history of pterosaurs see Evans (2010), and Martill (2010).

89 Eichstätt, Bayern's famous Fossil-Lagerstatte of the Solnhofener Plattenkalk.

90 Georg August Goldfuß (1782–1848), palaeontologist and zoologist. Leopold von Buch refers to Goldfuß (1831). Goldfuß presented first results on the 8. Versammlung der Gesellschaft Deutscher Naturforscher und Ärzte im September 1829 in Heidelberg, see Tiedemann & Gmelin (1829, 47) from which Leopold von Buch was absent.

91 William Buckland (1784-1856), English theologian and palaeontologist.

92 Henry Thomas De La Beche (1796-1895), English geologist and palaeontologist.

93 The famous print *Duria Antiquior – A more ancient Dorset*, drawn 1830 by Henry De La Beche. The print for the first time depicts a reconstructed environment of deep time. Reconstructions of fossils (mostly of the Lyme Regis) are depicted, which were collected for the greater part by Mary Anning (1799–1847), see Rudwick (1992, 42–55) and Rudwick (2008, 153–159).

94 The term *„Liasformation"* goes back to Conybeare & Phillips (1822).

gen in leicht beweglichen Kasten, sondern mit Kiemen, gröstentheils in schwerfälligen Magen gesungen. Daher sieth [man?] das Meer nicht bloß auf der Oberfläche, sondern auch bis auf den Grundt. Inßeln erheben sich daraus hervor, allein kein zusammenhängendes Ganze. Was im Wasser noch mit Flossen umherschwimmt hat auf dießen Inßeln Füsse bekommen. Es sind doch immer nur noch *Reptilien* und höhere Thiere erscheinen noch Nirgends. -

Die Hauptfigur des Bildes ist der *Ichthyosaurus vulgaris*, der jüngst in *Bullocks* Museum[95] die Aufmerckßamkeit der Naturforscher erweckte[96]. Man hat ihn seitdem in fast allen Ländern von Europa wiedergefunden; und dadurch die Ueberzeugung bekommen, daß er in der Periode, welche das Bild vorstellt wirklich das Haupt aller übrigen Geschöpfe geweßen sey. Ein *Crocodil* auf einer Inßel zur Seite, welches kein Nil-*Crocodil,* sondern ein ebenfalls jezt nicht mehr unter den Lebenden vorhandenes ist, belehrt, wie sehr der *Ichthyosaurus* von dießem Thiere abweicht. Das schreckbare Ding auf der Seite, der ungeheure Rachen, so lang der Laib, die vier verbundnen Wallfischflossen geben ihm, ein Allem jezt noch Bekannten völlig abweichendes Ansehen. Fast noch ausserordentlicher ist, der, unter ihm erscheinende *Ichthyosaurus tenuirostris*[97]. Ohnerachtet viel kleiner und schmaler ist doch der Rachen noch bedeutend länger, und kan sich öffnen um Thiere zu verschlingen viel breiter als er selbst. Die Flossen sind länger und schmaler, als bey der vorigen Art; er ist zum Schnellrudrer gemacht; = die zerstörende Freßlust der grösseren, weniger beweglichen, nöthigt die kleineren in weiter liegende Regionen zu rücken, und dort neue Nahrung zu suchen. Der große *vulgaris* kan es noch wagen einen langhalßigen *Plesiosaurus* anzugreifen der kleine muß sich mit Fischen und Sepien gegnügen. Beyde Räuber noch, ohne festes Land, im grossen Meer leben. Aber der ausserordentliche *Plesiosaurus* ist offenbar bestimmt, die schon sparßam werdende Nahrung um die grösseren Thiere her, zwischen Felsklüften zu suchen. Auch er ist ein schneller Ruderer, und kan leicht weit voneinender entlegene Inßeln besuchen. Der lange Schlangenhals vergönnt ihm die Felsklüfte nach allen Richtungen zu durchforschen, der kleine, mit spitzen Zähnen versehene Kopf, das zu ergreifen, was sich an Spalten und Felßen festgesetzt hat; was die gossen *Ichthyosauren* vergebens angreifen würden. So sehen wir dießen *Plesiosaurus* eine ruhige Seeschildkröte auß ihrem Lager überfallen; der lange Hals hat erlaubt sich ihr zu nähern, ohne daß sie zur rechten Zeit, die Ankunft der Feinde geahndet hätte. Der *Plesiosaurus* erhebt sogar den Hals über dem Wasser, und hat wirklich einen, in der Luft sich schon sicher glaubenden *Pterodactylen* bey dem Flügel gefast. Das arme Thier wird ohne Verlust des Flügels nicht mehr entweichen. Glücklicher sind andere *Pterodactylen* am Hintergrunde, die den Inßeln zufliegen, wo sie mit ihren mächtigen Krallen sich an die Bäume anhängen. So glücklich sind die *Sepien* nicht. Sie haben zu Liaszeiten, wie auch jezt zur Hauptnahrung der Ungeheuer gedient. Ihre Reste sind in dießer Formation überall verbreitet. Auch zeigt uns das Bild die *Sepien* nicht bloß vom *Ichtyosaurus*, sogar auch von der Seeschildkröte angegriffen und verzehrt. Einige aber haben sich demnach von dießer Verfolgung gerettet und sind noch jezt vollständig erhalten. Sie enthalten noch immer den schwarzen Saft, den sie in einem besonderen Sack tragen, und im Wasser verbreiten, wenn man sie angreift; und dießer Saft aufgelöst und zerlassen, kan noch eben jezt zu eben so trefflicher Malerfarbe benutzt werden, als die ist, welche die lebendigen *Sepien* des Mittelmeeres liefern. Es hat wohl etwas sehr Ueberraschendes wenn man überlegt daß man mit einer Farbe malt welche die Tiere lange, sehr lange vor Adams Erscheinung benutzt haben[98]. =

Das Bild zeigt viele Fische, welche nicht bloß *passiva* verschluckt werden, sondern auch Angreifer sind. Indeß scheinen sie doch viel weniger häufig als man bey so ausgedehnten Meeren vermuthen sollte, und die Zahl der verschiedenen Arten leidet mit der, in unßeren jetzigen Meeren bekanten gar keine Vergleichung. Bey Weitem die Meisten gehören zu der schönen Art des *Dapedium politum*[99], den eben der *Ichthyosaurus tenuirostri* zu verschlucken im Begriff ist. Man kennt von dießem ganzen Geschlecht nichts ähnliches lebend, allein hat man einzelne Thiere in größter und schönster Vollständigkeit in den Liasschichten gefunden daß man das untergegangene Geschlecht besser kennt, als viele die uns von weit entlegenen Meeren zugefürth werden. Es ist auch eines der schönsten Fischgeschlechter, die man auffinden kann. Die *rhomboidalen* Schuppen sind über den Körper so fest und zierlich geordnet daß sie einer Mosaikarbeit Ehre machen würden, und dabey sind sie schwarz und so glänzend poliert, als wären sie mit himmlischem Lack überzogen. Die *Ichthyosauren* haben nicht die Kraft dieße Schuppen zu verdauen; sie werfen sie wieder von sich und zerstreuen sie auf dem Liasboden umher. Fast Nirgends kan man eine Platte von Liasschiefern aufheben, ohne nicht darinnen solche glänzende *Dapedium* Schuppen zu finden.

95 See above.

96 Leopold von Buch probably refers to *Ichthyosaurus communis* Conybeare 1821, or to T*emnodontosaurus platyodon* (Conybeare 1822). *T. platydon* had been collected by A. Manning in Lymes Regis and was on display at Bullocks Museum (see above).

97 *Ichthyosaurus tenuirostris* (De La Beche, 1822.)

98 Leopold von Buch probably refers to Buckland (1829), see also Buckland (1836). Fossil coleoid cephalopods with ink sac were also described from the Lias of Baden-Würthenberg by Zieten (1830, 34, figs. 4–7), and from the collection of cloister Banz, see Meyer (1832, 320).

99 *Dapedium politum* (Leach, in De La Beche, 1822).

Ich gehe vom Wasser auf das feste Land über. Es ist nicht zufällig, daß dießes Land in Inßeln zertheilt ist. Schon die gänzliche Abweßenheit vierfüssiger Thiere, der *Mammalien* in den Resten würde schliessen lassen, daß grosse *Continente* in den Zeiten der älteren Formationen nicht vorhanden gewesen sind. Denn noch jezt finden sich solche Thiere nur auf solchen Inßeln, welche man selbst als kleine *Continente* ansehen kan, oder die in der Nachbarschaft eines grossen Festlandes liegen. Die im atlantischen Ocean zerstreuten Inßeln, die Inßeln der Südmeere ernähren noch izt nicht das kleinste Thier dießer Ordnung, welches nicht durch Menschen vom grösseren *Continent* dort eingebracht worden wäre. Noch mehr aber wird dieße InßelNatur der Vorwelt durch die Pflanzen dargethan. Die Steinkohlenformation, welche der abgebildeten *Liasperiode* noch vorhergreift, ist aus keinen anderen Pflanzen entstanden, als solchen welche zu ihrem Wachstum ein sehr gleichförmiges *Clima*, und eine sehr feinste Atmosphäre erfordern, wie sie nur auf wenig versehrten Ländern und unter dem Einfluß des Meeres erwartet werden können. Man sieth Bäume genug auf dießen Inßeln; aber sie sind alle von ganz eigenthümlicher Form. Vergebens würden wir uns nach Bäumen umsehen, die unßeren Eichen oder Linden, Ahorn oder Weyden ähnlich seyn könten. Ueberall sind sie astloß und die Blätter treten nur erst an der Spitze des Schaftes hervor. Es sind fast alles Farnbäume, baumartige Farnkräuter oder gigantische *Lycopodien*, nicht aber Palmen oder andere *Monocotylen*bäume, die man sonst noch in dießen Resten zu finden geglaubt hatte. Zwischen ihnen erscheinen, und in dießer Formation zum Erstenmale *Cycadeen*[100], eine Pflanzenfamilie, welche jezt nur noch in Tropenclimaten am Rande des Meeres wächst. So sieth man über dem *Crocodil* eine *Lamia* hervorwachßen, wie ein ungeheurer *Pinus*apfel gestaltet, mit einem Busch von Blättern darauf. = Eine *Vegetation* derjenigen die uns umgiebt, auch nur unserer ähnlich, erscheindt erst lange nach der Liaswelt, und die Oberfläche der Erde geht noch viele Perioden durch, ehe sie dahin gelangt. =

Der Boden des Wassers, und was darauf vorgestellt ist, verdient unßere besondere Aufmerkßamkeit. In der Ecke erhebt sich ein Wald von *Pentacriniten*[101], ein lebendig jezt nur erst in fünf aus den Meeresgrund hervor gehollten Exemplaren bekantes Thier, von welchen sich eines im Hunterschen Museum zu Glasgow befindet, eines zu London, ein anderes zu Bristol, eines in Paris und eins Nantes. Daraus lernen wir, daß solche Thiere wirklich noch izt den Meeresgrundt bewohnen, und vielleicht in eben so grosser Anzahl als die Gebirgsschichten uns vorführen. Wenn wohl schwerlich in der Manningfaltigkeit der Gestallten. Man würde dieße *Pentacriniten,* oder die ihnen ähnlichen *Encriniten* ganz für Maul und Magen halten, von welchem der [##?] sich bis zu viele hundert Fuß Länge ausdehnt, wenn nicht die sonderbar vorherschende Eintheilung aller fast unzählbaren Glieder in der geheimnißvollen Zahl fünf, welche die ganze organische Welt regiert, in dießem Thier etwas mehr vermuthen liesse, als bloß die Neigung zum Fressen und Auswerfen. Wenn die Zahl der Muscheln wächst, so vermehrt sich auch das *Encriniten*heer, denn seine Ausdehnung und daher auch sein Leben, ist von dem Kalkspath abhengig, den ihm die Muschelgehäuse liefern und aus welchem er seine soliden, ihm einen aufrechten Standt erlaubenden Glieder verfestigt.

Ueberall liegen auf dießem Meeresboden die grossen *Ammoniten* umher. Sie erheben sich niemals über die Oberfläche des Wassers, und sind auch leben noch gänzlich unbekannt geblieben. So wahrscheinlich es aber auch seyn mag, daß noch jezt *Ammoniten* die Tiefe bewohnen so sind es doch zuverlässig die Alten nicht mehr, welche in Liasschichten vorkommen. Denn mit jeder Formation verschwinden *Ammonitenspecies*, sogar ganze Familien und erscheinen nicht wieder, und was von *Ammoniten* in der lezten *Formation* vorkommt, die noch dergleichen entfalten, in der Kreide auch denen dazugehörigen Sandsteinen (Königstein, Pirna) hat mit den *Liasammoniten*, ja sogar auch mit denen in dem Juraoolithen gar nichts gemein.

Was, im Bilde, auf der Oberfläche des Wassers schwimmt, sind *Nautilen* oder *Argonauten*. Die Fangarme mit Saugwarzen daran, welche von dießen Thieren zum Rudern gebraucht, die beiden lappenförmigen Arme welche die Eyerßäcke umgeben, breiten sich zum Segel aus. So ist dießes zierliche Geschöpf noch [häufig?] im Mittelmeer sichtbar.=

Häusser der *Gryphiten*, welche den Lias besonders auszeichnen, liegen noch auf dem Boden eine Menge sonderbar Spiral gewundener Körper, deren Natur lange ein Räthßel geblieben war, aber endlich, durch Herrn *Bucklands* Scharfsinn nicht allein entwickelt, sondern, so sonderbar es auch scheinen mag, vielleicht zu einem der wichtigsten und unentbehrlichten Momente in der *Geognosie*[102] erhoben worden ist. Die Geschichte der Entstehung der wahren Natur dießer Körper hat etwas sehr Merckwürdiges.

Herr Buckland ist ein Geistlicher. = Seine Neigung die englischen Gebirgslager und ihre Produkte zu erforschen, hatte ihm Ehr und Ruhm gebracht. Allein sie

100 Leopold von Buch refers probably to Buckland (1828), see also Rudwick (2008, 147–149).

101 Fossil group of crinoids (sealilies).

102 Leopold von Buch probably refers to Buckland (1821) who, among other fossils, used gryphites (oyster-like bivalves) for the correlation of mesozoic formations of the alps with England. In a publication of 1828 it becomes apparent how much Leopold von Buch admired this work Buckland über die Alpen (LvB IV, 30–31).

würde ihm die Aussicht zu fetten Pfründen verschlossen haben, hätte er nicht auf Mittel gedacht sie von dem Glauben der englischen Kirche abhängig zu machen. Glücklicherweiße hatte er hierinnen schon einen Vorgänger an Joseph Townsend[103] gefunden, dießer Mann, ein Pfarrer in der Nähe von *Bristol*, der aber selten seine Pfarre oder seine Pfarrkirche sah, war durch eine sachreiche und wohlgeschriebene Reiße durch Spanien[104] bekannt sogar berühmt geworden. Nach seiner Rückkehr hatte er häufig den Ingenieur *William Smith*, den Begründer der englischen *Geognosie* auf seinen Untersuchungen begleitet[105]. Da schienen ihm die Gesetze welche Herr *Smith* in der Lagerung englischer Gebirgschichten aufgefunden hatte, so merkwürdig und wichtig, daß er sie mit seinen *Comentaren* bekannt machen zu müssen glaubt; und so gab er dann im Jahr 1813 das erste geognostische Buch[106] heraus, welches bessere und genauere geognostische Kenntnisse in Englandt entwickelte und da das Buch sehr wohl und gründlich geschrieben ist und so geschah dies mit einer reissenden Schnelligkeit, die seitdem sich noch nicht vermindert hat, und der wir eine Menge der größten und wichtigsten Entdeckungen verdanken[107]. Allein als Geistlicher wagte es *Townsend* nicht sein Buch ohne einen geistlichen Umschlag erscheinen zu lassen. Er nannte es *Moses*, und ließ dießen Nahmen mit gewaltig großen Buchstaben auf das Titelblatt drucken. *Moses* oder die Zuverlässigkeit der mosaischen Schöpfungsgeschichte aus den englischen Steinlagen erwiesen.[108] Die Vorrede fängt abermalen mit *Moses* an, und es ist die Vortrefflichkeit seiner *Geogenie*. Auf dem zweyten Blatt geht aber der Verfasser sogleich über, auf die Schriftsteller welche vor ihm von Gebirgsschichten geredet haben, und erzählt seine Verbindungen mit *Willhelm Smith*. Und nun ist auch im ganzen Buch nicht mehr die Rede, weder von Moses, noch von irgend einer Schöpfungs-Geschichte, sondern bloß allein vom Abwechseln von Lias und Oolithschiefer, und von den Muscheln, welche dieße Schichten enthalten. *Townsend* konte, mit dem Titel und mit dem andern Blatte der Vorrede, ohne Scheu das Buch allen Bischöfen schicken, und der Erzbischof von *Canterbury* und der Bischof von London sind lange in Entzücken geweßen, wie gut er die *Concordanz* der mosaischen Schöpfungsgeschichte, mit dem, was die Natur selbst, in englischen Gebirgen erwießen hat. = Die hohe englische Geistlichkeit war dieße der *Geognosie* schon ziemlich gewogen, und man gestattete es gern, daß Herr *Buckland* die vor ihm noch nie gehörte geognostische Vorlesungen in Oxford anfing. = Dieße Vorlesungen hatten einen so glücklichen Fortgang und erwarben ihm so viel Beifall, daß Herr *Buckland* anfing ernstlich zu glauben, daß auf dießem Wege sogar, wenn auch nicht die im fernen Nebel ihm entgegenwinkende Bischofsmütze und den Wollsack[109], doch wenigstens fette Pfründe zu erreichen sein möchten. = Geschickt und zugleich in einer für die literarische Welt höchst lehrreiche Weiße benutzte er dazu eine neue Gelegenheit welche sich ihm 1822 darbot. Man hatte in dießem Jahre bey *Kirkdale* in *Yorkshire* eine Höle entdeckt, wie gewöhnlich mit einer Menge Knochen sehr verschiedenartiger Thiere darinnen. Herr *Buckland* untersuchte dieße Höle mit einer meisterhaften Genauigkeit, und beschrieb, was er fand mit großer Kenntnis und Umsicht. Schon längst hatte er zu beweißen geglaubt, daß die über einen großen Theil der Erdoberfläche zerstreuten, loßen Blöcke von älteren Gebirgsarten der wahre Sündfluth: Schutt sey und hatte deshalb den Nahmen des *Diluvium* schon bey seiner ersten geognostischen Antrittsrede in Oxford in der *Geognosie* eingeführt[110]. Die Knochen der Hölen lagen alle in einigen Fuß hohen Schlamm eingesenkt offenbar im Schlamm der Sündfluth, welcher durch die Oeffnungen der Höle sich eingedrängt und abgesetzt hatte. Das war so einleuchtend, daß Herr *Buckland* nun ganz Europa durchzog, überall die Hölen durchdrang und überall fand er zu seiner inneren Befriedigung, im Inneren den Sündfluthschlamm wieder, und die Knochen darinnen. = Da sammelte er alle dieße Beobachtungen in einem grossen und schönen Werke *Reliquies Diluvianae*, Beweiße und Zeugen der Sündfluth, mit seinem Bildniß voran. Ein solches Buch sprach zu mächtig und laut. Herr *Buckland* erhielt noch im gleichen Jahre, eine ansehnliche Prabende[111] durch welche er sorgenloß und im Wohlstande lebt, und die Hoffnung ist gar nicht fern, und gewiß auch von ihm nicht aufgegeben, daß wirklich die Geognosie einen Bischoff auf den Wollsack erheben wird. = Herr *John Fleming*,[112] ein treflicher Naturforscher und auch ein Geistlicher, aber ein Schottischer, dem seine *Presbyterian*kirche keine Bischofsmützen in der Ferne zeigen kan, hat freylich bemerckt, daß ihm vorkomme, Herr *Buckland* schiebe der Sündfluth Wirkungen zu,

103 Joseph Townsend (1739–1816), vicar, physician and geologist of Pewsey, Wiltshire see Morris (1969).

104 Refers to Townsend (1792){}.

105 See Morris (1969, 13–14).

106 Refers to Townsend (1813).

107 A detailed description of the events can be found in Rudwick (2008, 35–46).

108 The original English title is: "The Character of Moses Established for Veracity as an Historian: Recording events from the Creation to the Deluge." See Townsend (1813).

109 Woolsack: Large red-coloured cushion or seat of the Lord speaker in the Upper House of the Parliament of the UK.

110 Buckland (1822).

111 Correctly: „*Präbende*".

112 John Fleming (1785–1857), priest of the Presbytarian church and naturalist.

Veränderungen und Zerstörungen, welche sie unmöglich gehabt haben könne, denn wenn Oelbäume am Ende noch mit Blättern wieder hervortreten können, so ist wohl eine große Verwüstung nicht wahr glaublich, und dieße Oelbäume wachßen doch nicht auf dem Gipfel des Ararat sondern nur in der Tiefe[113]. Dem sey, wie ihm wolle, Herrn *Buckland* Hölen Werk enthält eine so grosse Menge neuer und treflicher beobachteter Thatsachen und so scharfsinnige Zusammenstellungen, daß es selbst als einen vorzüglichen Gewinn der Geognosie angesehen werden wird. In der Höle von Kirkdale sind die Knochen einer erstaunenswürdigen Mannigfaltigkeit von Thieren vereinigt. Unter dießen sind doch Keiner häufiger und vollständiger als die Knochen der *Hyänen*. Elephanten, *Hippothamus* und *Rhinoceros*knochen dagegen finden sich nur sparßam und zerstreut und ein vollständiges Thier würde aus dießen Knochen sich nicht zusammensetzen lassen. Herr *Buckland* sagt, daraus ist klar, daß die Hölen von den *Hyänen* bewohnt gewesen sind, welcher ihrer Weiße gemäß die Knochen abgestorbener grösserer Thiere entfürth und in ihrer Wohnung aufgehäuft haben.-

Elephanten und Rhinoceros hätten nimmermehr durch die Oeffnungen der Höle eindringen können. und gefressen haben. In dießer, so werden die *Hyänen* die zusammengeschlepten Knochen benagt und gefressen haben. Und, zum grossen Erstaunen der Naturforscher, zeigte er wircklich eine Menge Knochen der Höle, an welchen der Eindruck der *Hyanen*zähne und die Spuren des Benagens gar nicht zu verkennen waren waren. Seitdem hat man solche benagten Knochen fast in allen Hölen wiedergefunden wie, in Sundwig[114], in Muggendorf und Streitberg[115].= Das fiel dem Chemicker *Wollaston*[116] mächtig auf-.

Er schloß nun wieder; wenn die *Hyanen* ihren Raub in den Hölen verzehrt haben, so können sie doch nur die *gelatinoesen* Theil der Knochen verdauen, der Uebrige, die feste Substanz der Knochen wird ausgeworfen, und da sich dieße *Excremente* nicht zerstören können, so wenig als der *album graeum*[117], welches man von Hunden bereiten ließ, und ehedem in den *Apothecken* als ein specifisches Mittel gegen *cholera morbus* verkaufte, so müste sich ein ähnliches *album graeum* im Sündfluthschlamm der Hölen, und auch in nicht geringer Menge auffinden lassen. Sogleich sandte ihm Herr *Buckland* ganze Kisten von *album graeum* aus den Hölen von *Kirkdale*. Herr *Wollaston* untersuchte, es, und fand es, wie die Knochen, auf phosphorsauren Kalk mit wenig kohlensaurem Kalk zusammengesetzt und mit einem geringen Antheil einer *Ternair*verbindung von phosphatsaurem Ammoniak und Magnesium. Nun verglich er und *analysierte* die Exkremente lebendiger Hyänen mit der *Menagerie* von *Exeterchange* zu London[118] und fand zwischen ihnen und denen aus den Hölen die genauste Übereinstimmung.– Für Herrn Buckland war dies aber nicht bloß eine Befriedigung seine Meynungen so glänzend bestätigt zu sehen es ward für ihn ein Strahl des Lichtes.– Können sich solche Auswürffe in Hölen erhalten, so wird das auch noch mehr unter Wasser möglich gewesen seyn. Wie, wenn die sonderbaren spiralförmigen Körper der Liasschichten vielleicht auch zu *Exkrementen* des *Ichthyoaurus* und *Plesiosaurus* gehärten! Sogleich schrieb er Miss *Anning* ihre Aufmerckßamkeit besonders auf dieße Körper zu richten, und sie bestätigte kurz darauf seine Vermuthung vollkommen. Miss *Anning*[119] ist eine kenntnißreiche, und jezt durch ihre Entdeckungen in *England* und auf dem *Continent* sehr berühmte Dame, die zu *Lyme Regis* am Meeresstrande in Dorsetshire lebt. Bey jeder Ebbe schürzt sie ihre Röcke auf, und sucht mit einer erstaunenswürdigen Beharrlichkeit in dem tiefen, schwarzen und fetten Liasschlamme, was die Wellen der Fluth hervorgerissen und abgespült haben. Anfangs zu ihrer Belehrung findet sie jezt in dießer Beschäftigung ihren Gewinn, und Verkauft nach Rarißcouranten was die Fluth ihr bescheert. Die *Excremente* welche Herr Buckland nun zierlicher *Coproliten*[120] genannt hatte, waren ihr längst bekannt gewesen, aber vergebens hatte sie bis dahin gefragt, was es wohl seyn könte. Jezt suchte sie dieße Körper in der Nähe der *Saurier* auf, und gar bald gelang ihr, nicht eines sondern mehrere Gerippe zu finden, welche in ihrem Innern *Coproliten* umschlossen und genau auf dem Wege, den sie hätten durchlaufen müssen um vom Magen aus denen Gegenden zuzueilen in denen sie das Licht der Welt erblicken sollten.

Die *Coproliten* bildeten nun einen Hauptartickel der Anningschen Rarißcourante und sie waren es werth.=

113 Leopold von Buch refers to the known controversy between Buckland and Fleming about the magnitude and impact of the deluge, see Fleming (1824, 1826), Page (1969), Herbert (2005, 184-187), Burns (2007).

114 Sundwig, Westphalia, Germany, the caves are termed today the Perick-caves, see (Diedrich 2008). Leopold von Buch probably refers to Goldfuß (1823), see also Buckland (1823,112–113).

115 Muggendorf and Streitberg, Frankonian Switzerland. Leopold von Buch refers to Wagner (1829, 1831), see also Buckland (1823,100 probably, 103, 130).

116 William Hyde Wollaston (1766 –1828) English physician, physicist and chemist.

117 Leopold von Buch probably refers to Buckland (1822, 187).

118 Menagerie, Exeter Exchange, London.

119 Mary Anning (1799–1847), british fossil collector, see e.g., Goodhue (2002).

120 See Buckland (1829).

Sie wurden auf das genaueste untersucht. Herr *Buckland* fand ihr Inneres aus einem verwirrtem Gemenge von Fischwirbeln zusammengestzt, von Gräten, *Dapedium*schuppen, von *Sepien*schnabeln, vielleicht gar auch von *Ammoniten*schnäbeln, von *Saurier*knochen und von vielen anderen ähnlichen Dingen, eine vollständige *carte* eines *Ichthyosaurus Diners* welche unerwartet den deutlichsten Rückschluß über das Leben, über die Neigungen und das Wirken dießer unbekannten Thiere giebt. Das alles ist durch eine braune Masse von ebenenem, fast muscheligem Bruch zu einem *conglomerate* verbunden; dieße braune Masse aber besteth des *chemikers Prout*'s[121] Analyse zufolge, aus 1/4 bis 9/4 phosphatsaurem Kalk, aus kohlenßaurem Kalk und in den dunkelen Stufen aus etwas geschwefeltem Eißen und Kohle, alles Substanzen, welche offenbar die ehemalige organische Natur dießer Reste erweißen und sie weit aus dem Gebiet ursprünglich mineralischer Substanzen entfernen. Nun fand man die *Coproliten* bald überall und in jeder Formation. Herr *Buckland* bewieß durch Form und Lage in den Gebirgsklüften, Herr *Prout* zeigte durch die chemische *Analyse*, daß man zu ihnen auch viele Körper rechnen müsse, die häufig, und in fast allen Wercken über *Petrificate* aufgeführth, und fast in jedem *Cabinet* aufbewahrt werden, Körper, welche man bisher unbedingt für Fichten- und Tannenzapfen gehalten, und als solche beschrieben hatte.= Nirgends aber fanden sich die *Coproliten* grösser und in solcher Menge, als eben in der Formation des Lias. Ja es giebt Schichten, welche durch[weg?] aus nichts anderem, als aus solchen *Excrementen* bestehen. Sie ziehen sich vom Ufer der Severn[122] tief in das Land, und sind jezt schon viele Meilen weit verfolgt worden. Herr *Buckland* bemerkt mit grossem Recht, daß es besondere Beachtung verdiene, daß dieße Schicht gerade die Unterste der ganzen Liasformaion sey. Grosse Knochen Ueberreste finden sich hier nicht zwischen den einzelnen *Coproliten*, wohl aber Fischgräten und Schuppen in Menge. Offenbar sagt er, ist dies lange ein Seegrund geweßen über welche die Seebewohner wegschwammen, und lebten, und welche ihnen zu ihrer *cloaca maxima* diente. Da nun dieße sonderbare und merckwürdige Schicht leicht zu erkennen ist, und wie alle übrigen caracteristische Eigenheiten der ganzen Formation in anderen Ländern mit gleicher Bestimmtheit sich aufzeichnen läst, in *Deutschland* so gut, als in *Englandt*, so liefert sie ein treffliches und der *Geognosie* unentbehrliches Mittel die *Liasformation* von denen Sandsteinen der *Formationen* zu trennen, welche ihr vorhergehen, eine Unterscheidung die bisher immer ziemlich unbestimt und schwankend geweßen ist. =

Auch war sie den ausgezeichneten Männern, nicht unbekannt geblieben, die in *closter* Banz zwischen *Bamberg* und *Coburg* die ganze Liasformation durch ihre *Producte* in einer Schönheit und Vollständigkeit aufgestellt haben, wie man sie selbst in ganz *Englandt* nicht findet. Von dem ehemaligen hochberühmten Benedictinerstift ist nehmlich izt noch ein einziger Mönch übrig, der im *Closter* lebt der *P. Geyer*[123], dießer Mann hat sich das Talent erworben gleichßam mit seinen Augen die festen Erdschichten zu durchdringen. Wo Niemand etwas sieth, selbst Naturforscher nicht entdeckt er den verborgenen Schaz, lässt er Blöcke ausheben und nach seiner Wohnung bringen. Dann arbeitet er oft Monathe lang, an dießen Blöcken, mit Hämmern und Meisseln mit Grabsticheln, mit Säuren und Bürsten und aller Art, und wie durch einen Zauber treten nun unter seinen Händen in vollendeter Schönheit die wunderbaren Gestallten hervor. Durch seine Beharrlichkeit durch seinen Scharfsinn und Fleiß werden die Erdschichten seiner Gegenden lebendig;= Er hat ihnen Sprache gegeben, mit welcher sie uns ebenso wichtige, als unerwartete Begebenheiten erzählen. In *Closter Banz* ist der vollständigste Ichthyosaurus tenuirostris aufgestellt[124], den man bis izt kenet und Herr *Teodori*[125], der mit gelehrten Kentnissen aller Art nicht weniger Beharrlichkeit verbindet. Die Produkte der Gegend hervorzuziehen und zu samlen, hat dießen *Ichthyosaurus* in seiner natürlichen Grösse, nahe an fünf Fuß lang gezeichnet, ein Meisterwerk, das jetzt neben dem *Original* aufgestellt ist. Man ist verlegen soll man mehr das *Original* oder die Zeichnung bewundern; sah man sich schon lange mit dem übrigen Schätzen dießer sehr reichen Sammlung beschäftigt so kehrt man doch immer wieder zum *Ichthyosaurus* zurück mit derßelben freudigen Ueberraschung als sähe man Natur und Zeichnung zum erstenmal wieder. Darselb ziehen auch von Weither die Naturforscher und alle welche die Eindrücke ausseror-dentlicher Gegenstände auffassen wollen nach Banz den ganzen Sommer fort um dießes merckwürdige Thier zu sehen; und schon mehr als einmal hat bey dießem Anblick der alte Herzog von *Bayern*, der Banz bewohnt[126], wehsüchtig geklagt: Daß er nicht ein *Ichthyosaurus* geworden sey; alles suchte das Unthier zu sehen, ihn alten Mann geh-

121 William Prout (1785–1850), English chemist, and physician.

122 Longest river in the UK.

123 Augustin Andreas Geyer (1774–1837), priest at Banz, former monk in Cloister Banz, see Thiem (1839). The claim of Leopold von Buch that Geyer was the last monk in the cloister that had been closed in 1803, is wrong. The last Konventuale was Ansel Reusche, he died 1853 (pers. comm. Günter Dippold, Sept. 2012).

124 The mentioned specimen is the specimen of an *Ichthyosaurus tenuirostris* exhibited today in the museum. It must not be confused with the large specimen of *Leptopterygius trigonodon* (Theodori). The latter was collected in 1841 by Carl Theodori (see Theodori 1854, XIII) and figured in Theodori (1854). The large lithograph is not preserved.

125 Carl Theodori (1788–1857), see Dippold (2011).

126 Refers to Wilhelm Herzog in Bayern (1752–1837)

te man vorüber, und Niemanden fiele ein, daß auch er zu sehen sey[127].

Die Zeichnung des Herrn *Teodori* wird jezt gestochen, in derßelben Größe und wahrscheinlich auch in derßelben Vollkommenheit als das *Original* selbst, und Deutschland wird stolz seyn können, auf ein Werk, wie es das Ausland nicht besizt. =[128]

Ich schliesse diesse Bemerkungen über die Liaswelt mit den centnerschweren Worten, mit welchen Herr Linck[129] seine physikalische Erdbeschreibung[130] endigt: Es geht aus der Betrachtung der organischen Formen in den verschiedenen Formationen die grosse Wahrheit hervor, daß die *Organismen* auf der Erde in einer steten Ausbildung begriffen geweßen ist und nie Rückschritte gemacht hat.=

Daher ist es klar, daß wenn einst neue Gebirgsreyhen aus dem Innern der Erde hervorquellen sollten[131] einige Geschlechter zerstört werden können; es wird aber [dann als?] ein vollkommenes Geschlecht aus dem *Organismus* der Menschen hervorgehen, ein Geschlecht das vielleicht die Welt um sich her wie wir durch das Licht, so durch den alles durchdringenden Aether erkent, an welchen die *cohasion* der Kraft alle zurückzwingt, wie vor und durch uns die die Luft sich zertheilt, das sich daher so ungehindert und frey eben so leicht durch das Innre der festen Erdrinde, als wie durch die Atmosphäre bewegt, ein Geschlecht das mitleidig auf die Armseeligkeit des Menschen herabsith, wie wir auf die Affen, welche die africanischen Bäume bewohnen.

127 Leopold von Buch visited the Cloister Banz several times and corresponded with Carl Theodori, see Dippold (2011, 54), and Theodori (1846, 28). In Leopold von Buch's diary there is an additional description of a visit in Banz and a meeting with Theodori and Geyer on December 3rd 1829 (SI, Tgb Buch, Lv., Bd. 15, 133).

128 See Theodori (1854).

129 Heinrich Friedrich Link (1767–1851), Berlin naturalist, director of the Botanical Garden. His works include: *Die Urwelt und das Altertum erläutert durch die Naturkunde* (Link 1821). Like Leopold von Buch Link was member of the *Gesetzlose Gesellschaft* and was well- known to von Buch (see above).

130 The reference is: *„Ist nicht vielmehr diese Krystallisation des Ganzen, diese Mechanik des Universums ein kleinlicher Gedanke? Uebertrifft nicht ein Jedes auch unvollkommende organische Wesen jene bewunderte Weltordnung? Es ist viel wahrscheinlicher, daß sich dieses Weltall in einer steten Ausbildung befindet, hinstrebend zu einer Organisation, welche bis jetzt nur im Kleinen und im Einzelnen erreicht worden ist. Das Vollendete kann nicht in der Zeit vorhanden sein, da die wahrhafte Vollendung die Zeit aufhebt.*" Link (1826, 11–12).

131 Here Leopold von Buch implicitly refers to his Theory of Elevation Craters, see above, see also Fritscher (2008, XVI-XVI)I.

English translation of the talk

REMARKS ON A LITHOGRAPHIC PRINT, DEPICTING THE PRIMEVAL WORLD

February 5, 1831

Over the last twenty years a large number of animals have been discovered which are so bizarre and so dissimilar to any of those surrounding us today that the mere sight of them easily leads to the conviction that they do not belong to our own world, but to a strange and unknown one. These creatures, it appears to me, are less known than they ought to be, notwithstanding the fact that throughout Europe they have inspired minds of great anatomical astuteness to write masterly treatises. It is about a few of these animals and their coexistence that I wish to talk today.

Some time ago, there was a collector of curiosities in London by the name of Ashton Lever. Nothing was too costly for him, as long as it had an appearance out of the ordinary. Hence, people kept sending him a wealth of odd-looking objects. When, at last, he had lost his fortune by incautious spending, his collections had to be sold. The better part of it fell into the hands of a certain Mr Bullock, who exhibited these objects in Pall Mall, one of the finest streets in London, charging an admission fee. Among the exhibition's foremost attractions ranked a monstrous head of five feet: a dragon's head with beastly eyes, as had never been seen before. The skull had been excavated in English Mountain beds and proved to anyone who had paid their shilling that England in the old times had been populated by dragons. This assumption, however, seemed flawed to the famous anatomist Sir Everhard Home. In his opinion, the skull rather ressembled a fish than a beast of the land; yet, since it could not be a fish, he subjected the head to a rigorous, in-depth examination. This marked the beginning of a number of discoveries, which continue to be made today, and which have presented us creatures that even the most exuberant imagination could not have put together.

How could a natural scientist, as Cuvier asked 20 years ago, have considered possible to see a dolphin's snout made into a unit with a crocodile's teeth, the head and tail of a lizard, with feet of a whale and all of this upon a skeleton, belonging to a fish. Or that such a skeleton, feet and back part would be attached to a snake's body, bearing a lizard's head at one end. And yet, these are precisely the ichthyosaurs and plesiosaurs, known to us today down to the smallest detail. What is more, these voracious beasts, which in their form as mosasaurs can reach a size of 45 feet, chase and destroy eachother in the ocean, which is their habitat. Fear drives the weaker and smaller specimens to escape over the sur-

face of the water into the element unreachable to their greedy enemies, in the manner as flying fish do. The formerly jointed front limbs that were necessary to survive in this element, separate from eachother, one toe becomes a great deal longer, as the skin indispensable for flying needs to be spread out. All strength disappears from the front part, the body nearly vanishes towards the neck, while the latter is supported by vertebrae which the farer away they are from the trunk, the more they lose the form of a fish. Thus, the lizard transforms from a marine animal into an inhabitant of the sky. It will never return to the element where the enemies lurk.

It hovers away in the sky. And now, as an adaption to the new way of life, the enormous eye vanishes that was of use but in the water; the dolphin snout changes into a full head of a bird, although it can be still distinguished from our birds today by a row of long and sharp teeth. In the front, the head ressembles a bird's, in the back where it is connected to the neck, it makes an excellent crocodile. This is a pterodactylus, which was discovered by Soemmering in Aichstedt 15 years ago. And as if this were not yet enough, up in the air the scales of the aquatic animals divide into hairs; the skin covers itself with hairy fur. At long last a bit closer to the nature of a bird, the lizard grows wings and even feathers. Such was the discovery of Mr Goldfuß in Bonn, not quite a year ago. A reptile with feathers, that flies!

In order to get an idea about this fabulous, one might even say queer and fantastical world, Mr Buckland and Mr. De la Beche have brought all this information into one drawing in which most of the recently discovered creatures are represented in a charming hustle and bustle; all following their destiny, that is devouring eachother. The age represented is Lias. Hence, only few mountains or few stretches of land had raised themselves from the waters yet. This explains the nearly complete absence of terrestrial animals; and quadruped animals of the higher orders are still inconceivable. And much less to think of earth as the dwelling-place of man! In those days the praise of the Lord was not sung by lungs in their flexible rib-cage, but by gills, and for the bigger part in sluggish guts. This is why [in this picture] you can not only see the surface of the ocean, but also are allowed a glance at what is beneath. Islands appear here and there, without yet forming a greater landmass. The creatures that still display fins in the water, will grow feet once they reach the islands. However, they will only ever be reptiles. Higher animals are not present yet.

The central figure of the print is an Ichthyosaur vulgaris, which recently caught the attention of natural scientists in Bullock's museum. Since then, specimens have been found in almost all European countries and for that very reason one has concluded that, indeed, it took front rank among the creatures during the period depicted in the print. A crocodile here on an island, which by the way is not a Nile crocodile, but one extinct today, shows how much the ichthyosaur differs from this animal. The frightening thing on one side, the enormous jaws, a body of such length and the four interconnected flippers of a whale add up to an appearance totally unlike anything we know today. Almost even more out of the ordinary is the Ichthyosaur tenuirostris, depicted below. Despite the fact that its jaws are smaller and more narrow, they are considerably longer as well and can open up to devour animals much bigger than itself. The flippers are longer and slimmer when compared to previous species; he is designed to be fast rower. The devastating voracity of the larger, less mobile beasts forces the smaller ones to escape into remote regions in order to find food. The tall vulgaris can still risk to attack a long-necked plesiosaur, the small one has to content itself with fish and sepia. Both of these predators still are species of the ocean, without the need of terra firma. The extraordinary plesiosaur, however, seems to be destined to counter the scarce supply of food around the bigger animals by foraging in the crevices of rocks. It is a fast rower too and manages very well to visit islands that are far away from eachother. Its snake-like neck enables it to scour the rocks in all directions; the small head with its sharp teeth helps to grab what has settled in the cracks and crevices, where an ichthyosaur would attack in vain. Hence here we see this plesiosaur attacking a placid turtle on her resting place. The long neck allows it to draw near without giving away that an enemy is approaching. The plesiosaur even raises his head out of the water and has managed to seize a pterosaurs by its wing, who certainly had assumed himself to be out of danger up in the skies. That poor animal will not escape anymore without losing a wing. The pterosaurs in the background are more fortunate. They are flying towards the islands, where they will cling to the trees, by means of their enormous claws. The sepias are not that lucky. During Lias, they formed the staple food of those beasts. Their remnants are to be found everywhere in this formation. The print even shows us, that sepias were not only attacked by ichthyosaurs, but also by turtles. Yet a few specimens did escape such prosecution and have been completely preserved to the present day. They still carry the dark fluid in a specific bag which they usually squirt when attacked. This fluid, dissolved in water, can still be used as an excellent paint, it is in fact similar to the one living sepias of the Mediterranean would provide. There is something amazing about the thought that you paint with a colour which was used by these animals at a time, long, long before the apparition of Adam.

In the drawing, there are many fish which are not just passively devoured, but which attack others. However, they seem to be less common than one could assume considering the vastness of the seas and keeping in mind too, that the number of different species is in

no way comparable to the one in our oceans of today. The majority of these fishes belong to the pretty species of dapedium politum, which could be devoured by an ichthyosaur in one go. We do not know of any similar species living today, but specimens of the most wonderful completeness have been found in the Lias strata, and it is for this very reason that the extinct species is better known to us than are species brought to us from far-away seas. It is one of the most beautiful fish species that can be found. The rhomboid scales are arranged so neatly and delicately all over the body that they would do credit to the finest mosaic work. At the same time, they are of black colour and polished so brightly, as if covered by celestial varnish. Ichthyosaurs are not capable of digesting these scales, they throw them off and disperse them on the Lias ground. It is next to impossible to find a plate of Lias shale from which are absent these glistening scales.

I leave the water and proceed to the land. It is no coincidence that the land in this picture is divided into islands. The total absence of quadruped animals, the absence of mammals in the remains, surely would indicate that in the times of the earlier formations there were no large continents. Even today, you would find such animals only on those islands which in themselves can be regarded as small continents or which are situated in close vicinity to the mainland. To the present day no animal is found on the islands dispersed in the Atlantic Ocean and the islands of the South Seas that has not been brought there by human beings from a larger continent. It is the plants, though, that manifest even more impressingly the insular nature of primeval times. The coal formation preceding the Lias formation here depicted originated from no other plants than those which – for their growth – need a stable climate and a delicate atmosphere: circumstances that could only be provided by landscapes little marred, under the influence of the sea. There is high occurrence of trees, yet they are all of the most peculiar shape. We would search in vain for trees which resembled our oaks or limes, acorns or willows. In all places they are without branches, and leaves emerge but at the top of the stalks. All these are fern trees, tree-like fern herbs or gigantic Lycopodiae, not yet palm trees, though, or other monocotyledonous trees, which one had assumed to find among these remains. Among them appear cycadeans, and that was for the first time during that formation - a family of plants which can be found today on seashores in tropical climates only. Hence, above the crocodile you can see a lamia, formed like an enormous pineapple with a bush of leaves on it. A vegetation similar to the one surrounding us will not emerge until a long time after the Lias formation and the surface of the earth is still going to cross many periods till that moment.

The bottom of the sea and the organisms represented upon it, deserve our special attention. Here, in the corner, there is a forest of pentacrinites, an animal, known to us only by five specimens brought up alive from the bottom of the sea. One is at the Hunter's Museum in Glasgow, another in London, another in Bristol, yet another in Paris and a last one in Nantes. From this fact we can defer that such animals indeed inhabit the seafloor and maybe even in numbers as large as the mountain-beds suggest. Hardly though, in such a variety of forms. One could easily take these pentracrinites or the similar encrinites for nothing but mouth and guts, from which the [##?] extends up to a length of several hundred feet. Yet it is the strange predominance of the mystical number 5 into which nearly all uncountable members divide and which governs the whole organic world that easily convinces the beholder that there must be something more to these animals than just devouring and defecating. When the number of mussels increases, so does the multitude of encrinites, because its expansion and that is: its life is dependent on the calcspar provided by the mussel shells and which allows it to indurate its joints and assume an erect posture.

Everywhere on the seafloor there are huge ammonites. They never break the surface of the water, and even in their living forms remain completely unknown. As likely as it may be that ammonites populate the depth even today, we can be certain that these would not correspond to the old forms which existed in Lias. For it is a fact that in each formation species of ammonites vanish, even whole families - and they do not reappear. Those ammonites that were found in the last formation in which such forms are contained, that is in the Cretaceous, and in the corresponding sandstones (Königstein, Pirna), bear no resemblance whatsoever with ammonites from Lias, not even with those contained in the Jurassic oolite.

Returning to the print: Floating on the surface of the water we can see nautiluses or argonauts. The tentacles and their respective suckers which are used by these animals for rowing, these webbed arms surrounding the egg-case can be spread into a sail-like flap. In this form, nautiluses can still be found today in the Mediterranean.

Apart from gryphites, which are highly characteristic of the Lias, there are a number of other strange spiral-shaped objects here on the ground. For a long time their nature was a mystery to everyone, until finally the brilliant mind of Mr Buckland not only solved the riddle, but as strange as this may appear, also initiated one of the most significant and indispensable moments of geognosis.

Mr. Buckland is a clergyman. His inclination to explore the rock layers of the English mountains and their products has brought him fame and honour. However,

these activities might well have shut him out of any future prebend, if he had not found a means to reconcile these findings with the Faith of the Anglican Church.

Fortunately, he had a predecessor, Joseph Townsend; this man, a vicar from near Bristol, who was rarely seen in his vicarage or church, had gained a reputation and even fame by his informative and well-written account of his travels through Spain. Following his return, he frequently accompanied William Smith, engineer and founder of English Geology, on his explorations. And as the laws that Mr. Smith had found with regard to the stratification of the English mountain beds seemed so remarkable and significant, he concluded it would be worth to present these discoveries to a broader public in his Commentaries.

Consequently, in 1813, he published the first book on geognosis, which fostered a more profound and more detailed knowledge about geology in England; and as the book is well-written and thoroughly researched, this happened with an incredible swiftness that has not yet diminished. To this we owe a wealth of discoveries of the utmost importance. Being a clergyman, however, Townsend did not dare to publish this book without an ecclesiastical wrapper. So he called it Moses and had this name printed in huge letters on the title page. Moses or the reliability of Moses' account of creation as evinced by English mountain beds. The preface starts with Moses again – and it is the pinnacle of his geognosis. On the second page, though, the author passes over to other writers who have been addressing the topic of rock strata and also informs about his connection to William Smith. And from there, nor the name of Moses nor any account of creation are going to be mentioned again - not a single time in the whole book. Instead, it is all about alternating strata of Lias and Oolith shale and about mussels, contained in these strata. With a title and a preface like this, Townsend could send this work to all bishops without the slightest reluctance; and the archbishop of Canterbury and the bishop of London have long been delighted, how wonderfully Townsend had evidenced the concordance between Moses' account of creation and the facts of nature as provided by the English mountains. The high clergy of England was favourably disposed towards a geognosis like this, and in consequence, graciously consented to allow Mr. Buckland, to hold lectures on geognosis in Oxford, which were the first of their kind. These lectures went on so well and gained him so many laurels, that Mr. Buckland seriously started to belief that further down this road a fat sinecure might be awaiting him – even if the mitre and the wollsack might be beckoning in vain from the distant mist. In a very apt, and at the same time - for the literary world - highly instructive way, he seized a new opportunity, which presented itself to him in 1822. In that very year, a cave had been discovered near Kirkdale in Yorkshire, and as is the common case it contained a wealth of bones from diverse animals. Mr. Buckland examined this cave with the utmost accuracy, and described what he found in a very knowledgeable and prudent way. He believed himself to have proven already, that the loose blocks of older rock forms, that were scattered all over the surface of the earth, were in fact detrital of the biblical Deluge. This is why he already had introduced the term Diluvium in his inaugural lecture of geognosis in Oxford. The bones of the caves were all immersed in a layer of mud of a few feet high; apparently, this was the mud of the Deluge that had forced its way into the cave through the apertures, and then sedimented there. This was so plausible an explanation that Mr. Buckland henceforth travelled through entire Europe, exploring caves in all places; and to his immense satisfaction everywhere inside these he would find that same diluvial mud and the bones. So he assembled all these observations in his great and beautiful work Reliquies Diluvianae, Proofs and Witnesses of the Deluge, with his portrait on the frontispiece. A book like this did speak with too loud and powerful a voice! In the very same year, Mr. Buckland received a considerable prebend, which allows him to live comfortably and free from worry; and surely, he has not given up hope that in the end, geognosis might help to raise a bishop onto the woolsack. = Mr. John Fleming, a great natural scientist and another clergyman, a Scottish one, though, to whom his presbyterian church cannot offer any mitres beckoning from the distance, has pointed out, however, that he was under the impression that Mr. Buckland was attributing effects to the Deluge- that is: changes and devastations - which it could not possibly have had. For if at its end, there were still olive trees with leaves, a preceding grand devastation was not quite credible. Furthermore, these trees did not grow on mountain peaks, so could not have been found on the summit of mount Ararat, but only in the valleys. Be that as it may, Mr. Buckland's work on the caves contains such a myriad of new and felicitously observed facts, and so astute compilations, that it is regarded as an excellent advance in geognosis. In the cave of Kirkdale, one can find animal bones of the most astonishing diversity. Yet among these, the most common ones and also the ones found in most complete sets, are those of hyenas. In contrast, the bones of elephants, hippopothamus and rhinoceros are found only scarcely, and scattered; and one would not be able to reconstruct an entire skeleton from these bones. Mr. Buckland argues that this demonstrates that these caves were once inhabited by hyenas, which - following their nature – dragged bones of larger, decayed animals into their cave and piled them up in their den. Elephants and rhinoceros would never have been able to enter the cave in order to eat there. Instead, inside the cave hyenas would have gnawed off and devoured their hoarded bones. To the great astonishment of natural scientists, Buckland was able to produce a number of bones from the cave that unmistakably had been gnawed upon and even carried the hyenas' dental impressions.

Since then, such gnawed bones have been discovered in nearly all the caves, as for instance, in Sundwig, in Muggendorf and Streitberg. This attracted the attention of the chemist Wollaston.

He, in turn, concluded that if the hyenas had devoured their prey in the caves, they would have been able to digest but the gelatinous part of the bones; the rest, that is the compact substances of the bones, would have to be disposed of. As these excrements could not be destroyed - as little as the album graecum, produced by dogs and in former times sold in pharmacies as a specific remedy against cholera morbus - there had to be something similar to an album graecum in the diluvial mud of the caves and in quite copious quantities, too. Mr. Buckland immediately sent him entire boxes of album graecum from the caves of Kirkdale. Mr. Wollaston analysed them and found that, like the bones, they were composed of phosphorous lime with a little calcareous lime and with a small part of a ternary complex of phosphorous ammoniac and magnesium. He then compared and analysed the excrements of living hyenas from the menagerie of Exeter Exchange in London and found they were alike in every particular. For Mr. Buckland, this was not only a resplendent confirmation of his theories, but turned into a flash of inspiration. If these residues had managed to preserve themselves in the caves, how much better they must have done so under water. What if also those strange, spiral-shaped bodies of the Lias strata had been excrements of the ichthyosaurs and plesiosaurs! He immediately sent a letter to Miss Anning and asked her to focus her attention to those bodies – and shortly afterwards, she entirely confirmed his assumptions. Miss Anning is a knowledgeable lady who of late has become quite renowned on the continent for her discoveries in England. She lives in Lyme Regis on the seashore of Dorset. At each low tide, she gathers up her skirts and with an astonishing perseverance searches the deep, black and rich Lias mud for objects which the waves have ripped out and washed up. Initially just for her own instruction, she now makes a profit from this pastime and successfully sells what the flood bestows on her. The excrements, now called more delicately coprolites by Mr. Buckland, had long been known to her, yet in vain she had tried to discover the nature of these objects. Now she deliberately looked for them in the vicinity of dinosaurs and soon, she managed to find not only one, but several skeletons, which contained coprolites in their interior, and at exactly the position they would have had to cross on their way from the stomach to other regions whence they were supposed to see the light of day.

The coprolites now became one of the major items amongst Miss Anning's rarities and they were worth it. They were subjected to the most rigorous examinations. Mr. Buckland found their interior composed of a bewildering mixture of fish-vertebrae, scales, Dapedium-scales, and beaks of sepias, maybe even beaks of ammonites, saurian bones, and of many other similar things; in fact, it was an entire menu card of an ichthyosaur's dinner which gave an unexpected insight into the life, the predilections and the actions of these unknown creatures. All this is held together by a brown mass of plain, almost conchoidal fracture, forming a conglomerate. As the chemist Prout has analysed, the brown mass consists in ¼ to 9/4 parts of phosphorous lime, of carbonic lime and in the darker parts of some sulphuric iron and carbon; all of which are substances that manifest the organic origin of these remains and clearly belie the former classification as mineral. After that, coprolites were found everywhere and in every formation. By an examination of their form and position in the mountain fissures, Mr Buckland was able to prove that also another group of bodies had to be included into the class of coprolites; these were frequently listed in works on petrification and had found their way to almost every cabinet, but had been mistaken for spruce cones or fir cones and been described as such. Mr Prout backed up these findings by a chemical analysis. Nowhere, though, as many and as large coprolites were found as in the Lias formation. In fact, there are strata that do not consist of anything else but such excrements. They extend from the banks of the Severn deep into the country and have been examined now on a length of many miles. As Mr. Buckland so rightly pointed out, it deserves our special attention that this stratum is the lowermost of the entire Lias formation. There are no remains of large bones among the coprolites here, but a wealth of fish bones and scales. Apparently, Buckland concludes, this stratum has been the seafloor for a long time and it was used as a cloaca maxima by those swimming and living above it. As this strange and peculiar rock stratum is easy to recognize, and as its characteristic traits are the same in a variety of countries, in Germany as well as in England, it is has turned into a reliable means of distinguishing the Lias formation from the sandstones of precedent formations. Until now this differentiation used to be quite vague and unstable.

It had not been unknown, though, to the excellent men of cloister Banz between Bamberg and Coburg, who have put up a presentation of the Lias, by exhibiting its products, that in its beauty and completeness searches its equal even in England. Of the formerly illustrious Benedictine abbey there is now only one monk left who lives in the monastery: P. Geyer. This man has acquired the talent to virtually penetrate the earth with his eyes. Where nobody, not even a natural scientist, sees a thing, he discovers the hidden treasure; he will have blocks of stone excavated and brought to his domicile. Then, for months and months, he meticulously works on these blocks: using hammers and chisels and styluses, acids and brushes of all kinds, and at long last those wonderful objects in all their splendour appear beneath his hands as if by magic. By his perseverance,

his sagacity and his diligence the strata of the earth in his region come to life again. He has given them a voice, with which they tell us significant and unexpected occurrences. In the cloister at Banz they have set up the most complete Ichthyosaur tenuirostris to date; and Mr Teodori, who combines a vast knowledge in a number of fields with no less perseverance in collecting products of the region, has drawn this ichthyosaur in life-size of nearly five feet: a masterpiece that has been put now next to the original. One is at a loss to decide what to admire more: the original or the drawing, and even if you have occupied yourself with the treasures of this prolific collection for some time, you will always return to the ichthyosaur with that same joyful astonishment, as if you were looking at nature and drawing for the first time again. This the reason why during the entire summer season natural scientists and people who want to be impressed by objects out-of-the-ordinary, come to Banz from far away in order to see this remarkable animal; and at this sight more than once already the Duke of Bavaria has exclaimed wistfully: why only he had not become an ichthyosaur; everyone longed to see the beast, and they passed him without paying attention, and nobody would realize they could admire him, too.

Mr. Teodori's drawing is presently being engraved, in the same size and probably the same splendour as the original and Germany shall be proud of a work that no other country possesses.

I close these remarks on the world of Lias with the grave words Mr. Link used to close his physical description of the earth: The examination of the organic forms in the different formations reveals the big truth that organisms have been in a continous state of change and that there never has been regression.

Hence, it is evident that if one day new mountain chains will erupt from the centre of the earth, some species might be destroyed; however, then, a perfect lineage will rise out of the organism of man, a lineage that maybe recognises the surrounding world through the all penetrating ether, as we do through light. And the ether forces back the cohesion of power, as we divide the air in front of us. Thus, that new lineage might be able to traverse the inner earth with the same ease as the skies; a lineage that will look down on the pitifulness of man, as nowadays man does on apes, which inhabit the African trees.

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