



## HOW OBJECTIVE WAS SCIENTIFIC OBSERVATION IN THE EARLY NINETEENTH CENTURY? REFLEXION ON KASPAR STERNBERG'S EXPLORATION IN TYROL

## WIE OBJEKTIV WAREN DIE WISSENSCHAFTLICHEN BEOBACHTUNGEN ZU BEGINN DES 19. JAHRHUNDERTS? BETRACHTUNGEN ZU KASPAR STERNBERGS FORSCHUNGEN IN TIROL

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Mit 6 Abbildungen / with 6 figures

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### Zusammenfassung

Kaspar Sternberg (1761–1838), der in einer späteren Lebensphase Paläobotaniker und Gründer des Böhmisches Nationalmuseums wurde, bereiste zweimal verschiedene Gegenden Tirols. Die beiden Reisen unternahm Sternberg in unterschiedlichen Lebensabschnitten; sie sind mithin eng verwoben mit den sich wandelnden Umständen seines Lebens. In seiner Autobiographie „Materialien zu meiner Biographie“ nennt Sternberg die erste Reise unter dem Jahr 1804, da er als Probst unter dem Fürst-Primas Carl Theodor von Dalberg (1744–1817) im Regensburger Domkapitel zu einer Reise nach Padua beurlaubt wurde. Er beschrieb sie in seiner „Reise durch Tyrol in die Oesterreichischen Provinzen Italiens im Frühjahr 1804“. Das Werk darf heute als eine der bedeutungsvollsten Reisebeschreibungen durch diese Gegend zu Beginn des 19. Jahrhunderts angesehen werden.

Sternbergs Hauptinteressen an Tirol wandelten sich, nachdem er Regensburg verlassen hatte und in seine Heimat Böhmen zurückgekehrt war. Erst im Sommer 1822 begann er seine nächste Reise durch Tirol, eine Reise, die Sternberg nie publizierte, wohl aber eingehend in seiner Korrespondenz mit Johann Wolfgang von Goethe (1749–1832) thematisierte. In diesem Lebensabschnitt hatte Sternberg bereits sein Hauptwerk „Versuch einer geognostisch-botanischen Darstellung der Flora der Vorwelt“ begonnen. Seine Güter in Bržezina (Pilsner Kreis) verfügten über weitläufige Steinkohlenlager, die ihm hiezu ein reichhaltiges Untersuchungsmaterial an Versteinerungen lieferten, abgesehen von der ausgedehnten Steinkohlenformation im übrigen Böhmen. Es überrascht daher nicht, dass Sternberg seine Beobachtungen auf der zweiten Reise nach Tirol auf fossile Pflanzenabdrücke der Steinkohlenlager von Häring/Tirol richtete; weiters nach Miesbach und Peissenberg.

### Abstract

Kaspar Sternberg (1761–1838), later becoming a palaeobotanist and the founder of the Bohemian National Museum, made two main journeys through various Tyrolian areas. These journeys happened in different life periods and were closely interwoven with Sternberg's changing biographical circumstances. In his autobiography "Materialien zu meiner Biographie" Sternberg mentioned his first journey for the year 1804, when, being provost under the arch-chancellor Carl Theodor von Dalberg (1744–1817) in the chapter of Ratisbon, he was officially ordered to Padua. On the occasion he passed through Tyrol, giving him the oppor-

tunity to increase his botanical knowledge by collecting and determining recent alpine plant species mainly around Bozen and at the same time observing the given geognostical facts. He then described the results of these excursions in his "Reise durch Tyrol in die Oesterreichischen Provinzen Italiens im Frühjahr 1804". This work may nowadays be considered as one of the most significant journeys' descriptions of the area at the beginning of the 19th century. It had been praisingly reviewed in the journal "Allgemeine geographische Ephemeriden" in 1807.

Sternberg's main interests in Tyrol were modified, after he had left Ratisbon and had returned to Bohemia. It was not before summer 1822, when he started his next journey to Tyrol. This journey never became published, but it is extensively mentioned in his correspondence with J. W. v. Goethe (1749-1832). At this life period, Sternberg had already started his main work "Versuch einer geognostisch-botanischen Darstellung der Flora der Vorwelt". His manors in Bržezina (Pilsen district) provided rich hard coal areas, which guaranteed him considerable funds of fossil material to examine for this purpose apart from the vast hard coal areas in the rest of Bohemia. It was the knowledge of these happy conditions, which probably made the French palaeobotanist, Barthélemy Faujas de Saint Fond (1741-1819), suggest to Sternberg already in 1805 to examine the primordial flora. It is therefore not surprising, that Sternberg was focussing his observations on his second Tyrolian visit on plant fossils in the hard coal formations at Häring, Miesbach and Peissenberg, comparing the fossil genera and species with those found in Bohemia and facing his geognostical findings in this area with those claimed by Christian Keferstein (1784-1866) and by Alexandre Brongniart (1770-1847) on the Swiss clay-formation.

Tracing Sternberg's relations to Tyrol back is shedding light on the interactions between biographical and scientific facts as well as on the implication of the dimension of time and historicity in historical interpretations.

The dimensions of time and their implication for the interpretation of history in the broadest sense have forever concerned historians, philosophers and scientists in various contexts. Here I am trying to outline an abstract experiment with several aspects of past and future time courses related to two journeys through Tyrol undertaken by the Bohemian scientist Kaspar Sternberg (1761-1838) in the summers of 1804 and 1822. In fact, it was Sternberg himself, who chose the motive of time proportions, when he highlighted the fragmentariness of his first journey in the preface to his Tyrolese travelogue *Reise durch Tyrol in die Oesterreichischen Provinzen Italiens im Frühjahr 1804*<sup>1</sup> and concluded:

Is man himself not an individual ring of Creation, following a short course along a fragment of time and space? Fragmentariness therefore seems to match his nature more accurately than the all-embracing, which has ever been most rarely achieved by individuals. Historians construct the whole by arranging a collection of fragmentary incidents from the past. For – to speak with Bolingbroke, who was very right – : 'Man is born too late and dies too early to see the beginning and the end of all incidences.' If we only had significant primordial frag-

ments of natural history, we would not face so much trouble in decoding seemingly contradictory events in volcanoes, occasionally appearing in Northern Italy, based on a batch of calcareous petrifacts.<sup>2</sup>

The general questions underlying my experiment are: How objective could scientific observation and propagation at the beginning of the nineteenth century possibly be, and what parameters limited their objectivity? Did the various extensions of the examined time courses have any effect on the interpretation of events that had happened in the relevant periods? Considering Sternberg's statement quoted above, the correct reconstruction of history exclusively depends on the significance of the regarded events witnessing its periods. However, Sternberg neither mentions the significance of time in proportion to our own 'fragmentary' lifetime for the cognition of history, nor does he talk about the number of ascertainable significant events as a limiting factor therein. However, the relationship between different time courses and their projection onto human cognitive processes offer an appropriate experimental system for finding the respective answers.

In this context, a few biographical details about Sternberg will prove indispensable<sup>3</sup>. He was born on January 6, 1761 in Prague, the youngest of three

sons. Somewhat against his own will, he followed his parents' wishes and attended the *Collegium Germanicum* in Rome in 1779. After graduating with the degree *theologus absolutus*, he embarked on his career as a clergyman in the Chapter of Ratisbon in 1784 and at the same time became a member of the Free Masons' lodge of Ratisbon. As a consequence of Napoleon's seizure of power in Ratisbon, Sternberg resigned from clerical life in 1810 in order to return to Bohemia, where he spent the rest of his life as a scientist. His main scientific accomplishments concern the foundation and guidance of the Bohemian National Museum (*Vaterländisches Museum in Böhmen*), which he undertook until his death in 1838, and his palaeobotanical studies, which – concordantly with Ernst Friedrich von Schlotheim (1764–1832) and Adolphe Théodore Brongniart (1801–1876) – led to the conclusion that fossil plants had existed since the geological era of the Carboniferous and could be classified according to the Linnéan system with some forms still existing as extant species, and furthermore, that there had been climate changes in the course of the earth's history.

During his years in Ratisbon, Sternberg reached the position of provost under archchancellor Carl Theodor von Dalberg (1744–1817). During this time, he attended to his scientific interests merely as an additional and autodidactical occupation, which mostly concerned botany, galvanism and geognosy. His first journey through Tyrol to Italy was induced by Dalberg's permission to take three months of leave for semi-official affairs in Padua in May 1804. He was 43 years old at the time and open to all cultural, social as well as scientific aspects, which Tyrol had to offer. Sternberg's route to Italy began at Ratisbon, and he made stops in Landshut – Freysing – Munich – Benediktbeuern – Garmisch – Innsbruck – Sterzing – Brixen – Bozen – Trient – Bassano – Padua – Venice. He recorded his observations in a chronologically-structured French travelogue, dedicated and personally addressed to Dalberg in order to express his gratitude; the German version of the travelogue was published<sup>4</sup>. In this travelogue, Sternberg focussed on the cultural history of the region, on its social aspects and on its geognostical features, leaving the results of his botanical studies to a separate publication, i.e. *Reise in die Rhätischen Alpen, vorzüglich in botanischer Hinsicht, im Sommer 1804*<sup>5</sup>, thus combining his botanical excursions in South-Tyrol with those made in the Rhaetian alps on his way back from Italy to Ratisbon. Sternberg's *Reise durch Tyrol* attempted

to shed light on all the aspects mentioned above, thus giving an overall picture of the places visited. In his preface to this work, the author stated that he had confined his notes to topics not previously mentioned by others on a given area, thus selecting central themes from what appeared noteworthy from his own point of view. His scientific observations – apart from his botanical approaches – are limited to the last chapter, and merely give a brief geognostical overview of the region, based on observations that had been previously made by the Tyrolian cartographer Peter Anich (1723–1766) and published in a geognostic map in cooperation with the surveyor Blasius Hueber (1735–1814)<sup>6</sup>. Sternberg mentioned this source in his travelogue together with a few data on Anich's biography<sup>7</sup>. Four copper engravings embellish the travelogue, adding to its aesthetical value rather than to the scientific information on the areas visited. Sternberg's *Reise durch Tyrol* was anonymously reviewed by Carl Haberle (1764–1832) in 1807<sup>8</sup>, who restricted his review to a report of the work's contents rather than expressing any critique on Sternberg's presentation of his journey. Moreover, Haberle went into the geological details of the visited region, but neglected the cultural, historical and social details, which make up a prominent part of the travelogue. His review does not therefore provide much evidence for or against the objectivity of Sternberg's observations.

Sternberg's second journey to Tyrol, in 1822, happened under completely different life circumstances and with a different intention in mind. In 1822, he had started the edition of his main pioneering work *Versuch einer geognostisch-botanischen Darstellung der Flora der Vorwelt*, which appeared between 1820 and 1838 in eight issues<sup>9</sup>. His main hypotheses, that plant species had existed at least as long ago as the Carboniferous period with some similarities to extinct species, and that there had been climatic shifts in the course of the earth's history, were based on plant fossils in hard- and brown-coal formations that had been sent to him from various European countries in addition to those plant fossils he had collected himself. This second journey was aimed at collecting further plant fossils in the coal formation of Peissenberg and Miesbach in Bavaria, and Häring in Tyrol. The relevant fossil plant species were compared with those found in Bohemian hard- and brown-coal formations. Furthermore, Sternberg compared his geognostical conclusions, drawn from the Tyrolian coal formation, with those of Christian Keferstein (1784–1866),

drawn from the area of Häring<sup>10</sup>, as well as with those of Alexandre Brongniart (1770–1847), drawn from his observations in Swiss clay schist formations<sup>11</sup>. All Sternberg's experiences from his second Tyrolian journey are well documented in his correspondence, following his journey, to his friend Johann Wolfgang von Goethe in September 1822<sup>12</sup>.

Jörn Rüsen mentioned the importance of sense-constituting items within time courses<sup>13</sup>. He pointed out that they add to time sense-bearing symbols as a condition for characterising time as culture and that, consequently, not only the three dimensions of present, past and future make up time, but their interactions with those incidences in the course of time, which attribute particular relevance to its periods and add a fourth dimension to time. Bearing this in mind when analysing time in the context of both of Sternberg's journeys to Tyrol, three time courses with particular sequential events may be figured out in my experimental set up:

- (1) the biographical time course, roughly covering the circumstances around Sternberg's first journey to Tyrol in May 1804 with its various subsequent stops, his eventual return from Padua, his botanical excursions on his return journey, followed by a time gap of 18 years before his second journey, initiated exclusively by geognostical and palaeobotanical interests;
- (2) the cultural-historical time course relating to the cultural history of the visited locations, narrated in Sternberg's travelogue of 1806. The term event does not refer to Sternberg's visitation of the various places, but to their historical development. In Sternberg's travelogue, we learn the details of the fortification of Scharnitz, the history of Innsbruck including that of the Franciscan church therein, containing Maximilian I's sarcophagus and its sculptures, called the black men ("*Schwarze Mander*"), representing the imperial family and ancestors; some information about their origin and artistic significance is also given. Sternberg continued his journey from Innsbruck to the fifteenth century castle Ambras and depicted a brief report on the historical and natural collections therein in his work. Likewise, moving to the south, Sternberg communicated his impressions of the cathedral at Brixen. Such cultural comments are totally absent from Sternberg's communications to Goethe after his second journey in 1822.
- (3) A third time course of events may be called the *natural-historical* time course, and there again,

the expression *events* does not relate to the occasions of Sternberg's scientific observations, but rather to the primordial genesis of the described natural witnesses, such as plant fossils, even extinct plant species with respect to their first appearance in nature and geological formations, and also to amply described landscapes. All these natural elements and their scientific significance are discussed in both of the mentioned texts, thus telling a story on their own. No matter, which time course we consider – whether individual life history, cultural history or natural history – as time goes by, history gradually augments life history resulting in an increase of individual memory, cultural history resulting in an increase of collective memory, and natural history resulting in an increase of natural witnesses of their past.

At this point, the question arises as to whether it makes sense to line up three totally different time courses of events whose contexts are indirectly related to each other. Although they all deal with time, their time scales differ greatly: In the biographical time course, there is a time span of weeks, months and years; in the cultural-historical time course, the time span is on the order of centuries; and in the natural-historical time course, the time span is on the order of millions of years. Furthermore, the onset of the three time courses is shifted, the natural-historical time course beginning first, the cultural-historical time course following much later and the biographical time course starting last. By putting the three time scales in a dimensional relation to each other, it becomes obvious, that the protagonist in the biographical time course, i.e. Sternberg, attempted in two minute glances – one in 1804 and the other in 1822 – to capture the disproportionately longer periods of the other two time courses. To understand how he managed this feat, the characteristics and interactions of the single time courses need to be examined, promising a distinct answer to the initially asked questions.

Let me start with the natural-historical time course. It is characterised by being projected into the present by conserving its relicts, such as fossils and other geognostical features currently present in the earth's crust, which in return point back into the past to which they bear witness. They witness the time period of their own genesis, but also of their changes in the course of the earth's history to become traces of the past. The number of available relicts, emerging from the natural-historical time course, must neces-

sarily be regarded as limited. Each of them represents a momentary photographic snapshot from the past, characterised by its morphological features and the position at which it was deposited, but at the same time carries the traces of long-term conformational and environmental changes. They thus constitute elements of dual sense, on the one hand as naturally created objects and on the other hand as traces of time. It is the responsibility of scientific research to put the genesis of these elements into their correct chronological sequence so as to reconstruct the order of events in the course of the earth's history. Yet, the limitation of available conserved relicts causes time gaps within the process of reconstruction, and we find, that the lower the number of available relicts, the wider the time gaps between them and, consequently, the lower the resolution of reconstruction (Figure 1).

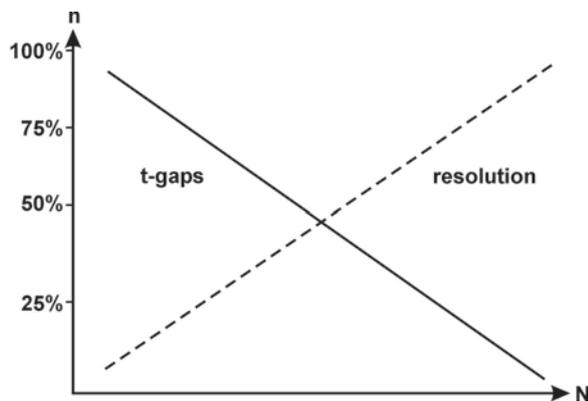


Fig. 1: Negative correlation between the number of relicts and the width of time gaps, and positive correlation between the number of relicts and the resolution of the earth's history's reconstruction; n: number of relicts; N: width of time gap, and the earth's history's resolution respectively.

In Sternberg's letter to Goethe dated September 1822, written after Sternberg's return from Tyrol, the author alluded to the difficulty in assigning the genesis of the formation at Häring to a distinct period. Based on the deposits of dicotyledon fossil plants, which he had found in the formation, he assumed the Tyrolean coal to belong to the later developed clay formation, in contrast to the Silesian and Bohemian hard-coal formations, which are characterised by deposits of monocotyledon plant fossils, which were assumed to have developed earlier than dicotyledon plants. On the other hand, he claimed that the Tyrolese clay formation was still older than the brown-

coal formation, which again exhibits different fossilised plant species (Figure 2).

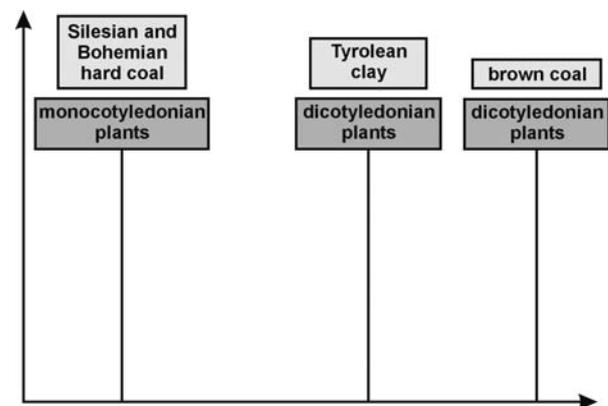


Fig. 2: Sequence of vegetation periods according to Sternberg's view; t: time-axis.

This view agrees with Keferstein's sedimentation map of the region (Figure 3), but contradicts Brongniart's position, who assigned the Swiss clay formation to brown-coal, while Sternberg considered the Swiss clay to be identical to the clay formation in Häring.

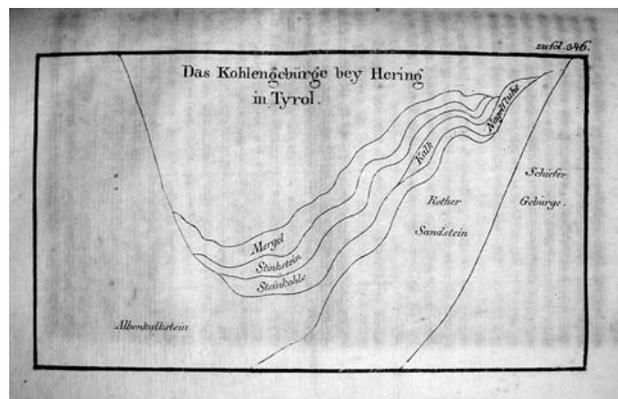


Fig. 3: Sedimentation map of the area around Häring (from C. Keferstein, see note 10, p. 346).

From the observation that plant fossils found in hard-coal-, clay- and brown-coal formations exhibited differences in morphology, Sternberg concluded that they had belonged to different vegetation periods under different climatic conditions, and suggested a tropical climate for the early primordial monocotyledons (Figure 4) before the occurrence of dicotyledons (Figure 5) in clay, and subsequent brown-

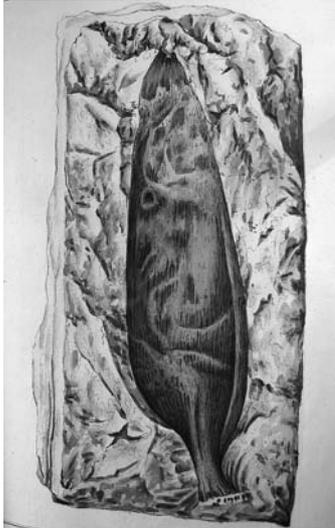


Fig. 4: Plant fossil of a monocotyledon leaf from the Bohemian hardcoal formation of Radnice (from K. Sternberg, see note 9, Issue 4).



Fig. 5: Dicotyledon plant fossil together with shell fossils in the stinkstone from the coal formation at Häring (from K. Sternberg, see note 9, Issue 4, Tab. XLIV, Fig. 5.) The occurrence of shell fossils in this formation served as a further justification for Sternberg to place it temporally before the brown-coal formation (ibid., p. 40).

coal formations with morphological similarities to middle European recent species. The latter he assumed to have lived in moderate climatic conditions.

As stated above, Sternberg published these vegetation differences in his *Flora der Vorwelt*. It is evident, however, that his conclusions were drawn in an indirect manner, based on geognostic comparisons of different areas and on a limited number of observa-

tions. He admitted this fact in his letter to Goethe<sup>14</sup> as well as in his *Flora der Vorwelt*<sup>15</sup>. In a draft of a letter to Johann Gottlieb Rhode (1762–1827), written in 1821, he stressed the importance of selecting geognostically significant fossil plants amongst the collected specimens<sup>16</sup>, which sets an additional limit on the available number of interpretable findings. Therefore, we may consider his scientific conclusions as rather misfocussing zoom-lenses, zooming into certain spots on the large time scale of the earth's history, which inevitably results in a more or less distorted and blurred cropped view of what *might* have happened some long while ago, instead of what actually *had* happened and *when* it had happened. Likewise, what Keferstein would have loved to have seen in the coal formation at Häring was the distinct picture, which he himself called an "ideal profile"<sup>17</sup> (*"idealer Durchschnitt"*), based on a sketch on the spot (Figure 3), but what he actually saw, was hardly more than a distorted blur of this scheme. This is further attested to in his verbal description of the Häring coal formation, in which Keferstein uses expressions to describe the localities of the rock species such as: "somewhat deeper"<sup>18</sup> (*"mehr in der Tiefe"*), or: "The coal seam [...] becomes a little flatter at its base, assimilates to the form of its basic rocks, and forms various cavities and elevations, such as to make one believe for a while that there were many seams."<sup>19</sup> In his letter to Sternberg, dated 3<sup>rd</sup> September 1822 (i.e. after he had published his geognostic profile of the area), he confessed that the proportions at Häring were still "most cryptic" (*"höchst räthselhaft"*). Sternberg's argument to Goethe on the analogy between the Swiss clay formation and the coal formation at Häring and Miesbach is expressed as an open question in Keferstein's letter.

The various interpretative uncertainties encountered in both scientists' correspondence and publications permit the conclusion to be drawn that the probability  $p$  of being faced with a 'distorted reality' in geologic interpretations appears to be negatively correlated with three parameters: (a) the number of significant observations made at a particular geological formation in a particular geographical area, (b) the number of different geographical areas compared within the same geological formation, and (c) the number of different geological formations examined (Figure 6).

The diagram representing this correlation is by no means based on any mathematical calculations but rather serves the purpose of exhibiting the negatively

correlating trend of the viewed parameters in relation to  $p$ .

At first glance, the approach to time seems less critical in the case of the cultural-historical time course. Most cultural history is well documented not only by the cultural objects themselves, but also by the historiography about them, which was written *along* the time course, recounting the history behind the creation of these objects and on their alterations as years and centuries have gone by. Historiography means putting facts into words while viewing time backwards. Otto Gerhard Oexle wrote a brief review on the comprehension of historiography in the course of the nineteenth century<sup>20</sup>. Leopold von Ranke (1795–1886) understood historiography to mean a verbal photograph of 'what had really happened', based on the fundament of historical sources and their critical selection<sup>21</sup>. His belief in the objective reconstruction of history by interpreting provable historical facts was based on his metaphysical conviction that historians were predestined to find the ideas of God in history, as their intellect, being created by God, was apt to take part in God's thoughts. The physiologist Emil Heinrich Du Bois-Reymond (1818–1896), proclaiming the positivistic and empiristic views of later nineteenth century historiography, insisted that scientific methods be applied in order to acquire objective insight into the past, thus regarding historiography as science<sup>22</sup>. Both positions are in contrast to Johann Gustav Droysen's (1808–1884) approach; he pointed out the difference between events that happened in the past, historical sources witnessing these events in the present, and the history of the events as a present narrative<sup>23</sup>. He thus realised that the problem of historiography was linked to the crucial distinction between the actual past and the present knowledge of it. Droysen's understanding of historiography explains why historical reports hardly ever give a one-to-one translation of past reality. His approach was modified by Wilhelm Dilthey (1833–1911), who considered 'nature' and 'history' as two different parts of the same reality, referring to 'nature' as its general part and to 'history' as its individual part<sup>24</sup>. Consequently, history not only regards a sequence of events caused by individuals, but has to take the individuality of the historian into account as well. Understanding history in the course of the nineteenth century is a history of historiographic self-criticism, which steadily grew into the twentieth century. Historians who write about the past often view different

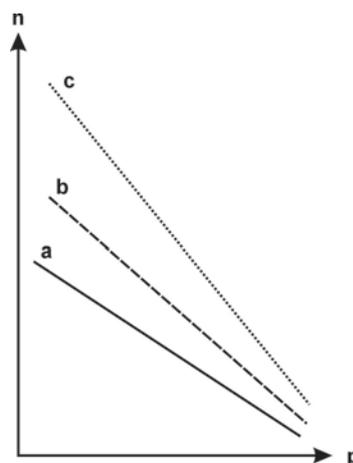


Fig. 6: Negative correlation between 'reality distortion' and parameters (a), (b) and (c) (see text).

perspectives with regard to the era they are living in or to their political, religious and cultural background. Most often, they add their own impressions, opinions, taste and views on the matter to their presentations. In cultural-historical terms, we find this trend illustrated by Sternberg's visit to the Benedictine monastery of Ettal. Although he had visited this location in 1793, he included his impressions of the occasion in his travelogue of 1804, as he pointed out in the preface. His comments on the monastery, which is situated in a charming valley, surrounded by the Southern Bavarian Alps, are heavily superimposed by the author's own personal view of the atmosphere of monastic isolation, criticising parents, who had sent their children to school in this "sombre"<sup>25</sup> ("düster") cloister, as he called it. The genre he saw the Abbey in was obviously influenced by his personal disposition on the day of his visit. The details on the history of the abbey in turn, which are supposed to be hard facts, were frequently at odds with the author's subjective approval or disapproval of the artistic quality of its rebuilt architecture and sacral paintings, the work of Johann Jakob Zeiller (1708–1763) and Martin Knoller (1725–1804), respectively after the monastery had been burned down in 1744. Sternberg did not even mention Zeiller, but only referred to Knoller and criticised his painting in the abbey's choir on the "Descent from the Cross" ("Abnahme vom Kreuz"): "My *sentiment*<sup>26</sup> was rebelling against the esprit of the composition."<sup>27</sup> ("Gegen den Geist der Komposition hat sich mein Gefühl aufgelehnt."), Sternberg's use of the term *sentiment* underscores the subjectivity of his criti-

cism. He continued by explaining why he disliked the painting: the Virgin Mary is shown as *mater dolorosa*, overpowered by sorrow and likely to faint under the impact of her son's crucifixion; St. John and others appear to be exclusively occupied with her. Two followers of Christ, conversing in the background, seem to have nothing to do with the main action, while – in contrast – Magdalene is presented in deep distress, descending to Christ's declining arm. Sternberg's criticism referred to this dualism in the attention, drawn *away from* the crucifixion on the one hand and *towards* Christ's death on the other. He claimed that Mary as the elected virgin was supposed to be strong enough to bear the sorrow put upon her and that all advertency in the painting should exclusively be addressed to the main action, which is the crucifixion. In broad terms Sternberg intermingled the painter's thoughts behind the piece of art with his own feelings and views. This is only one example, *pars pro toto*, of many in Sternberg's travelogue; to outline them all would go beyond the scope of this article. What we read in Sternberg's cultural history is a *depiction* rather than a *description*; in other words: The author's comments on the cultural history of the areas visited became a piece of cultural history in their own right, linked to the circumstances at the moment when being set out in writing. Returning to our experiment, we therefore find that blur and distortion also inevitably show on the map of cultural history, caused this time by the observer's subjectivity.

Due to the lack of sharpness in the display of factual cognition in both of the above time courses, some consideration is required for the cognitive methods of the observer, which are inevitably linked to the biographical time course in our experimental system, i.e. to the sequence of events in the course of both of Sternberg's Tyrolean journeys. In this respect, one main question focuses on the recording method of his travel experiences as a cognitive tool. Besides Sternberg's published German version of his travelogue and the French manuscript, which is held at the Sternberg family archive in Prague, no travel diary or other informative notes are known to be preserved; however, the travelogue's detailed depiction, particularly concerning the cultural and social aspects of the visited areas, gives the impression that either the author had written it up chronologically, while travelling, or that it was based on daily written notes, which later were lost. The depicted details as well as the travelogue's stylistic aspects rather point to a re-

port written from fresh memories. The probability of distorted presentations due to vast time gaps between the visitations during the journey and their being recording in the travelogue is therefore low, and any distorted presentations in the author's depiction can likely be accounted for by the mentioned cognitive subjectivity regarding the cultural-historical time course and by the outlined difficulties in the access to the natural-historical time course, respectively. It should be noted that the author did not fail to include his subjective aesthetical cognition even in his depiction of changing landscapes when travelling from north to south.

Sternberg's subjectivity is not only the result of personal taste and his expectations of what a specific cultural object or landscape should look like, but is also linked to educational and traditional influences, which leads us to Sternberg's biographical time course. Subjectivity therefore points back into the past to a certain extent. Similarly, Sternberg's scientific interests were preformed in the past, i.e. in the progress-oriented life philosophy of the Enlightenment. Indeed, when comparing Sternberg's geognostical descriptions of the north Tyrolean clay formations made in 1804 with those made in 1822, it is striking to find considerable progress in information, differentiation and knowledge in the later version, i.e. in Sternberg's letter to Goethe, even though at the expense of cultural topics. This fact can only be explained by the time gap of almost 20 years between the two journeys, which gave Sternberg ample time to study and acquire knowledge and experience in the geognostic field. When analysing Sternberg's in depth research during this period, we find it linked to various events that happened at various periods in the course of his life. These can be located as hard facts on the scale of his biographical time course. They were primarily based on his favourite science, botany, which he started to study on extinct plant species in the early 1790s, guided by his friends Gabriel Count de Bray (1765–1832) and Amaury Duval (1760–1838). In 1804, he founded the botanical garden in Ratisbon under the patronage of Dalberg and over the years, besides a few botanical travelogues, he prepared his pioneering work *Revisio Saxifragarum*<sup>28</sup>. It was the personal acquaintance he made in 1805 in Paris with the French palaeobotanist Bartholomé Faujas de Saint Fond (1741–1819), which gave his botanical studies a totally new direction: Faujas suggested that he study primordial plant species. This idea was particularly appealing to Stern-

berg, as he owned hard-coal mines on his manors in the Bohemian Pilsen district, promising rich funds of fossil plants. Following Faujas' suggestion, he therefore intensified his occupation with geognosy in order to acquire the necessary knowledge to understand the context between the deposits of plant fossils, and the morphology and development of geological formations. From 1807, he was supported in these endeavours by his correspondence with Carl Haberle, at the time in Weimar, an autodidactically trained scientist himself, but who possessed vast geognostical knowledge and field practice. Subsequently, the Napoleonic politics at the beginning of the nineteenth century put an end to Sternberg's clerical career in 1810 and induced his return to Bohemia, hence leading to his exclusive scientific occupation for the rest of his life. The first issue of the *Flora der Vorwelt* was prepared between 1810 and 1820. This aforementioned sequence of events within Sternberg's biographical time course reveals completely different intentions for his second journey to Tyrol in 1822, this time dedicated to the future progress of scientific knowledge. Furthermore, the coincidences that determined Sternberg's life circumstances not only promoted his scientific interests but also determined the routes and interests of both journeys. Thus – more generally speaking – Sternberg's life provides an example of how a biographical time course with its sequential landmarks as sense-bearing symbols can form a link between scientifically outdated past time courses on the one hand and progress in scientific knowledge to be attained for future time periods on the other hand.

What does this rather trivial context imply for the initial question on the objectivity of scientific observation at the beginning of the nineteenth century? Lorraine Daston has discussed the term *mechanical objectivity* as the late eighteenth and early nineteenth century scientists' puristic attitude of anxiously observing exclusively natural facts and avoiding personal interpretation from interacting with their empirically gained findings<sup>29</sup>. She verified that the idea of objectivity passed through its own history, setting off at scholasticism with altered meaning up to Immanuel Kant (1724–1804) and the subsequent eras until the nineteenth century. Furthermore, she pointed out the paradox between scientists' emphasis on the persistence and inertia of facts, and their simultaneous fear of the subversive forces of their own imagination in the first decades of the nineteenth century<sup>30</sup>. Facts were considered

to be incontrovertibly determined by nature, in contrast to 'artefacts' created by human action. Imagination, on the other hand, was considered to induce artefacts by interpretation. This attitude meets with one of Sternberg's statements in his *Flora der Vorwelt*: "Scientists in the field of applied geognosy must stick to facts."<sup>31</sup> ("*Der praktische Geognost muss bei den Thatsachen bleiben.*"). He did not stand alone in this conviction. Alexander von Humboldt (1769–1859), Goethe and even scientists in other fields and in the tradition of Romanticism, such as the German physicist Johann Wilhelm Ritter (1776–1810), the botanist Christian Gottfried Nees von Esenbeck (1777–1858), or the anatomist Carl Gustav Carus (1789–1869) agreed with him. However, looking at the effect of Sternberg's biographical time course on his mechanical objectivity in scientific progress just as a case study, we may conclude that a distinction should be made between what Sternberg aimed to do and what he actually achieved. In the second half of his life, his goal was to reveal the chronological sequence of geological events, climatic changes and the evolution of plant species in the course of the earth's history; this was a programme that had evolved not only from his earlier botanical interests but also from his access to hard- and brown-coal formations on his Bohemian manors. His goal was to read the book of nature viewed from the perspective of nature's modes of dealing with time. Thereby, not only should the areas visited in Tyrol be regarded but as many different locations on the globe as Sternberg could possibly access. To this end, he delegated the task of collecting samples of fossil plants to additional explorers. The *mechanical* objectivity of the results would thus increase with the number of observations made. Yet, the number of accessible locations was naturally limited by geographical, organisational and technical constraints, and what Sternberg therefore achieved, was a limited objective view, which did not match up to nature's real modes, but rather to its tendencies in dealing with time. This result inevitably left many questions open, and – as outlined above – Sternberg filled the factual gaps by indirect conclusions from his findings. Thereby, he added his own interpretations to the facts, just as he added his own impressions to the depiction of cultural objects; but at the same time, his interpretation paved the way for future evolutionary and palaeontological research beyond the Darwinian era up into the twentieth century.

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## Annotations / Fußnoten

- 1 Kaspar Sternberg: *Reise durch Tyrol in die Oesterreichischen Provinzen Italiens im Frühjahr 1804*, Ratisbon, 1806.
- 2 *Allein ist der Mensch nicht ein einzelner Ring der Schöpfung, der in einem Bruchstück von Zeit und Raum seine kurze Bahn beschreibt? Das Bruchstückartige scheint daher besser zu seiner Natur zu passen, als das Allumfassende, das der Einzelne doch immer nur höchst selten zu erreichen fähig ist. Aus den gesammelten Bruchstücken der Vergangenheit ordnet der Geschichtsforscher die Begebenheiten zu einem Ganzen. Denn, wie Bolingbroke sehr richtig bemerkt: „Der Mensch wird zu spät geboren und stirbt zu früh, um den Anfang und das Ende der Begebenheiten zu sehen.“ Hätten wir in der Naturgeschichte nur bestimmte Bruchstücke aus der Urwelt, so würden wir in dem Gemenge von KalkPetrificaten in Vulkanen, die uns allenthalben in dem nördlichen Italien aufstossen, nicht so vielen Schwierigkeiten begegnen, um die widersprechend scheinenden NaturBegebenheiten zu entziffern.* (See Sternberg, note 1, p. 1 f.).
- 3 For Sternberg's full biography, see Kaspar Sternberg: Materialien zu meiner Biographie, in: *Ausgewählte Werke des Grafen Kaspar Sternberg*, vol. 2 (W. Helekal, ed.), *Bibliothek Deutscher Schriftsteller aus Böhmen* 27, Prague, 1909.
- 4 See Sternberg (note 1).
- 5 Kaspar Sternberg: *Reise in die Rhätischen Alpen, vorzüglich in botanischer Hinsicht, im Sommer 1804. Eine Beilage zum botanischen Taschenbuch*, Nürnberg, 1806.
- 6 Peter Anich and Blasius Hueber: *Tyrolis chorographice delineata curante Ignatio Weinhart, aeri incisa*, Vienna, 1774.
- 7 See Sternberg (note 1), p. 27 f.
- 8 Anonymous: *Reise durch Tyrol in die oesterreichischen Provinzen Italiens im Frühjahr 1804*. Von Caspar Grafen von Sternberg, *Allgemeine Geographische Ephemeriden* 24/3, 1807, pp. 300-314.
- 9 Kaspar Sternberg: *Versuch einer geognostisch-botanischen Darstellung der Flora der Vorwelt*, 8 Issues, (Ratisbon, Leipzig, and Prague, 1820-1838).
- 10 Christian Keferstein: *Deutschland geognostisch-geologisch dargestellt*, vol. 1/3, 1821, pp. 344-351.
- 11 Alexandre Brongniart: *Notice sur des végétaux fossiles traversant les couches du terrain houiller*, Paris, 1821.
- 12 August Sauer (ed.): Briefwechsel zwischen J. W. von Goethe und Kaspar Graf Sternberg (1820-1832), *Ausgewählte Werke des Grafen Kaspar Sternberg*, vol. 1., *Bibliothek Deutscher Schriftsteller aus Böhmen*, vol. 13, Prague, 1902, pp. 29-31.
- 13 Jörn Rösen: *Zeitsinn, einige Ideen zur Typologie des menschlichen Zeitbewußtseins*, in: *Wissenschaftsgeschichte und Geschichtswissenschaft – Aspekte einer problematischen Beziehung* (Stefan Jordan and Peter Th. Walther, eds.), Waltrop, 2002, pp. 168-186.
- 14 See Sauer (ed.) (note 12), p. 30.
- 15 See Sternberg (note 9), issue 3, p. 9.
- 16 Signature SM 178, archive of the Bohemian National Museum.
- 17 See Keferstein (note 10), p. 346.
- 18 See Keferstein (note 10), p. 347.
- 19 *Das Flötz [...] verflacht sich in der Tiefe etwas mehr, richtet sich nach der Gestalt des Grundgebirgs, und bildet daher einige Mulden und Saettel, so, daß man eine Zeitlang meint, es wären mehrere Flötze vorhanden.* (Ibid.).
- 20 Otto Gerhard Oexle: Naturwissenschaft und Geschichtswissenschaft. Momente einer Problemgeschichte, in: *Naturwissenschaft, Geisteswissenschaft, Kulturwissenschaft: Einheit - Gegensatz - Komplementarität?* (Lorraine Daston and Otto Gerhard Oexle, eds.), Göttingen, 1998, pp. 101-151.
- 21 Ibid., p. 106 f.
- 22 Ibid., p. 109.
- 23 Ibid., p. 114 f.
- 24 Ibid., p. 122.
- 25 See Sternberg (note 1), p. 15.
- 26 Italicised by myself.
- 27 See Sternberg (note 1), pp. 16-17.
- 28 Kaspar Sternberg: *Revisio Saxifragarum iconibus illustrata*, Ratisbon, 1810.
- 29 Lorraine Daston: Angst und Abscheu vor der Einbildungskraft in der Wissenschaft, in: *Wunder, Beweise und Tatsachen, zur Geschichte der Rationalität* (Lorraine Daston, ed.), Frankfurt, 2001, pp. 99-123, particularly p. 118.
- 30 See Daston (note 29), p. 119.
- 31 See Sternberg (note 9), issue 3, p. 9.

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