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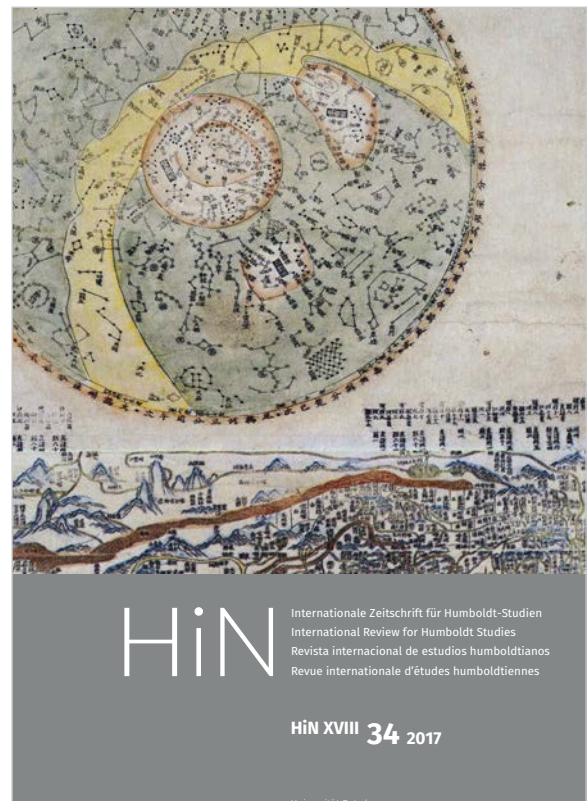
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## Ulrich Päßler

### A Political Economy of Nature. Alexander von Humboldt's *Essay on the Fluctuations in the Supplies of Gold*

#### ZUSAMMENFASSUNG

In seinem Aufsatz „Ueber die Schwankungen der Goldproduktion mit Rücksicht auf staatswirthschaftliche Probleme“ (1838) entfaltet Alexander von Humboldt auf wenigen Seiten eine Weltgeschichte des Edelmetallverkehrs von der Antike bis ins 19. Jahrhundert. Der vorliegende Artikel geht Humboldts ökonomischem Denken als Teil seiner Forschungen zur Natur- und Menschheitsgeschichte nach. Er beginnt mit einem kurzen Abriss der von spätkameralistischen und frühliberalen Einflüssen geprägten Ausbildung Humboldts. Der Artikel diskutiert anschließend eine von Humboldt angefertigte Weltkarte sowie vier darauf bezogene Schaubilder, die historische und zeitgenössische statistische Daten zur graphischen Vision eines globalen Wirtschaftskreislaufs kombinieren. In einem weiteren Schritt geht der Artikel Humboldts Anwendung historischer und naturgeschichtlicher Forschungsmethoden auf dem Gebiet der politischen Ökonomie am Beispiel des Aufsatzes von 1838 nach. Den Schluss der Untersuchung bildet Humboldts Auseinandersetzung mit dem Edelmetall Platin, dessen begrenzte Verbreitung im Widerspruch zur Idee eines freien weltweiten Austauschs stand.

#### RÉSUMÉ

Dans son mémoire « Sur la production de l'or considérée dans ses fluctuations » (1838), Alexandre de Humboldt développa une histoire universelle de la circulation des métaux précieux de l'antiquité jusqu'au XIXe siècle. Le présent article poursuit la pensée économique de Humboldt en la mettant dans le contexte de ses études physiques, naturelles et historiques. L'article commence par un abrégé de l'éducation professionnelle de Hum-

boldt, qui était marquée par des influences caméralistes et libérales à la fois. Puis l'article commente une mappemonde et quatre diagrammes, dessinés par Humboldt; la combinaison des données statistiques historiques et contemporaines constitue la vision cartographique d'un circuit économique global. Dans un second temps, l'article aborde le mémoire de 1838 et analyse l'emploi des méthodes de recherche des sciences naturelles et historiques dans le domaine de l'économie politique. L'article se conclut par un examen des remarques de Humboldt sur le platine, un métal précieux qui en raison de sa répartition naturelle limitée était en contradiction avec l'idée d'un libre échange mondial.

#### ABSTRACT

In his “Essay on the Fluctuations in the Supplies of Gold” (1838) Humboldt presents a global history of the flow of precious metals from antiquity to the 19th century. This paper traces Humboldt's economic thinking within his natural and historical research, starting with an outline of his educational background which incorporated late mercantilist and early liberal influences. It then discusses a world map and four charts drawn by Humboldt, which combine historical and contemporary statistical data into a cartographical vision of a global economic circuit. In a next step, the article explores Humboldt's application of natural and historical research methods in the field of political economy, using the example of his 1838 essay. Finally, the article addresses Humboldt's discussion of platinum, a precious metal whose limited natural distribution contradicted the idea of free global exchange.



Recent research has brought new attention to Alexander von Humboldt's early career as a Prussian state official in the 1790s (Klein 2015, Schwarz 2015). He was educated in the German tradition of Cameralism, which not only dealt with questions of state-regulated economy and finance, but also defined the state's role for industrial progress, public order and welfare. Accordingly, Humboldt's early memoranda on Prussia's manufactories and mines show him as a naturalist, technological expert and political economist at once.<sup>1</sup>

Four decades later, in 1838, Humboldt summed up his economic thinking in a short article entitled "Ueber die Schwankungen der Goldproduktion mit Rücksicht auf staatswirthschaftliche Probleme".<sup>2</sup> The essay drew on material compiled for the *Examen critique de l'histoire de la géographie du Nouveau Continent* and for the yet to be published *Asie centrale. Recherches sur les chaînes de montagnes et la climatologie comparée* (Humboldt 1836–1839, Humboldt 1843). On forty pages, Humboldt presented a global history of mining of precious metals and their distribution from antiquity to his own time.

Foregrounding this little-known treatise, the following paper traces the mutual impact of Humboldt's economic thinking and his research in both the natural sciences and human history. It starts with an outline of his educational and early professional background which incorporated late mercantilist and early liberal influences (I). It then discusses one of Humboldt's maps and four charts, which combine historical and contemporary statistical data, as a depiction of his global vision of economy (II). To explore his application of natural scientific and historical research methods in the field of political economy, the article examines Humboldt's essay on the worldwide fluctuations of gold and silver. In a last step the article addresses Humboldt's discussion of a third precious metal – platinum, whose limited natural distribution stood in opposition to his vision of global exchange (III).

## I

Eighteenth-century economic thinking, generally speaking, was infused with analogies to the natural world in metaphorical terminology and the assertion of certain natural laws. Adam Smith's lifelong studies in astronomy, geology, chemistry and botany supported his conviction that human economy follows a natural order just like the economy of nature (Schabas 2003). Humboldt's teacher Johann Beckmann, professor of economy at the University of Göttingen, was a student and correspondent of Linnaeus. Reminiscing about his first reading of Beckmann's *Beyträge zur Oekonomie* as early as 1788 when he was still enrolled at the University of Frankfurt/Oder, Humboldt wrote, "I realized that I could not understand such an admirable book like Beckmann's *Ökonomie* without the knowledge of plants." (Schwarz 2015, 94, Beckmann 1779–1791) The economist Beckmann supplied information on the processes and products of nature for the purpose of practical application. Yet another of Humboldt's teachers, Johann Georg Büsch at the trade academy (*Handelsakademie*) in Hamburg, investigated the history of the Hanseatic League and wrote an account of a journey to Sweden, relating geography, trade and industry of the country (Büsch, 1815, Büsch 1783). These subjects belonged

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1 See for example two new editions of Humboldt's memoranda on the manufacturing of porcelain and glassware penned between 1792 and 1797: Hülsenberg/Schwarz (2014), Hülsenberg/Schwarz (2016).

2 "An Essay on the Fluctuations in the Supplies of Gold, with Relation to Problems of Political Economy" (Humboldt 1838).

to *Staatsmerkwürdigkeiten*, a peculiar German sub-field of economics that encompassed the collection of historical economic data of states and territories from antiquity to the present age (Brandt 1992, 69–71).

It has been repeatedly demonstrated that the comprehensive approach of Cameralism shaped Humboldt's large-scale socio-economic analyses, above all the "Political Essays" on the Vice-Kingdom of New Spain and on the island of Cuba (Humboldt, 1811, Humboldt 1825–1827, Humboldt 1826). Referring to the *Essai politique sur l'île de Cuba*, Michael Zeuske points out that Humboldt, while maintaining the approach of a "practitioner who was trained in the natural sciences", simultaneously "mobilized the pragmatic-political aspects of his Cameral education and became a contemporary historian, political scientist and sociologist". While Cameralism indeed informed Humboldt's research in important ways, his adherence to this school of economic thought can be defined more precisely: The two *Essais* as well as his American travel narrative *Relation historique* in fact reveal a Humboldt, who gradually turned away from German Cameralism and towards early economic liberalism (Raphael 1995, 757, 764).

Humboldt's training as a mining engineer at the Freiberg Mining Academy combined technological studies, natural research and history with political economy. The teachings of Abraham Gottlob Werner at the Academy followed a Cameralistic mindset in that they combined natural research with the practical application of this knowledge on the one side, and the administrative duties of the mining official on the other (Schimkat 2015, 234). Historicity was an integral part of this outlook, since the mining expert was obliged to assess the future profitability of a district by examining archived administrative documents that provided information on past rates of yield and on the technologies that were used to attain them.<sup>3</sup> Moreover, none of these three aspects—technology, natural resources and historical as well as future profitability—were examined as purely local phenomena. To be sure, the profitability of a mining project had to be assessed by an essentially managerial, cost-benefit-calculation, which, based on geological realities, took into account the cost of required work and resources. But beyond these local geological and labour-related conditions, the final success of a mining venture was contingent upon the profit that could be realized from the sale of extracted minerals and metals—which, in turn, ultimately depended on their worldwide demand. The comparison of geological strata and rock formations across sites all over the world was expected to help to detect promising locations for establishing mines. Comparability was achieved through fieldwork, which, as a crucial part of mining practice, played a key role in the creation of modern geology.<sup>4</sup>

## II

A map designed by Humboldt and entitled "Carte des diverses routes par lesquelles les richesses métalliques refluent d'un continent à l'autre" ("Map of the different routes by which precious metals flow from one continent to another") published in the *Atlas géographique et*

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3 Werner defines the history of mining as an essential element of the discipline (Werner 1811, 175).

4 On this particularly French and German combination of traveling, mining and natural history afield see Cooper (1998) and Fritscher (2015), 219. Perhaps, the Humboldtian approach of "science on the move" as a mode of transdisciplinary research and writing (Ette 2009, 332–336) finds its source in this Franco-German tradition.

*physique du royaume de la Nouvelle-Espagne* (Humboldt 1808–1811) presents us with Humboldt’s global perspective on mining and economy (fig. 1).<sup>5</sup>

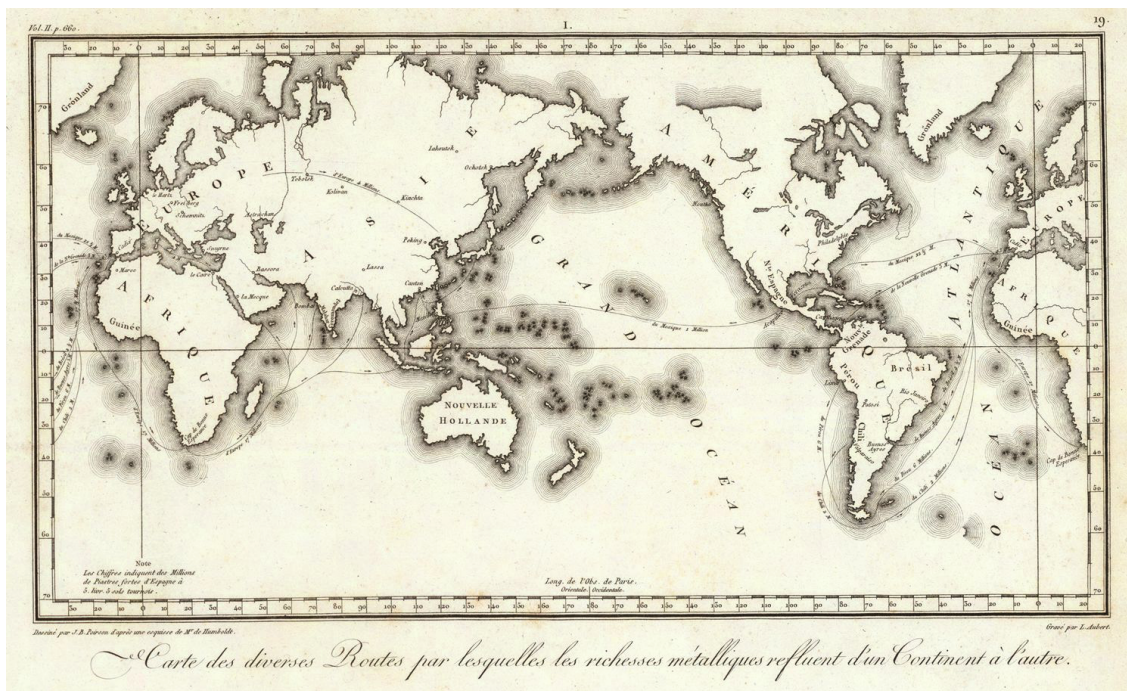


Fig. 1: “Carte des diverses routes par lesquelles les richesses métalliques refluent d’un continent à l’autre”, in: Humboldt 1808–1811. (www.davidrumsey.com, CC BY-NC-SA 3.0)

Three features of this map deserve special attention: Starting with the obvious, Humboldt draws lines to show the global routes of distribution of gold and silver, indicating the direction of this flow with small arrows. Following these lines and arrows, one can see that precious metals do not actually *circulate*. The lines end in Central Asia and they omit completely the interior of the African continent. In the supplementary description of this map Humboldt talks quite generally about a “flux and reflux” of precious metals in a west-to-east direction, which “is opposed to the currents of the oceans, the atmosphere and the civilisation of our species” (Humboldt 1811, I, 184).



Fig. 2: Detail of “Carte des diverses routes par lesquelles les richesses métalliques refluent d’un continent à l’autre”, in: Humboldt 1808–1811. (www.davidrumsey.com, CC BY-NC-SA 3.0)

5 The atlas accompanies Humboldt (1811). For a close analysis of this map and the accompanying charts see Godlewska (1999), 255–257.

A second feature of this map is easily overlooked: Humboldt's rather eclectic choice of geographical names inscribed on the map—or so it seems. If we look at Europe, we will not find Paris, London or any other 19th-century metropolis. Instead we see Cadiz, the Harz Mountains, Freiberg in Saxony and Schemnitz<sup>6</sup> (fig. 2).

Why do we find these places on a map depicting contemporary lines of trade? It is possible, I suggest, that Humboldt chose Cadiz for its historical status as a centre of silver mining and trade from the Phoenicians to Roman times, as described by the Greek historian Diodor. Cadiz was furthermore the main port for the Spanish treasure fleet since the 1500s. Harz, Freiberg and Schemnitz, for their part, were the main mining sites for silver in medieval and early modern Europe, whose importance became more or less nullified in the 16th-century by the influx of silver and gold from the Americas. Hence, this map does not only present contemporary data, but is also a historical map, indicating that trade flows of precious metals are not static but subject to variation.

This leads to a third observation. The geographic map is thematically linked to four charts shown on the same page of the atlas: Two line charts showing the production of gold and silver in American and specifically Mexican mines from 1500 to 1800, and two bar charts, depicting the production of gold and silver in various parts of America compared to Europe and Asia. In this way, Humboldt specifies the two factors of time (“Temps”) and space (“Divisions Géographiques”), which are already alluded to in the superordinate map and this map in turn recomposes the two factors into a third – that of movement, as represented by the lines and arrows of the geographical map (fig. 3).

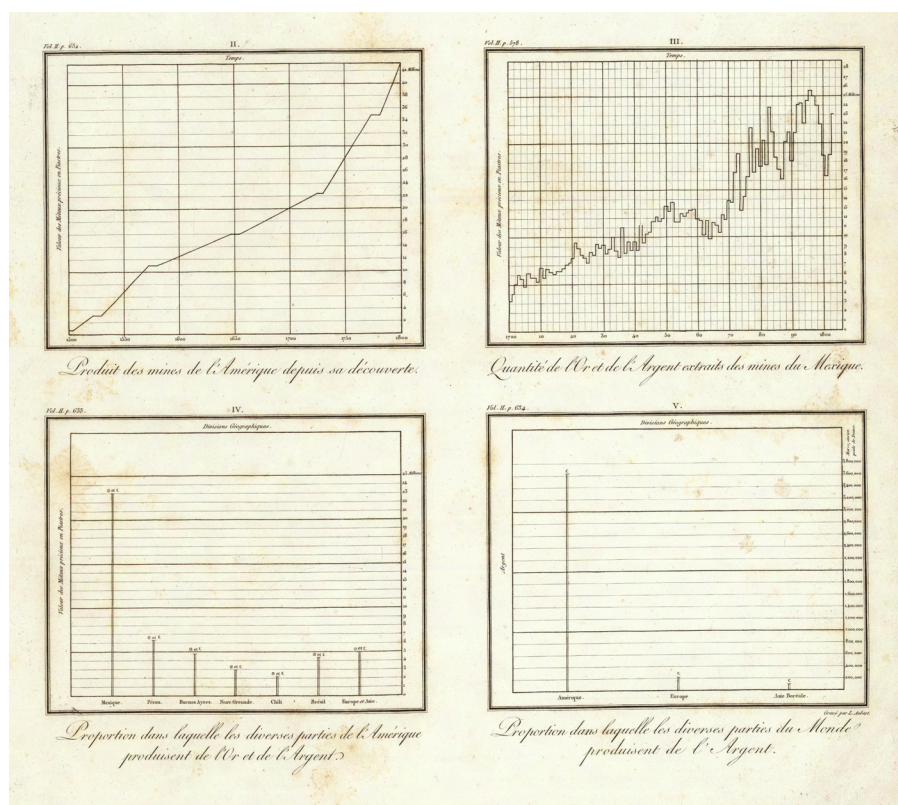


Fig. 3: Accompanying charts of “Carte des diverses routes par lesquelles les richesses métalliques refluent d’un continent à l’autre”, in: Humboldt 1808–1811. (www.davidrumsey.com, CC BY-NC-SA 3.0)

6 Selmečbánya in Upper Hungary, today Banská Štiavnica (Slovakia).

In the description accompanying his Atlas, Humboldt not only acknowledges the inspiring example of William Playfair, who was a pioneer of graphical statistics in political economy. Referring to the four graphics just mentioned, he also states that his data were more exact than those that could be found in the works of Guillaume-Thomas Raynal, William Robertson and Adam Smith (Humboldt 1811, I, 184). Humboldt shares a range of vision with historians and economists and thus establishes a graphic vision of world economy.

In his 1838 essay “On the Fluctuations in the Supplies of Gold”, published in Johann Georg von Cotta’s periodical *Deutsche Vierteljahrs Schrift*, Humboldt once more pursues a question that had already guided his statistical investigation undertaken for the Political Essay on the Kingdom of New-Spain and the accompanying maps and charts: How do contingencies in the production and traffic of precious metals influence their reciprocal exchange value? Specifically, how did the exploitation of considerable deposits of silver in America after 1500 influence the early modern European economy and what was to be expected of the newly discovered riches in gold in North America, the Ural Mountains and the Altai region during the 1820s and 1830s? Humboldt explained his approach to providing adequate explanations:

This change in the direction of the current, this compensation presented by accidental discoveries in the north, when the supply of gold suddenly ceases in the south, is deserving of serious consideration, of examination according to numerical data; for in political as well as in the observation of natural phenomena, numbers are ever decisive; they are the last, inexorable judges, in the much-disputed questions of political economy. (Humboldt 1839, 5)<sup>7</sup>

After a tour de force through 2.500 years of economic world history and a painstaking analysis of historical and contemporary statistical data, Humboldt answers his opening questions using the imagery of the naturalist: “The flow of the precious metals from Asia and America to our smaller continent, and from it partially back again to the parent source, follows, like fluids, the laws of equilibrium.” The connection between Humboldt’s economic research and his ideas of natural science, the investigation of the physics of the earth through the collection of data and the search for mean values is obvious.<sup>8</sup> It may be so, Humboldt adds, that some of these currents dissipate in parts of central Africa and central Asia which do not actively participate in the circulation of precious metals. But he adds: “Under the influence of western civilization, however, from Nertschkinsk, the Altai, and Ural, and beyond the Atlantic from the Missouri, there exists a continual flow in the intercourse of the precious metals.” (Humboldt 1839, 28)

Humboldt’s imagery of hydrodynamics is telling in that it refers back to the Cameralist ideal of a closed economic cycle, while his global and liberal perspective at once prompts him to acknowledge the insufficiency of this analogy.<sup>9</sup> He argues that the countless chaotic perturbations, “the complicated arrangements and fluctuating relations of modern society” (Humboldt 1839, 28), which temporarily influence the value of precious metals (economic, demographic, but also technological factors) eventually even out over time. As Norton M. Wise and Crosbie

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7 All translations from Humboldt (1838) in this article follow the first English edition (Humboldt 1839).

8 On Humboldt’s method of mean values see Knobloch (2009), 36.

9 On the concept of a closed economic cycle within a given territory in Cameralism and Physiocracy and the usage of hydrodynamic imagery see Vogl (2000), 229–231.



Smith have pointed out for the case of Britain during the early 19th century, political economy and natural sciences were both working with the idea of balance, or dynamic equilibrium, whereby natural and economic laws remain unaffected by disruptive accidental causes in the long run (Wise/Smith 1989).<sup>10</sup> Wise and Smith argue that it was this interest in the concepts of equilibrium and balance—informed by the mathematical and astronomic works of Condorcet, Lagrange and Laplace—that helped to bring the notion of temporality into British natural philosophy. I would make a similar point for the case of Humboldtian geognosy. In his purely geological works, Humboldt was unwilling to speculate on the age and developmental history of earth formations.<sup>11</sup> Nevertheless, he linked geographic configurations and the comparative analysis of strata and deposits to the history of humanity when researching the dynamics of political economy. In Humboldt's essay, the dynamic equilibrium represents a progressive course of history that is traceable through economic data. These data show that frequencies and strength of the oscillations in the value of precious metals trend to diminish through the history of trade. Fewer channels of trade and local accumulation of precious metals favoured bigger and more sudden changes in their value during the European antiquity, whereas in the modern age these oscillations have levelled out due to "the universality and rapidity of communication" which facilitated the flow of metals and goods (Humboldt 1839, 4). That is why perturbations in recent history, such as the Revolutions in Spanish America during the 1820s and the Great Recoinage in Great Britain after 1816, only slightly affected the exchange value of silver and gold (Humboldt 1839, 13).

In this sense, the dynamic equilibrium is analogous to the image of the helix used in biology around 1800. In a combination of historical and natural thinking, it signifies a compromise between the concept of the cycle and the idea of linear progress, in that it depicts a steady movement that might approximate, but never actually returns to a prior condition (Lepenies 1978, 28). Humboldt's observation of the "remarkable circumstance in the history of mining" that the ebbing of one mining area gets balanced by the discovery of new sources in another part of the world is not a slip into speculative natural philosophy (Humboldt 1839, 19). Rather, it alludes to human intervention, namely the role of the mining expert in the discovery and operation of new mines. In two detailed passages of his essay, Humboldt presents his own on-site research on the silver mines of Mexico and the gold deposits on the eastern slopes of the Ural Mountains and Altai. The renewed Asian gold extractions have historical relevance in Humboldt's line of argument, because they signify yet another shift in direction of the flow of precious metals in world history (now in an east-to-west direction). Turning his attention from the big picture to the details of applied mining technology, Humboldt then discusses the properties of the Siberian gold washes and reports on new efforts to improve the smelting technology in the Urals, mentioning also the promising development that the workforce now only "consist[s] of well-paid volunteers" instead of serfs (Humboldt 1839, 22).

The case of the Mexican silver extractions since the country's independence is brought forward by Humboldt as a vindication of his own mining expertise:

The assertions so often made, in consequence of unsuccessful speculations, concerning the exhaustion of the Mexican mines, are disproved as well by the geological formation of the country, as by the most recent experience. (Humboldt 1839, 17)

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10 For a history of the general equilibrium theory in mathematical economics see also Ingrao/Israel (1990).

11 Rather, Humboldt speaks of the "relative age" (*âge relatif*) of rocks in a given formation.

Here, Humboldt is directly referring to criticism from parts of the British public. British mining companies had used Humboldt's *Essay on the Vice-Kingdom of New Spain* as a sort of scientific backup to attract possible investors for mining ventures during the 1820s (Rupke 1999, 333, Bernecker 2001, 88–93). Failed projects, mostly due to lack of in-situ preliminary surveys and overall bad planning, were quickly blamed on Humboldt. In the essay on the fluctuations of gold Humboldt refutes his critics with data from the two Mexican mints of Zacatecas and Guanajuato, showing that revolutionary turmoil, not a general exhaustion of deposits, had temporarily held up extraction.

### III

In his historical analysis of the worldwide circulation of gold, Humboldt makes use of the studies of historians, economists and statisticians. But he also resorts to the expertise of trained mining engineers such as his friend and former classmate at the Freiberg Academy Johann Carl Freiesleben, and Ernst Heinrich von Dechen, professor of mining at the Berlin University (Humboldt 1838, 13, 32). To stay informed on the development of mining for precious metals in the Americas, Humboldt also maintained correspondence with several European miners active on this continent during the 1820s and 1830s. During the mid-1820s Humboldt had become interested in the deposits of alluvial platinum of Colombia. Humboldt himself had taken notice of the occurrence of platinum in gold mines in the Chocó district during his American voyage. In his travel journal, he made notes on the earlier practice to bury platinum, since it could easily be used to counterfeit gold coins or gold alloys.<sup>12</sup> After winning its independence in 1819, the state of Gran Colombia envisioned using its platinum resources to mint a coin, thus introducing a new national currency system that would be based on three precious metals instead of two. Humboldt knew about these plans through his contacts with Colombian representatives in Europe, namely Francisco Antonio Zea and Joaquín Acosta. Humboldt instructed one of his protégés, the young French mining engineer Jean-Baptiste Boussingault, who had been hired by the government of Gran Colombia in 1822, to investigate the occurrence of platinum in this region.<sup>13</sup> Boussingault detected the mineralised source of the alluvial platinum found in the valleys of the Chocó on a 9000-foot-high plateau near Medellín in the Antioquia province in 1826 (Boussingault 1826), a breakthrough that enhanced patriotic euphoria for Colombia's "national metal".

Up until the 1820s considerable platinum deposits were only known to exist in Colombia, but in 1824 and 1825, rich deposits of native platinum were also found in the Urals. In an analogy to the idea of the government of Gran Colombia, the Russian government came up with plans to introduce a platinum coin that would serve as legal tender only in the Russian Empire (McDonald/Hunt 1982, 235–243). The Russian minister of finance Georg von Cancrin asked Humboldt

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12 Staatsbibliothek zu Berlin – Preußischer Kulturbesitz, Handschriftenabteilung, Nachlass Alexander von Humboldt, Tagebuch VII a/b (1801–1802), fol. 163v.

13 It can be only noted in passing here that Boussingault, like Humboldt, combined the economic utilitarian imperatives of the mining profession with the task of natural research. During his time in Colombia Boussingault furnished Humboldt with data from such varied fields as meteorology, paleontology, chemistry and botany. Early on, Boussingault also concerned himself with works of economics and population statistics, asking Humboldt to send copies of Jean-Baptiste Say's *Économie politique* and a French translation of Thomas Malthus's *Essay on the Principle of Population* (Humboldt 2015, 60, 86).

for his expertise on this matter in 1827. In a detailed report, Humboldt politely advised against such a platinum-based currency. The world-wide outlook of Humboldt's economic thinking – as visualised in his map on the distribution on precious metals and conceptually elaborated in the essay on fluctuations of gold production – is again clearly discernible in his line of argument. First and foremost, he hints at the geographical disparity and small number of known platinum deposits on the globe. Therefore, this metal could never obtain a balanced value – “an oscillation within narrow limits”, as Humboldt writes. Additionally, Humboldt deems the idea of a coin that would be valid and convertible only in one country as illusory, even if this country was in fact a vast Empire:

The communication of the peoples of both parts of the world [e.g. America and Eurasia, U.P.] is so vivid presently, that a provincial coin in the strictest sense of the word can exist no more. Certainly, an almost immensurable empire, like the one which is dignified by Your Excellency's economic activity, seems to be suited more than any other to give a provincial coin a try; but which country nowadays is isolated like an island? (Humboldt 1869, 12–13)

From Humboldt's vantage point, it was a lack of interconnectedness that hindered free movement and made a dynamic equilibrium as a basis for development impossible. While the Colombian government ultimately refrained from introducing a platinum coin, the Russian government ignored Humboldt's advice and went ahead with its plans in 1827. Their attempt failed and had to be abandoned in 1845.

While gold and silver as commodities of exchange fitted into Humboldt's global vision of free trade and of the circulation of goods and ideas, platinum was a natural product, the use of which remained dubious. Spanish colonial authorities had tended to put it to waste by simply discarding it, post-colonial Colombia and the Russian Empire saw it as a means of monetary and thus economic foreclosure, referring back to early modern mercantilism.

Humboldt concludes his *Essay on the Fluctuations in the Supplies of Gold* with a citation from a letter written by Amerigo Vespucci to Lorenzo Pietro de' Medici on 4 June 1501. Commenting on the newly found sea route to India by the Portuguese, he remarks that from this time on, the spices of Asia will be exported from Portugal to Italy and Alexandria, instead of the other way round as before and ends: “Such is the way of the world (Cosi va el mundo)”. (Humboldt 1839, 32) This citation – the final phrase of Humboldt's essay – constitutes more than just the laconic punch line of an historical anecdote. It underscores the meaning of trade in Humboldt's concept of an open, incomplete history of mankind.<sup>14</sup> Human agency played a decisive role in Humboldt's economics. The study of discoveries and technological developments provided the numerical basis for a postulated dynamic equilibrium in the supplies of gold and its exponential development towards stability. It is the statistical methodology of natural scientific research, based on historical source criticism and the applied knowledge of geology and mining that characterizes Humboldt's political economy of nature.

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14 On a contradicting point of view put forward by Georg Forster who saw “all of world history slowly dissipating” in European trade see Ette (2002), 90–101.

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