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**Text of paper:**

**Exploring the Americas in a Humboldt Digital Library:  
Problems and Solutions**

Frank Baron and Detlev Doherr

*I have omitted to state above the extreme satisfaction I have received from Baron Humboldt's communications. The treasures of information which he possesses are inestimable and fill us with impatience for their appearance in print.*

Thomas Jefferson, letter, June 7, 1804

*I formerly admired Humboldt, I now almost adore him. . .*

Charles Darwin, letter, May 18, 1832

*. . . nothing ever stimulated my zeal so much as reading Humboldt's *Personal Narrative*.*

Charles Darwin, letter, September 22, 1865

New computer technology, with the ability to access bodies of texts from on-line libraries and conduct comprehensive searches, is transforming the way research is conducted. Questions arise: Can the new technology create, at any one point in a given text, especially in a text that deals with travel or exploration, a clear view of the precise geographical and historical context. Can a digital library become a resource to access its total environment, including the background of a particular text and its influence? If so, are these links genuinely enlightening? Can the navigation tools efficiently elaborate on the text and then return to it? If the Humboldt digital library, a joint project between the Max Kade Center for German-American Studies at the University of Kansas and the Computer Center at the University of Applied Sciences in Offenburg, Germany, is to become a viable research tool and a model for treating texts with geographical dimensions, we must consider ways to deal with a number of challenging background issues and technological problems.<sup>1</sup>

With extensive observations and analyses written down after travels in Venezuela, Colombia, Ecuador, Peru, Mexico, Cuba, and the United States between 1799 and 1804, Alexander von Humboldt (1769–1859) generated advances in diverse disciplines, including anthropology, history, archaeology, sociology, botany, zoology, geography, geology, astronomy, and ecology. He published and illustrated twenty-nine volumes relating to his travels in the Americas. The wide range and complexity of Humboldt's legacy presents challenging problems for an edition of his works on the Internet.

At the conclusion of his journey in Latin America, Humboldt's meetings with Thomas Jefferson, James Madison, and other influential American leaders made a lasting impression on American cultural and social history. Humboldt supplied the political leaders with information and maps to show the geography and mineral resources west of the recently acquired Louisiana region (present-day Texas) (Baron 2004). Stephen Jay Gould wrote: "[In the 1850s] Alexander von Humboldt may well have been the world's most famous and influential intellectual" (Gould 2003, 93). As might be expected, an appreciation of Humboldt's significance is still very much present in Germany and France (where Humboldt resided for long periods). The greatest appreciation of his contributions today is undoubtedly in Latin America. Simón Bolívar believed that Humboldt had been the "true discoverer of the Americas" (Helfreich 2004, 303). Evidence of Humboldt's international relevance points to the need for improved access to his writings. At the present time, however, the highly unconventional form of his publications has undermined the awareness and a comprehensive study of Humboldt's works.

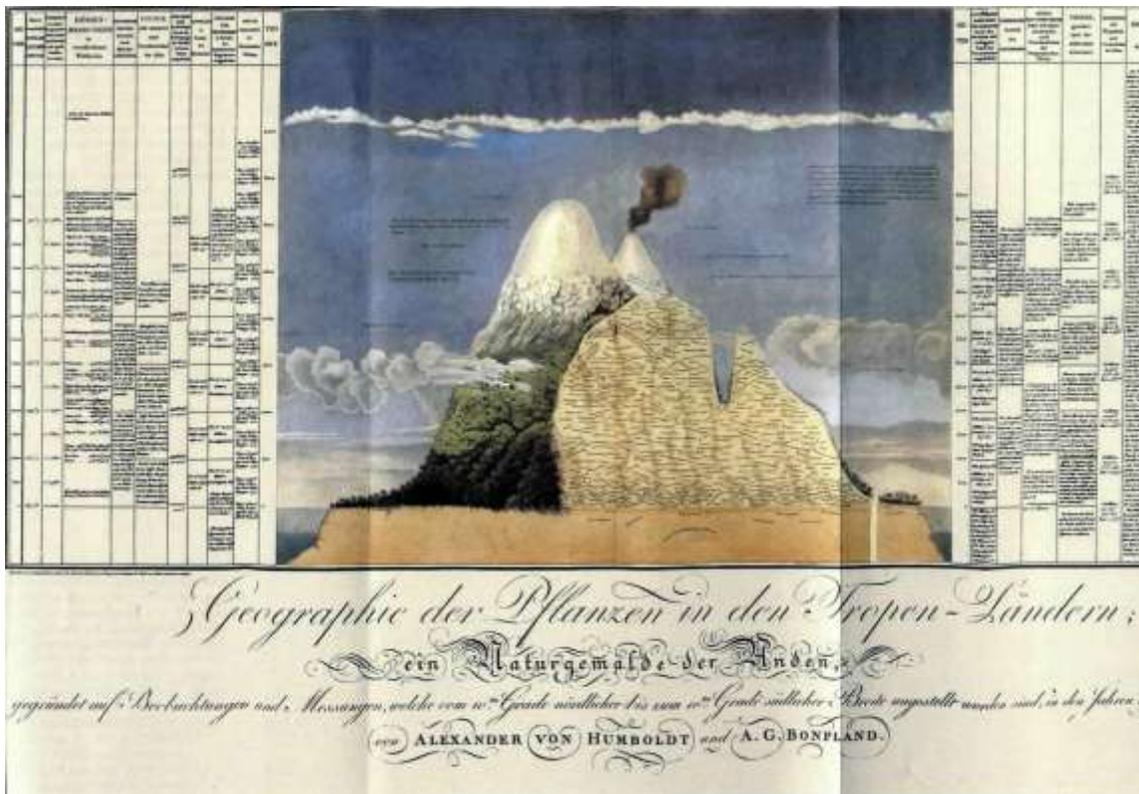
To understand Humboldt's unique historical role, certain prevailing assumptions deserve attention and critical analysis. Biographers often place Alexander von Humboldt's name next to Goethe's. A friendship and mutual respect existed between these two famous German intellectuals. They shared many interests in literature and the sciences. Both articulated holistic views of nature. The manner in which they explored the world displayed aspects that we recognize in the turn to magic in Goethe's *Faust*:

Drum habe ich mich der Magie ergeben [. . . ]  
Dass ich erkenne, was die Welt  
Im Innersten zusammenhält. (Lines 377–383)

(I have turned to magic, therefore, . . . hoping to discover what binds the world together in its innermost being.)

Magic in this sense symbolized for Goethe and for Humboldt the power of scientific knowledge, a key to understanding the harmony, unity, and interconnectedness in nature. Although such ideas had their roots in the ancient Hermetic tradition, Goethe empowered them with a new relevance through his unique poetic language. In Humboldt's works this proposition of unity and interconnectedness in nature is a fundamental and persistent presence. In the preface to *Cosmos* Humboldt wrote: "The

principal impulse by which I was directed was the earnest endeavor to comprehend the phenomena of physical objects in their general connection and to represent nature as one great whole, moved and animated by internal forces" (Humboldt 1863, vii). He applied this concept, for example, when he recommended that landscape artists seek inspiration in the Americas at points where tropical vegetation of the lowlands was not distant from the summits of the Andes. In a single painting, Humboldt suggested, it would be possible to show the features of the tropics and the gradual changes up to the snow-capped mountains. Humboldt foresaw an integration of aesthetics, botany, and geography. Joining the resources of various disciplines pointed the way to breakthroughs in scientific exploration. The same vision of unity is embodied in Humboldt's famous graphic image of the Mt. Chimborazo, which shows plants at several altitude levels. This "plant geography" influenced Goethe to draw a comparative representation of mountain ranges.



Ottmar Ette has described certain aspects of the Humboldtian method of writing. Ette maintains that the complex intertwining of different disciplines goes far beyond stylistic idiosyncrasy. It does not proceed in a linear direction but develops as an interwoven and constantly evolving structure. It embraces internal and external connections, projected to extend to a worldwide communication network (Ette 2001, 2002).

The tendency to link Humboldt and Goethe is problematic, however. It is easy to overlook the fact that in certain respects Humboldt and Goethe approached the sciences of their day differently. Goethe saw little value in experiments and observations for the sake of obtaining precise data or measurements (Holton 2001, 30). He was content with general observations and insights. Humboldt, on the other hand, saw the need to record everything with precision. In contrast to Goethe, he believed that the quantification and subdivision were destined at some point to reveal fundamental unity. British historian Susan Faye Cannon outlined the main features of Humboldt's pioneering work. She wrote that the great new event "in professional science in the first half of the 19<sup>th</sup> century was *Humboldtian science*: the accurate, measured study of widespread but *interconnected real phenomena* in order to find a definite law and a dynamic cause." As she demonstrates, Humboldt was less interested in new theories than in disproving false ones; this step was essential to enable the scientist to make generalizations (Cannon, 1978, 80 and 105).

Furthermore, Humboldt saw all phenomena in the context of a historical development. For him the historical perspective was an active dimension in the web of interconnectedness. Nature existed in space and time. Goethe did not have faith in the ability of humans to recover the past objectively (Danckert 1951, 173). In contrast, Humboldt affirmed the relevance of history for every discipline, perhaps most dramatically in his geographical research. In *Examen critique*, he consulted numerous sources to show how the naming of the American continent occurred (Humboldt 1836). After a meticulous study of the earliest voyages of discovery to the Americas, Humboldt established that the decisive role of cartographer Martin Waldseemüller who placed the name America on his map of 1507. With the aid of early documents and maps the "detective" revealed mistaken notions and reconstructed the actual developments of the past. (Humboldt 1852) Similarly, Humboldt's lengthy study of the El Dorado legend, presented in volume IV of his *Personal Narrative* (1814-1825), also corrected mistaken geographical assumptions and showed how that legend evolved. In his research on the Aztec calendar, Humboldt established a surprising high degree of similarities between Asian and American astronomical designations, but he was careful to refrain from a definitive explanation of possible contacts between the continents. If such contacts had occurred, Humboldt reflected, they would have taken place in the remote past and then been subjected to a long process of evolution. The information he uncovered was for him ". . . intimately connected with the mythology, the manners, and the individual genius of nations; it throws light on the history of the ancient migrations of our species and is highly interesting to the philosopher, presenting him, in the uniform progress of the language of signs in parts of the earth the most remote from each other, an image of the first unfolding of the faculties of man." (Humboldt 1811, II, 152) In North America, Adolf Douai, a German exile of the revolution of 1848–1849, argued that Humboldt had replaced the conception of a personal God with the "idea of organic evolution." He did this in 1859, the year the *Origin of Species* was published, thus recognizing the significant historical relationship between Humboldt and Charles Darwin (Randers-Pehrson 2000, 257). Although such a

provocative formulation by Douai, an avowed atheist, may oversimplify what had actually occurred in the progress of scientific thought, Humboldt's ability to combine geographical, geological, botanical, and zoological observations in a historical continuum undoubtedly prepared the foundation for Darwin's contributions.

When we consider the potential of the digital library to present the works of Humboldt in an innovative way, it is imperative not to lose sight of the full range of philosophical and scientific achievements. There are numerous preconditions for an effective Internet presentation. First, the Web site must represent an advance over the printed and Internet resources now available. Because this subject matter is of interest not only to scholars but also to the general public, a primary consideration must be, moreover, user-friendly access to texts and related materials.

Humboldt's original publications about his Latin American travels are now rare books; only a handful of libraries in the world have complete sets. Humboldt invested a fortune in creating expensive publications (folio volumes, frequently with plates colored by hand). Efforts to make works such as the travel narrative available to a wider public have resulted in the abridgement of the original texts. Many works still remain outside the scope of research. An Internet edition must preserve the author's original intention, retain an awareness of all relevant works, and still adhere to the requirements of a scholarly edition.

Although this project envisions Humboldt's works accessible in at least four languages (English, French, German, and Spanish), the initial focus is on a system that treats texts primarily in English. A digital library with a comprehensive storage of texts, images, and hyperlinks can go a long way toward meeting issues of preservation and access. The system should reach beyond the range of traditional digital libraries by supplying dynamic links to sources, maps, images, graphs, and relevant texts. New forms of interaction and synthesis between humanistic texts and scientific observations need to be created.

In the first half of the nineteenth century people believed that the Chimborazo Volcano was the tallest mountain in the world. Humboldt almost reached the summit of the mountain in 1802. Because no one had ever climbed so high before, reports of this accomplishment made Humboldt a celebrity in Europe. Humboldt's cross-section of the Chimborazo was his most daring experiment in the visual presentation of scientific data (Figure 1). With a great variety and richness of information, the image displays Humboldt's conception of plant geography and reflects his effort to show the unity, diversity, and interconnectedness of nature.

With the aid of such tools such as GIS (Geographical Information System) and Google Earth (a geographical visualization tool), the digital library should create new contexts for Humboldt's observations in the form of dynamic links to texts, databases, other narratives, maps, images, and data. It should establish the essential links within Humboldt's own works in a way that has not been possible in the book editions. In this system, we can also recreate the texts Humboldt consulted during his own research and, at the same time, point to his impressive legacy: influence on important figures such as Jefferson, Darwin, Agassiz, Church, and Muir (Baron 2005).

The structure of the digital library should accommodate diverse layers of humanistic and scientific knowledge. The convergence of a wide range of resources and computer technology should make it possible to conduct efficient searches into any part of the documents and thus allow for the comprehensive analysis of Humboldt's contributions. The complete set of his works on the Americas

(originally written in French and Latin, with one volume in German), must eventually become part of the searchable system.

## 1. Travel, History, Anthropology, and Geography

*Ansichten der Natur (Aspects of Nature)*, 1808, 1 vol.

*Relation historique (Personal Narrative of Travels)*, 1814–1831, 3 vols.

*Vues de Cordillères des Monumens des Peuples indigènes de l'Amérique (Researches [and] . . . Most Striking Scenes of the Cordilleras)*, 1810–1811, 2 vols.

*Essai politique sur la royaume de la Nouvelle-Espagne...avec un atlas physique et géographique, fonde sur des observations d'astronomiques, des mesures trigonométriques et nivellemens barométriques (Political Essay on the Kingdom of New Spain)*, 1808–1811, 3 vols.

*Atlas géographiques et physiques des régions équinoxiales du Nouveau Continent*, 1814-1838, 1 vol.

*Examen critique de l'histoire de la géographie du Nouveau Continent . . .* 1836–1839, 1 vol.

## 2. Astronomy

*Recueil d'observations astronomiques, d'operations trigonométriques et des mesures barométriques*, 1808–1811, 2 vols.

## 3. Zoology

*Recueil d'observacions de zoologie et d'anatomie comparée faites dans l'Océan Atlantiques dans l'intérieur du nouveau continent et dans la Mer du Sud*, 1811–1833, 2 vols.

## 4. Botany

*Essai sur la géographie des plantes, accompagné d'un tableau physique des régions équinoxiales*, 1805, 1 vol.

*Plantes equinoxiales*, 1805–1809, 2 vols.

*Monographie des Melastomacées*, 1816–1823, 2 vols.

*Nova genera et species plantarum*, 1815–1825, 7 vols.

*Mimoses et autres plantes légumineuses du Nouveau Continent*, 1819–1824, 1 vol.

*Revision des graminées*, 1829–1835, 2 vols.

We have scanned and digitized fourteen volumes of the English translations of works relating to Latin America: *Aspects of Nature*, *Personal Narrative of Travels*; *Researches*, *Most Striking Scenes of the Cordilleras*, and *Political Essay on the Kingdom of New Spain*. These are the texts in use in various languages and by which Humboldt is known to the scholarly world today. We have these texts now in a digital library based on *Eprints*, a tool of the Open Archives Initiative ([www.openarchives.org](http://www.openarchives.org)) and in a relational database. By means of *Eprints* they will become available on the Internet in the near future. Humboldt's writings in the humanities, most of which have been translated, have enjoyed considerable public appeal. The translations reflect a general preference for Humboldt the humanist rather than for Humboldt the scientist. Such a separation of spheres is not acceptable; even within the translated works a constant shifting of focus from one sphere to another takes place. Any separation is artificial.

Despite our initial attention to the English translations, we would consider it a grave mistake to follow the general tendency and ignore the previously untranslated texts. As a next step in creating a

viable digital library, the inclusion of all botanical works would make sense. Because of limited availability, these volumes are relatively little known or researched. It is true that under the title of Gallica, the *Bibliothèque nationale* in Paris provides the texts of these work through the Internet (<http://gallica.bnf.fr/scripts/catalog.php?MA=HUMBOLDT%20ALEXANDER>). These texts are available only as black-and-white images and are not searchable. This is a serious disadvantage that our system overcomes. Above all, links from the translated works to the original texts, maps, graphs, and illustrations of the entire body of Humboldt's works become possible. At an early stage of this project, the scanning and digitizing of all original texts must be completed. Only then can links between texts available in English and all other relevant information be established. The extension of the digital library from the basic English text unit to the entire range of the original twenty-nine volumes is essential.

The capability to search through fourteen volumes of English translations will represent an advance for Humboldt scholarship. In addition, new technology presents a number of opportunities to navigate through these writings in new ways. Two examples may suffice.

When we turn our attention again to the famous graphic of the "Geography of Plants" (Figure 1), it becomes clear that this image is significant primarily for its dramatic emphasis on the geographic factor in plant distribution. It owes its fame more to its aesthetic qualities than to its scientific value. Even in the folio edition, the data appear too small for the naked eye. Beyond an aesthetic impression, Humboldt's original display does not provide easy access to specific information. Modern computer technology offers an opportunity to overcome the limitations of the print medium. By expanding and magnifying the concentrated form of the data, the digital library can guide the user to Humboldt's vast store of botanical and geographical information. If we zoom into the mountain with its many plant genus designations, we can create links to plants that Humboldt and Bonpland had described in great detail. For many of these plants beautiful color plates exist, and these can appear on the computer screen in response to two or three clicks. The user can ascertain when and where Humboldt located the 700 plants of the *Nova Genera et Species Plantarum*. The digital library provides all relevant data to recreate the geographical context of these plants. Although this path does not lead to all of the thousands of plants the explorers described in fifteen volumes, the possibility of accessing this material will become evident, and the user of the system can simply search for specific plants or plant families independently of the graphic image. The graphic image of Chimborazo can become a useful navigation tool. For example, the precise location or distribution of individual plants two hundred years ago can be compared to the condition of the same plants today.

The Google Earth program offers another path of discovery in the digital library. By means of satellite photographs, the user can visit specific locations where Humboldt traveled. Zooming into Ecuador and Mt. Chimborazo will reveal the mountain, the summit of which Humboldt almost reached. Google Earth allows the insertion of a text box that contains in Humboldt's own words a succinct description of the spectacular event that made him famous in the Americas and Europe.





Figure 3. A segment of Humboldt own map of the area that includes the Chimborazo, to be available as an overlay on Google Earth. Source: *Atlas géographiques et physiques des régions équinoxiales du Nouveau Continent*, 1814-1838. Plate 25. Courtesy of the Department of Special Collections, Kenneth Spencer Research Library, University of Kansas, Lawrence, Kansas.

Before departing for Europe from Philadelphia in 1804, Humboldt prepared a summary of his five-year exploration of the Americas. He sent this text to his American host, John Vaughan, who translated it into English from the original French for publication. This summary, called the “Philadelphia Abstract” (see Appendix) offers useful orientation about almost any point in the course of the explorer’s lengthy journey. Although users of the digital library may not initially know precisely which texts or images may be of greatest interest, they can trace Humboldt’s journey by means of the Google Earth program. At each a text box indicates Humboldt’s statement about the significance of that particular location. The individual segments of the “Philadelphia Abstract” provide a convenient transitional navigation tool and can point the way to other, more specific locations or texts in the digital library.

The abstract provides a comprehensive overview. Humboldt’s *Personal Narrative (Relation historique)* often strays from a strictly chronological account (Humboldt 1814-1825). After his return to Europe Humboldt conducted research and often inserted discourses or articles of various lengths. These digressions make it difficult for the reader to follow the sequence of events in the journey, and the problem is aggravated by the fact that the *Personal Narrative* breaks off at the beginning of the Colombia journey. A detailed chronological narrative is still lacking for Ecuador, Peru, Mexico, and Cuba. Although Humboldt kept a diary, which has survived in manuscript form, no English version of it has appeared (Faak 1986 and 1990). The “Philadelphia Abstract” provides the basis for reconstructing the

five-year journey in a strictly chronological sequence. At each point the digital library can create a path to relevant observations from the *Personal Narrative*, as well as material from other volumes, which contain the maps, data, and images or information about society, politics, landscapes, geological formations, plants, animals, etc. The identification of almost any point along the Humboldt's route can lead to the recovery of geographical, anthropological, and biological environment of the early 1800s. Thus, the digital library can do more than simply recover rarely considered aspects of Humboldt's works; it can also restructure its extensive and complex content in a form that conforms to a user's primary interest. For example, the Humboldt digital library will provide the basis of comparison about the distribution of plants or animals in Humboldt's time in a specific location with the conditions existing there at the present time.

In Humboldt's works, this proposition of unity and interconnectedness in nature is a fundamental and persistent presence. In 1803, in his American diary Humboldt made an assertion that could stand as a motto for the digital library: "Everything is interconnected." Although this statement sometimes appears in scholarly presentations, it is not necessarily documented. Humboldt made the abrupt assertion "Alles ist Wechselwirkung" in German in the context of French diary entries in Mexico (Faak 1986, 358). One should keep in mind that the German word *Wechselwirkung* goes beyond the implications of the English *interconnected*. It implies, in addition, that everything has an impact on everything else. With its multiple traditional and dynamic features, the proposed library's structure can reveal a network of connections and paths of navigation for a better understanding of Humboldt's achievements.

The Humboldt digital library is a work in progress. The present Web site of the prototype ([www.avhumboldt.net](http://www.avhumboldt.net)) is open for continuous changes, corrections, and, above all, additions and links. Such a network of interconnectedness is consistent with Humboldt's holistic philosophy. The web of links also creates bridges to the historical and scientific sources that Humboldt depended on, along with the documentation of his influence. In this way Humboldt's historical dimension of his achievements and vision will also become part of the web of connections.

## NOTES

1. First proposed in the year 2000 by Rex Clark to the Max Kade Center for German-American Studies at the University of Kansas, the project has evolved with the support of numerous scholars in the United States and Germany. The working group at first consisted of partners at the University of Kansas (the Max Kade Center for German-American studies and the German Department, the Museum of Natural History, the Anthropology Department, and the Kansas Geological Survey). We gained partners at three research institutes in Germany (Humboldt Research Center in Berlin, the Eutin State Library for Travel Literature, and the Computer Center at the University of Applied Sciences in Offenburg), and, with the aid of a Transcoop grant, we conducted a series of meetings and conferences. Active participants in these early stages of the project were: Ulrike Leitner (Berlin), Wolfgang Griep (Eutin), Detlev Doherr (Offenburg), and Rex Clark (Lawrence).

2. Holton assigns to Goethe's holistic vision as expressed by Faust a significant impulse in Einstein's groundbreaking theories of the early twentieth century. (Holton 2001, 31).

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