

Humboldt's Plant Geography as a Web Service

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IV.21 Humboldt's Plant Geography as a Web Service

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Abstract

The concept of the interconnectedness of nature, which Humboldt articulated in different forms throughout his life, was an idea that dictated his approach to all disciplines, and it forms the basis for conceptualizing all aspects of this project. Because printed versions of Humboldt's texts and graphic present information in an extremely reduced form, it is the goal of the present project to make Humboldt's vision of plant geography accessible in a way that the technology of his time could not do. In contrast to the printed mode or even compared to a traditional digital library, a dynamic system can take full advantage of the innovative features of Humboldt's graphic. This prototype is based on the 700 plants of the "Nova Genera et Species Plantarum", but the expanded system will eventually include all plants that Humboldt and Bonpland described there.

Introduction

Alexander von Humboldt was one of the first German explorers, who travelled around the world and described precisely, what he found and discovered. He wrote in the preface to his *Cosmos* [Humboldt, Alexander von: *Cosmos*, 4 vols., great whole, moved and animated by internal forces." During the time of his explorations, Thomas Jefferson pointed out in a letter, June 1804, that "I have omitted to state ... the extreme satisfac-

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tion I have received from Baron Humboldt's communications. The treasures of information which he possesses are inestimable ...". And even Charles Darwin wrote 1832, that "I formerly admired Humboldt, I now almost adore him ...".

Encouraged by the vision of Web service the principal investigators met at the Max Kade Center at the University of Kansas, Lawrence, in 2001 and developed the concepts of the Humboldt digital library as an online information system to preserve the legacy of Alexander von Humboldt. The Max Kade Center (See fig. IV.21-1) is related to the Department of German Literature at the University of Kansas and provides a forum for literary, artistic, historical, and musical events that document the role of German-speaking immigrants in the development of American culture.

The Computer Center of the University of Applied Sciences in Offenburg, Germany, is hosting the Webserver and provides the online system to present the ongoing research work. Also they support the technical development of applications and database programming of the project.

Based on the work of a research activity in Summer 2006 at Max Kade Center in summer 2006, where the principal investigators worked out the Web portal for the Humboldt Digital Library, the flexibility of this system can be demonstrated on the basis of selected texts with a view of Humboldt's "Plant Geography" and the visualization of Humboldt's travels (using Google Earth as a navigation tool). Both aspects are online accessible on: <http://www.avhumboldt.net>

The Dynamic Digital Library

For Humboldt's most important writings on Latin America, data mining is now available (See fig. IV.21-2). Fourteen volumes of Humboldt's works in English translation (Personal Narrative of Travels, seven volumes; Aspects of Nature, one volume; Researches ... and Most Striking Scenes of the Cordilleras, two volumes; and Political Essay on the Kingdom of New Spain [Mexico], four volumes) have been scanned and digitized and allow users to search for specific words or phrases. Combined with the digital text service, our system will provide additional Web services for data mining and information research.



Fig. IV.21-1: Max Kade Center in Lawrence, Kansas

Our vision of the Humboldt Digital Library goes beyond the traditional system. Humboldt's idea of interconnectedness requires a system of flexible navigation from any point in the digital library to any other related point within and outside Humboldt's works. The digital information system is therefore based on modern client-server technology in combination with document server, map server, and database server. The system integrates the document services with a database containing Humboldt's texts and images in a paragraph structure. Although the initial focus is on Humboldt's works in English translation, it is our intention to create a structure that accommodates the works written originally in French, along with translations into German and Spanish (making efficient comparison of texts possible).

A further innovative feature of this dynamic system is that it can recreate the context of a particular text, making it possible to view images, georeferenced and interactive maps, information about plants, animals, and scientific facts relevant to Humboldt's observations. Although the digital library contributes by accessing rare books, the greatest advantage of the dynamic system will be its capacity to connect data from diverse locations in Humboldt's twenty-nine volumes and allow comparison with modern scientific knowledge and developments.

Plant Geography

In the first half of the nineteenth century people believed that the Ecuadorean Chimborazo volcano was the tallest mountain in the world. Alexander von Humboldt, accompanied by Aimé Bonpland and Carlos Montúfar, 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 (See fig. IV.21-3). With its 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.

The cross-section shows Latin plant names at various altitudes. In columns

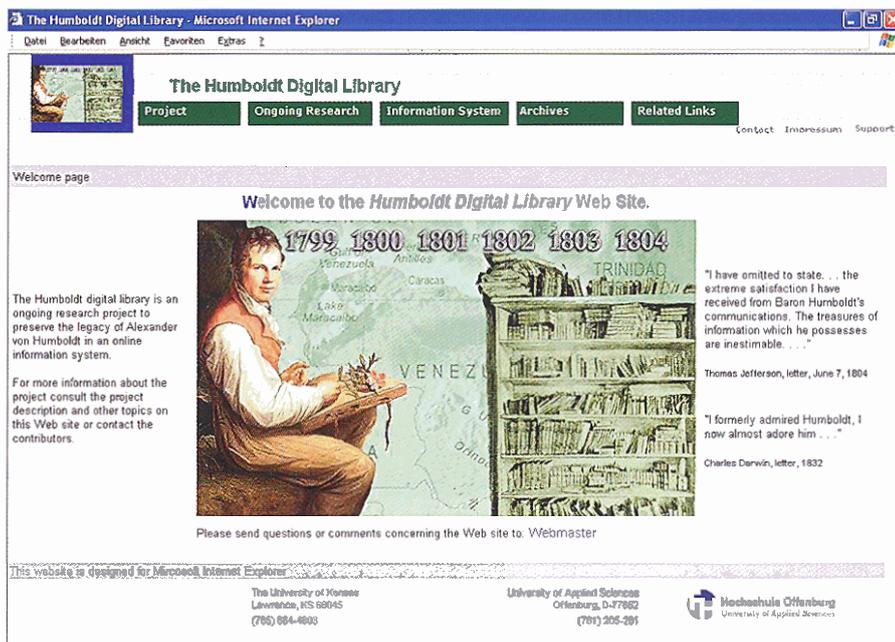


Fig. IV.21-2: The Web portal of the Humboldt digital library (<http://www.avhumboldt.net>)

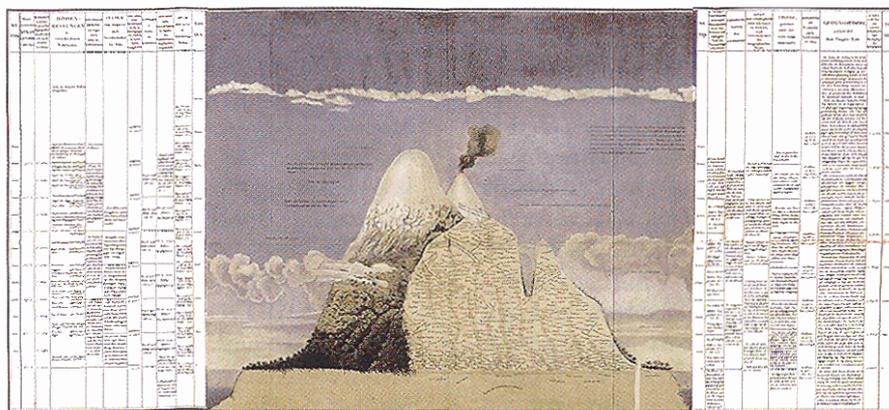


Fig. IV.21-3: Humboldt's cross-section of the volcano Chimborazo in Ecuador, showing Latin plant names related to altitudes together with relevant physical measurements, published by Alexander von Humboldt in the "Geographie des Plantes Equinoxiales" in his volume "Essai sur la Geographie des Plantes".-A.v.Humboldt & A. Bonpland, Paris, 1805

to the right and left of the cross-section, Humboldt presents relevant climatic conditions such as temperature, barometric pressure, etc. 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.

During their exploration of the Americas, Humboldt and Bonpland observed thousands of plants unknown in Europe. They described them in detail and supervised the preparation of colored lithographs. Although the digital library will eventu-

ally accommodate the entire range of descriptions and images, at the present time the Chimborazo graphic illustrates how it is possible to access information about the plants that Humboldt considered the most important discoveries. The user can ascertain when and where they located the 700 plants of Humboldt's "Nova Genera et Species Plantarum" (See fig. IV.21-4). The digital library provides all relevant data to recreate the geographical context of these plants.

So a click anywhere on the image opens clearly legible Latin plant family names (genus). The user may access four regions; Humboldt divided according to the altitude in which the plants are

found. Within each altitude segment, the names of the plant families are color coded with blue for Humboldt's observations on specific plants; green for color plates of plants, together with their descriptions; and black for further information in the digital library. A click on the names opens windows to Humboldt's succinct information about specific plants (the location at which Humboldt and Bonpland observed the plants, altitude, and time of blooming).

In several columns to the left and right of his famous graphic image Humboldt provides many detailed measurements and observations. This additional information relates to specific regions and altitudes (See fig. IV.21-5). A click on the narrow left and right borders opens columns with specific categories (such as temperature, barometric pressure, boiling point of water, zoological information, geological data, etc.) Further navigation within the columns leads to Humboldt's texts on specific issues and can open further links within the digital library.

A click on a flag above the graphic display will change the text to German, English, or Spanish (French will be added in the near future). In addition, the system has a network of links to the complete collection of scanned texts and images in the Bibliothèque Nationale de France (site name: Gallica).

Humboldt's travel narratives suggest innovative features. With the aid of navigation between text and interactive maps, users of the digital library will gain unprecedented access. For example, Humboldt's data on plant and animal distribution can be useful for analyzing the change in patterns during the last two hundred years. We envision a digital library that allows the visitor to reconstruct Humboldt's path, encounters, and discoveries simultaneously from different perspectives and more precisely than ever before. This work will contribute to the linkage of scientific to humanistic themes, in keeping with Humboldt's holistic vision.

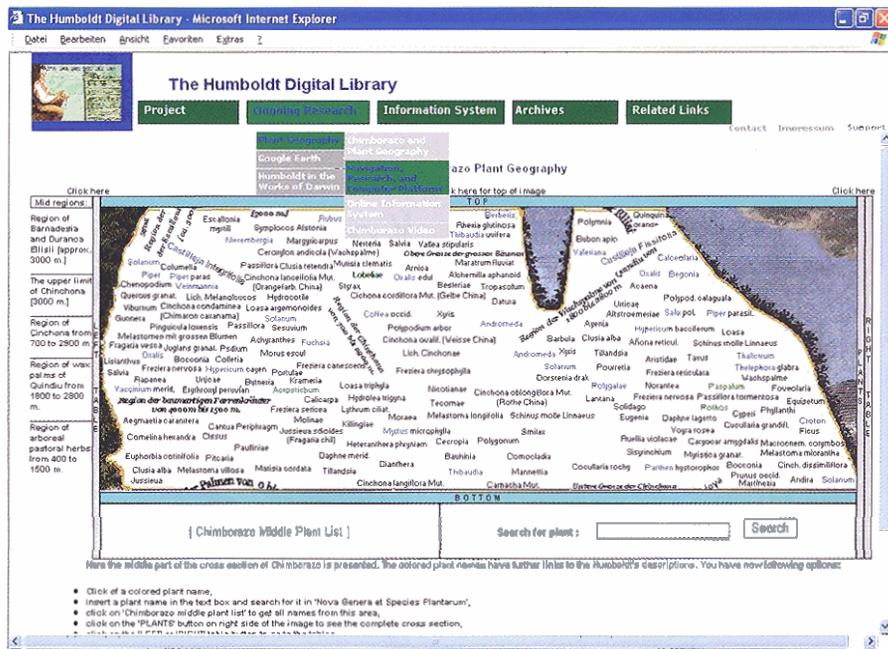


Fig. IV.21-4.: Interactive cross section of the middle part of Chimborazo mountain containing Latin plant names, which are linked to plant descriptions and images from the „Nova Genera et Species Plantarum“ and the digital library of Gallica from Bibliothèque Nationale de France

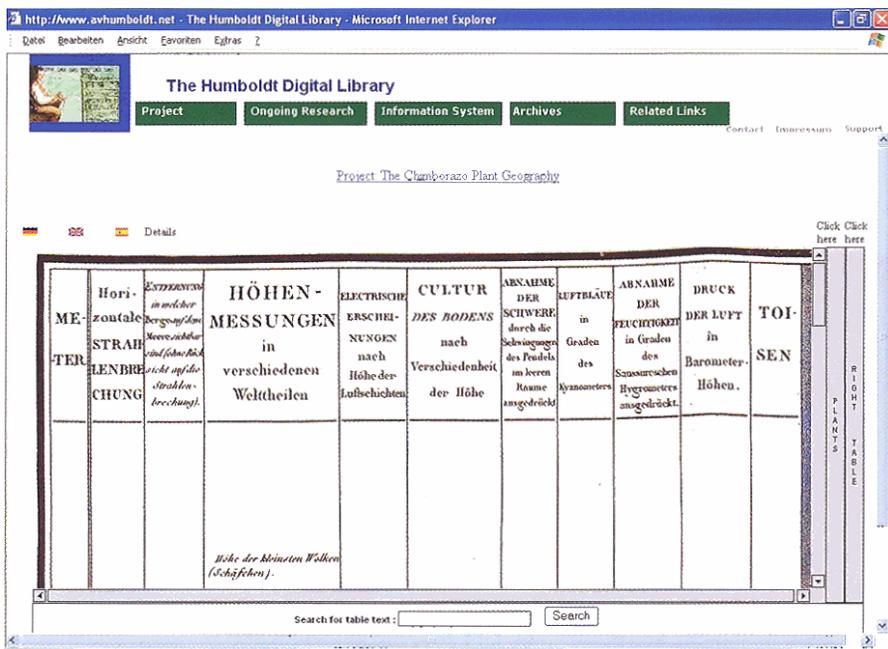


Fig. IV.21-5.: Presentation of the left table containing altitude related measurements, which opens the access to linked texts by mouse click on the entire part of the image

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