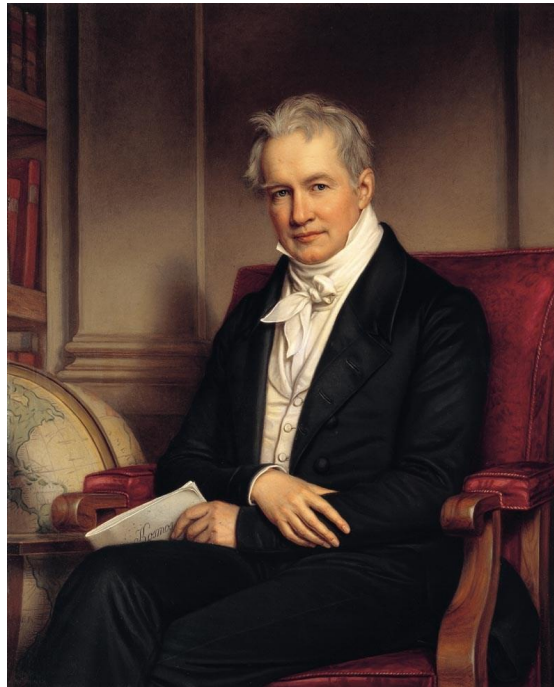


# From Science to Cosmos: What we can learn today from Alexander von Humboldt

Damien Ehrhardt,  
Université d'Evry / Paris-Saclay



Joseph Karl Stieler, *Humboldt and his Kosmos*, 1843



*Schiller, Wilhelm und Alexander von Humboldt und Goethe in Jena, Holzstich, 1860, nach der Zeichnung von Andreas Müller, in Die Gartenlaube, 8/15, Leipzig, Ernst Keil, 1860, p. 229. Berlin, Sammlung Archiv für Kunst und Geschichte.*

Goethe on Humboldt, 1826

*Er gleicht einem Brunnen mit vielen Röhren, wo man überall nur Gefäße unterzuhalten braucht und wo es immer erquicklich und unerschöpflich entgegenströmt.*

*He is like a fountain with many spouts, under which you need only hold a vessel; refreshing and inexhaustible streams are ever flowing.*

# Humboldt measuring the world for the progress of science



- Humboldt measuring the world and constantly taking readings



# Humboldt measuring the world for the progress of science



- Humboldt measuring the world and constantly taking readings
- *Reisetagebücher*, diaries which are likely to contain the world



bp bildarchiv preussischer  
k kulturbesitz

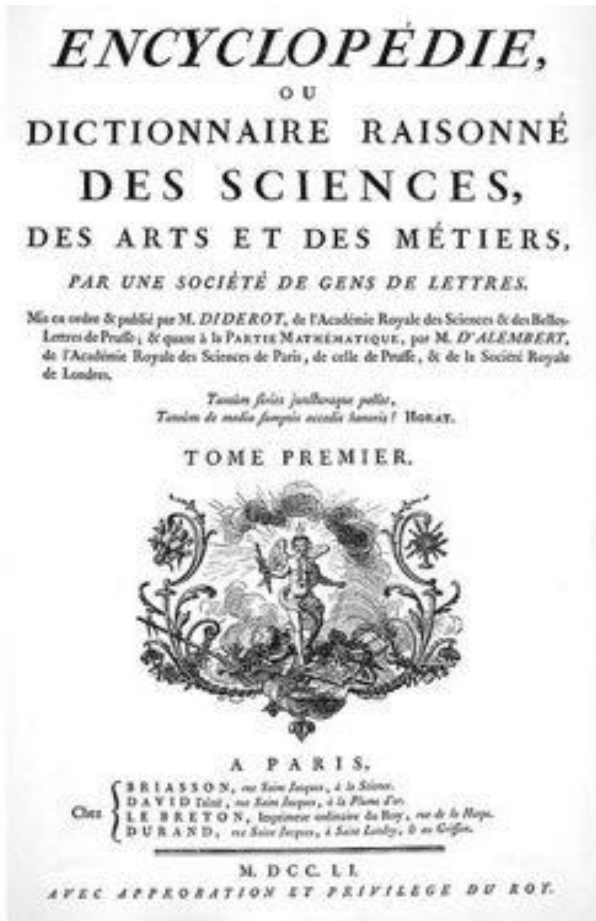
Eduard Hildebrandt, *Alexander Von Humboldt in seiner Bibliothek*, 1856, Berlin,  
Staatliche Museen zu Berlin – Preußischer Kulturbesitz, Kunstbibliothek





Eduard Hildebrandt, *Alexander Von Humboldt in seiner Bibliothek*, 1856, Berlin, Staatliche Museen zu Berlin – Preußischer Kulturbesitz, Kunstbibliothek

# Humboldt measuring the world for the progress of science



- Humboldt measuring the world and constantly taking readings
- *Reisetagebücher*, diaries which are likely to contain the world
- He was aware of the role of Enlightenment for the development of science

Title page of the first volume of the  
*Encyclopédie*, published in 1751

Alexandre de Humboldt to the editor-in-chief of the  
*Journal de Bordeaux*, 24 thermidor an XII  
(12 August 1804):

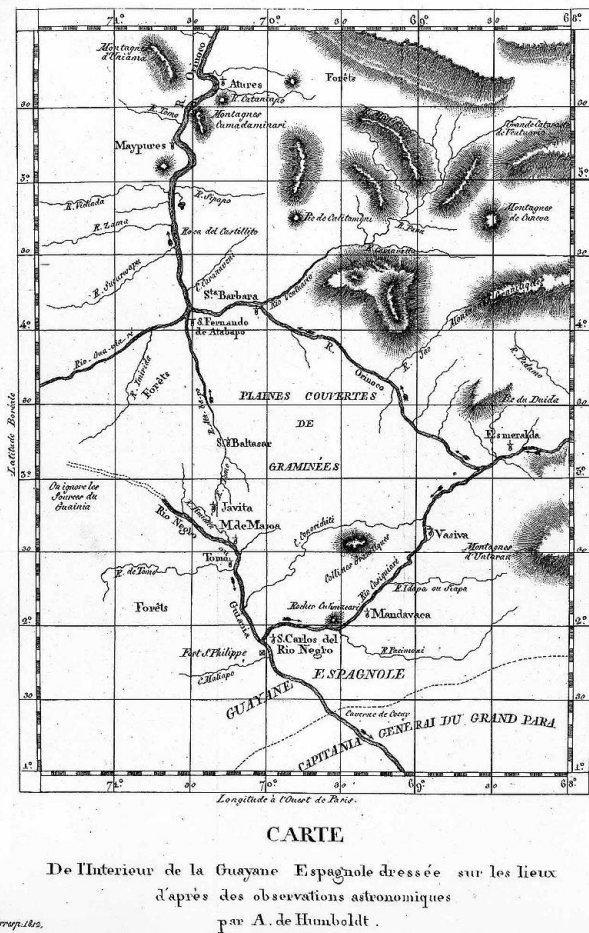
*Il est connu que je ne suis venu à Madrid l'an 1799 qu'afin d'y solliciter la permission de la Cour pour faire à mes propres frais des recherches dans les vastes colonies soumises à l'Espagne. Cette permission m'a été accordée avec cette libéralité d'idées qui caractérise notre siècle, et à laquelle on doit le progrès rapide des connaissances humaines*

Translation:

*liberality of ideas which characterizes our century,  
and to which we owe the rapid progress of human knowledge*



# Humboldt measuring the world for the progress of science



Map of the Cassiquiare canal based  
on Humboldt's observations, 1799

- Humboldt measuring the world and constantly taking readings
- *Reisetagebücher*, diaries which are likely to contain the world
- He was aware of the role of Enlightenment for the development of science
- Convinced that all results can be reduced to numerical relations:  
*J'ai la fureur des chiffres exacts*  
(letter to Gotthelf Fischer von Waldheim on March 20, 1837)

# Humboldt measuring the world for the progress of science



Instruments taken by Humboldt and Bonpland during their American trip

- Humboldt measuring the world and constantly taking readings
- *Reisetagebücher*, diaries which are likely to contain the world
- He was aware of the role of Enlightenment for the development of science
- Convinced that all results can be reduced to numerical relations
- **Proud of his instrument-based scientific approach**



Eduard Ender, *Humboldt und Bonpland am Orinoco*, Berlin, Akademie der Wissenschaften.





Friedrich Georg Weitsch, *Alexander von Humboldt und Aimé Bonpland am Fuß des Vulkans Chimborazo*, 1806, Stiftung Preußische Schlösser und Gärten Berlin-Brandenburg.





Friedrich Georg Weitsch, *Alexander von Humboldt und Aimé Bonpland am Fuß des Vulkans Chimborazo*, 1806, Stiftung Preußische Schlösser und Gärten Berlin-Brandenburg.

# Humboldt as a successful scientist: his main discoveries and innovations



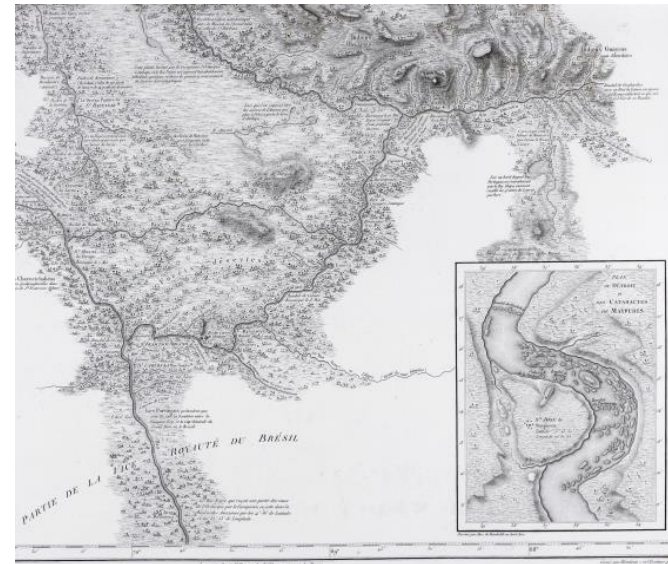
- The theory concerning the periodic swarm of meteors and the rain of shooting stars of the Leonid meteor

The Spectacular 1833 Leonid Meteor Storm:  
The View from Arkansas, Mary L. Kwas  
*The Arkansas Historical Quarterly*  
58/3 (Autumn 1999)



# Humboldt as a successful scientist: his main discoveries and innovations

- The theory concerning the periodic swarm of meteors and the rain of shooting stars of the Leonid meteor
- **The discovery of the fluvial system Amazon/Orinoco**



“Carte Itinéraire du cours de l’Orénoque, de l’Atabapo, du Cassiquiare et du Rio Negro, montrant la bifurcation de l’Orénoque et sa connexion avec l’Amazone” (detail)

A. v. Humboldt, *Atlas géographique et physique du nouveau continent*, 1814

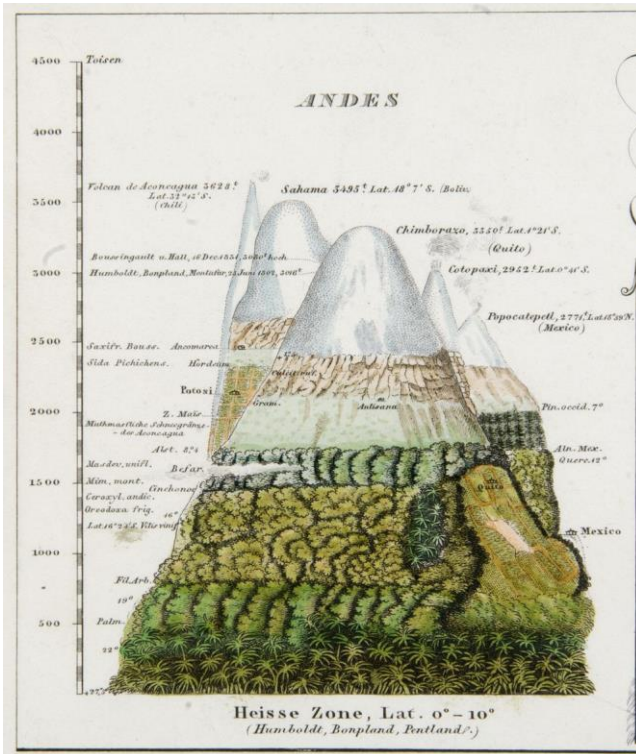






# Humboldt as a successful scientist: his main discoveries and innovations

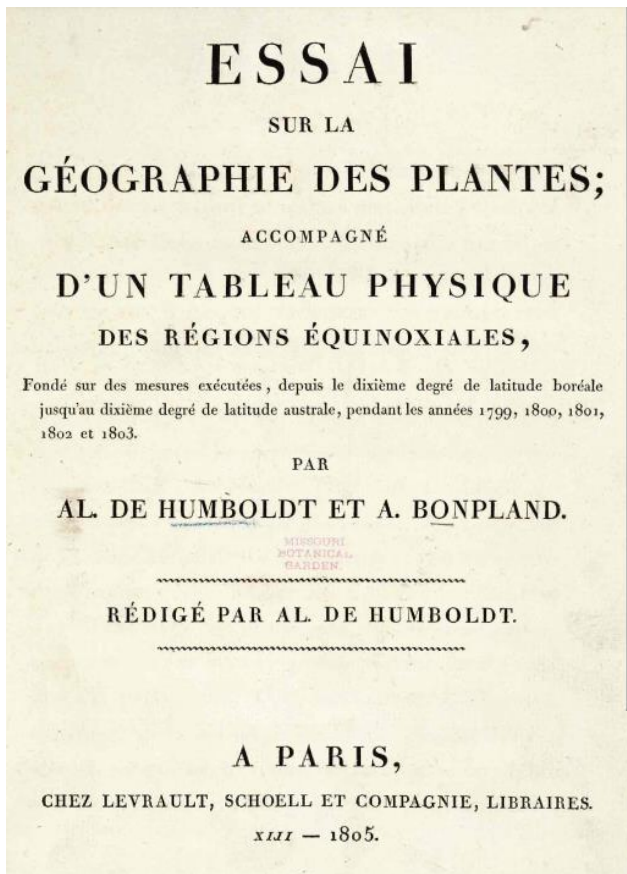
- The theory concerning the periodic swarm of meteors and the rain of shooting stars of the Leonid meteor
- The discovery of the fluvial system Amazon/Orinoco
- The law of the decrease in mean temperature with the increase in elevation above the sea-level



Heinrich Berghaus, *Physikalischer Atlas*,  
“Umriss der Pflanzengeographie”,  
p. 100-101

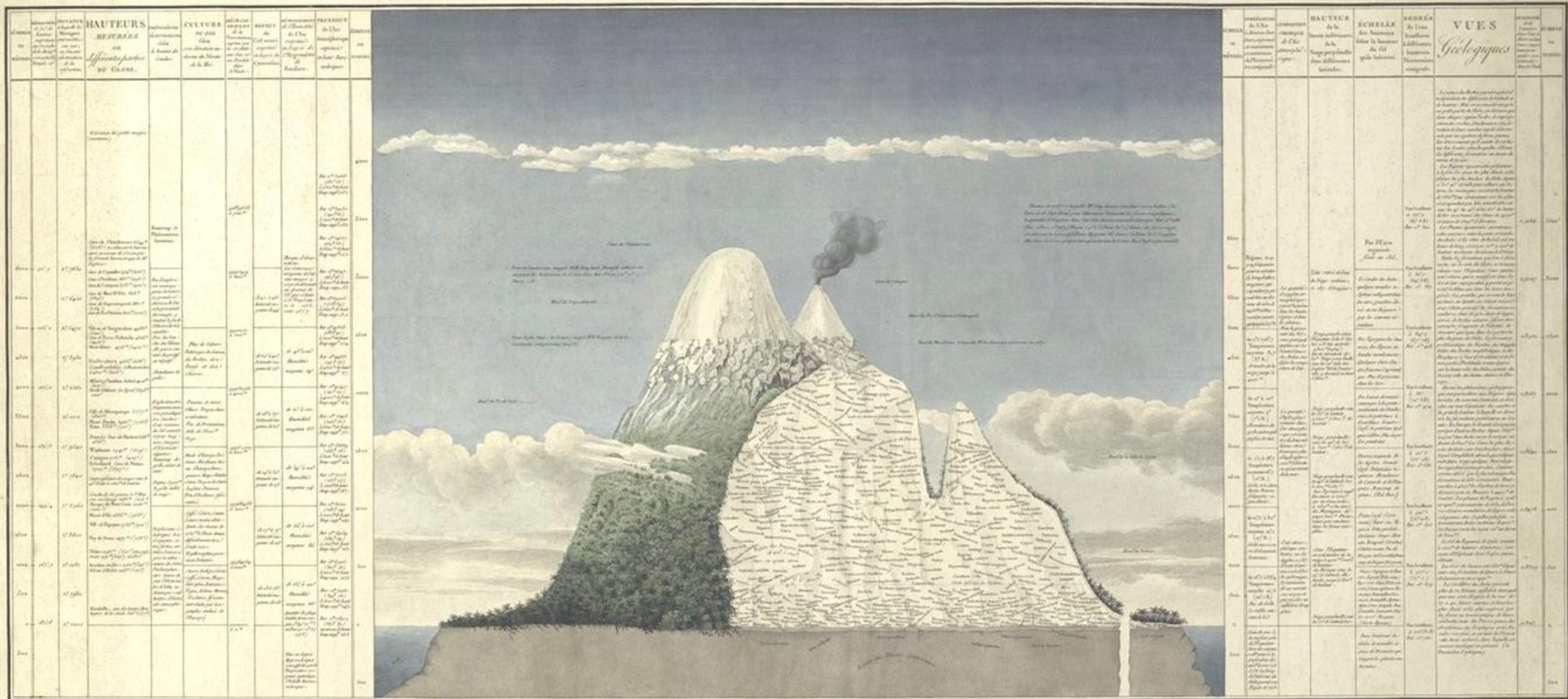


# Humboldt as a successful scientist: his main discoveries and innovations



- The opening of new research fields as geography of plants, scientific orography (*wissenschaftliche Gebirgskunde*), or early American studies (*Altamerikanistik*),

Title page of the *Essai sur la géographie des plantes*, 1805



# GÉOGRAPHIE DES PLANTES ÉQUINOXIALES.

*Tableau physique des Andes et Pays voisins*  
 Dressé d'après des Observations & des Mesures prises sur les lieux depuis le 10<sup>e</sup> degré de latitude boréale  
 jusqu'au 50<sup>e</sup> de latitude australe en 1799, 1800, 1801, 1802 & 1803.

ALEXANDRE DE HUMBOLDT ET AIMÉ BONPLAND.

*Reproduit en 1867 par M. de Humboldt, d'après son "Voyage aux Andes" et "Essai sur la Géographie des Andes" imprimé par la Cour.*

16-B-1310

“Géographie des plantes équinoxiales : tableau physique des Andes et pays voisins dressé d'après des observations et des mesures prises sur les lieux depuis le 10e degré de latitude boréale...”  
 by Alexandre de Humboldt and Aimé Bonpland. Paris, BNF, Gallica

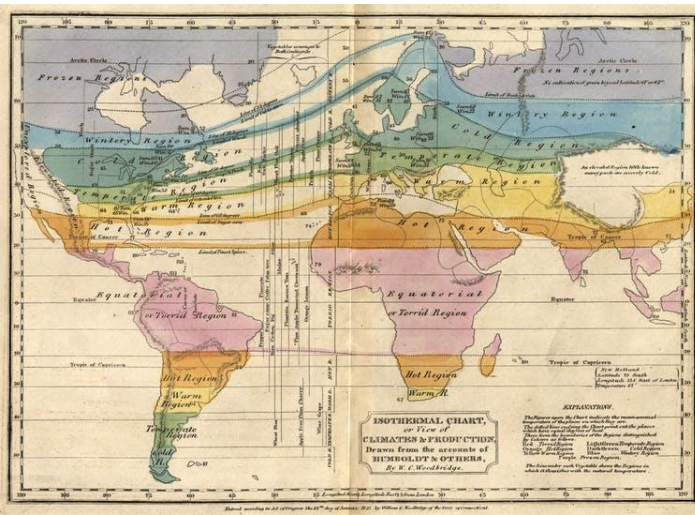


# Humboldt as a successful scientist: his main discoveries and innovations

- The opening of new research fields as geography of plants, scientific orography (*wissenschaftliche Gebirgskunde*), or early American studies (*Altamerikanistik*),
- The invention of isotherm lines



On the top: First isotherm map. Mean temperature around the world.  
Alexander von Humboldt – 1817



On the bottom: An 1823 map using Humboldt's innovation of isotherm lines.

# Humboldt's Cosmos

- Cosmos: a notion with metaphysic connotations

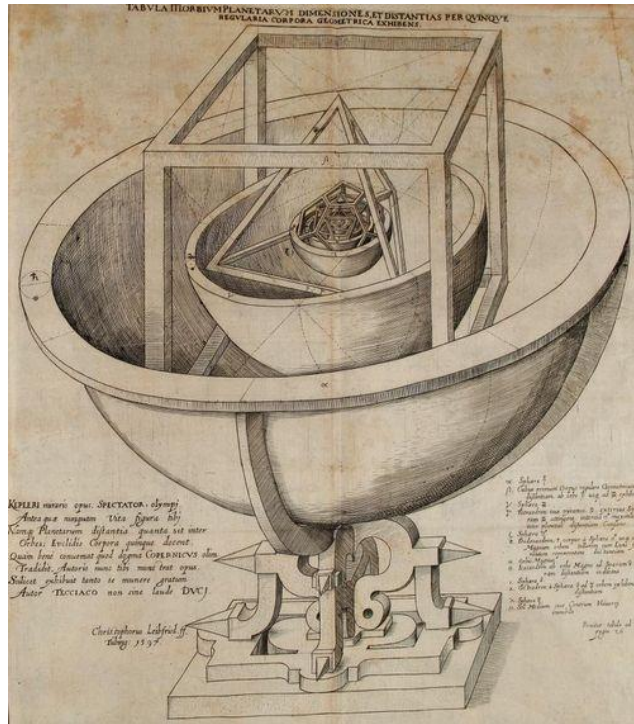


The Creation of the World according to the Nuremberg Chronicle, Hartmann Schedel, *Das Buch der Croniken*, 1493



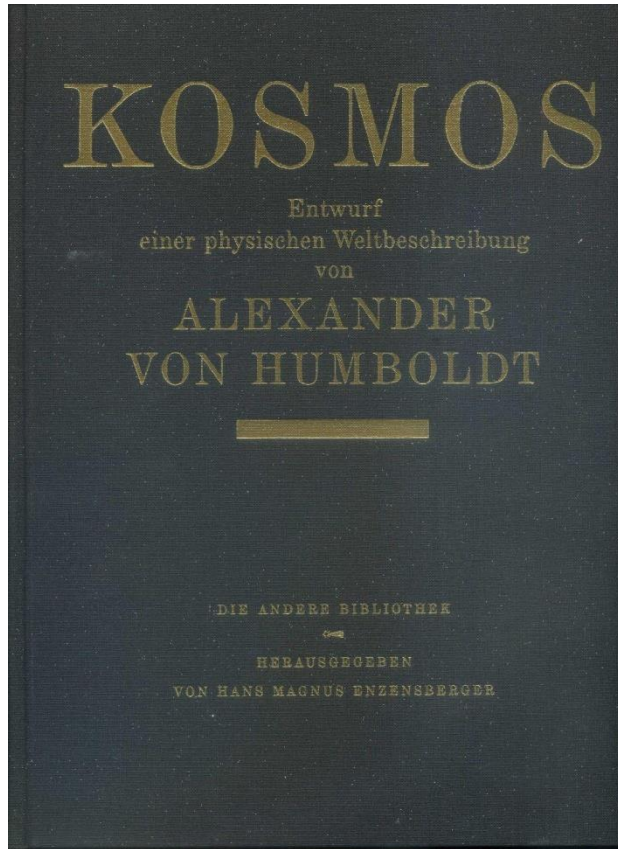
# Humboldt's Cosmos

- Cosmos: a notion with metaphysic connotations
- Humboldt moved away from speculations, like those of Kepler



A plate from *Mysterium cosmographicum*, by Johannes Kepler published in 1596

# Humboldt's Cosmos



- Cosmos: a notion with metaphysic connotations
- Humboldt moved away from speculations, like those of Kepler
- **Humboldt's cosmos: keeping only the poetic character of the Harmony of the Spheres: *aura caelestis***

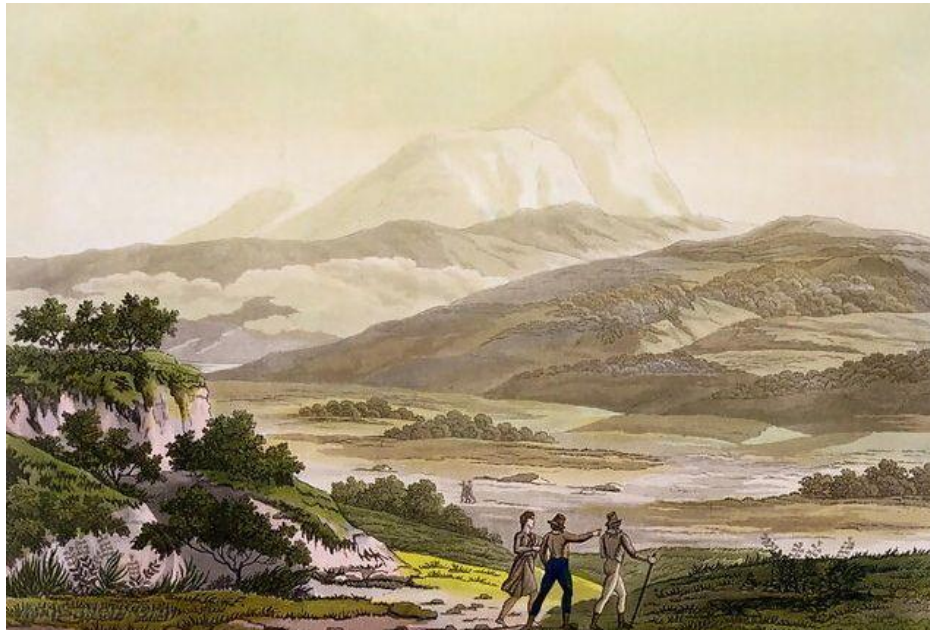


# The Humboldtian cosmos at the origin of ecology

- **Unity in diversity:**

*Die Natur ist für die denkende Betrachtung Einheit in der Vielheit, Verbindung des Mannigfaltigen in Form und Mischung, Inbegriff der Naturdinge und Naturkräfte, als ein lebendiges Ganze.*

Humboldt, *Kosmos*, Frankfurt/M. 2004, p. 10:



after Humboldt, *Mount Cayambe Ecuador*, oil on Canvas.

# The Humboldtian cosmos at the origin of ecology

- Unity in diversity
- Ernst Haeckel borrowed from Humboldt the idea of a coherent whole constituted by complex interactions



“Trochilidae” , plate 99 from Haeckel’s  
*Kunstformen der Natur* , 1904



# The Humboldtian cosmos at the origin of ecology

- Unity in diversity
- Ernst Haeckel borrowed to Humboldt the idea of a coherent whole constituted by complex interactions
- Humboldt discovered the idea of ‘keystone species’:  
Concerning the *Mauritia* palm, Humboldt and Bonpland “observed with astonishment how many things are connected with the existence of a single plant”



Palmiers *Mauritia* (*Mauritia flexuosa*)

*Palmiera Mauritia*, in Andrea Wulf, *L'invention de la nature*, French translation, Paris 2017, p. 116.

# The Humboldtian cosmos at the origin of ecology

- Unity in diversity
- Ernst Haeckel borrowed to Humboldt the idea of a coherent whole constituted by complex interactions
- Humboldt discovered the idea of ‘keystone species’
- **He explained the role of the forest in humidifying the atmosphere, holding the water, and protecting the soil against erosion**



Palmiers Mauritia (*Mauritia flexuosa*)

*Palmiera Mauritia*, in Andrea Wulf, *L'invention de la nature*, French translation, Paris 2017, p. 116.



Humboldt, *Voyage aux régions équinoxiales du Nouveau Continent*, 5, p. 172/3:

*En abattant les arbres qui couvrent la cime et le flanc des montagnes, les hommes, sous tous les climats, préparent aux générations futures deux calamités à la fois, un manque de combustible et une disette d'eau.*

Translation:

*By cutting down the trees that cover the summit and the side of the mountains, men in all climates seem to bring upon future generations two calamities at once – a want of fuel and a scarcity of water.*

January 20, 1988

Humboldt Glacier



2 km

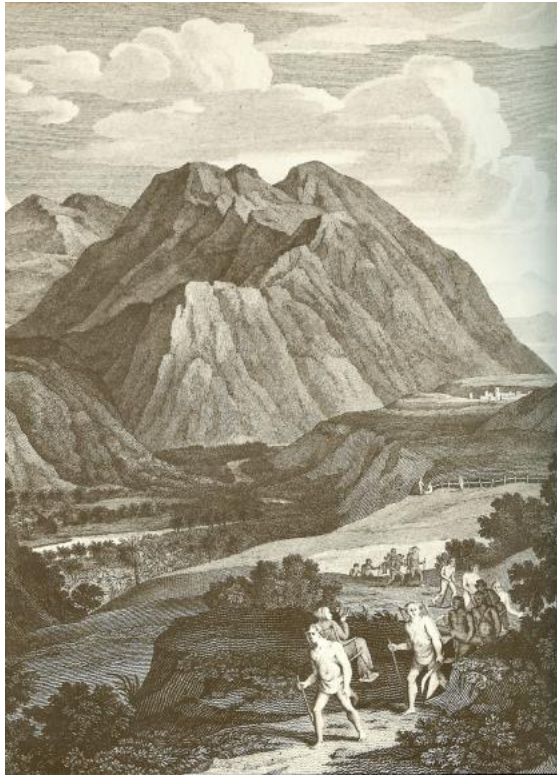
January 6, 2015

Humboldt Glacier

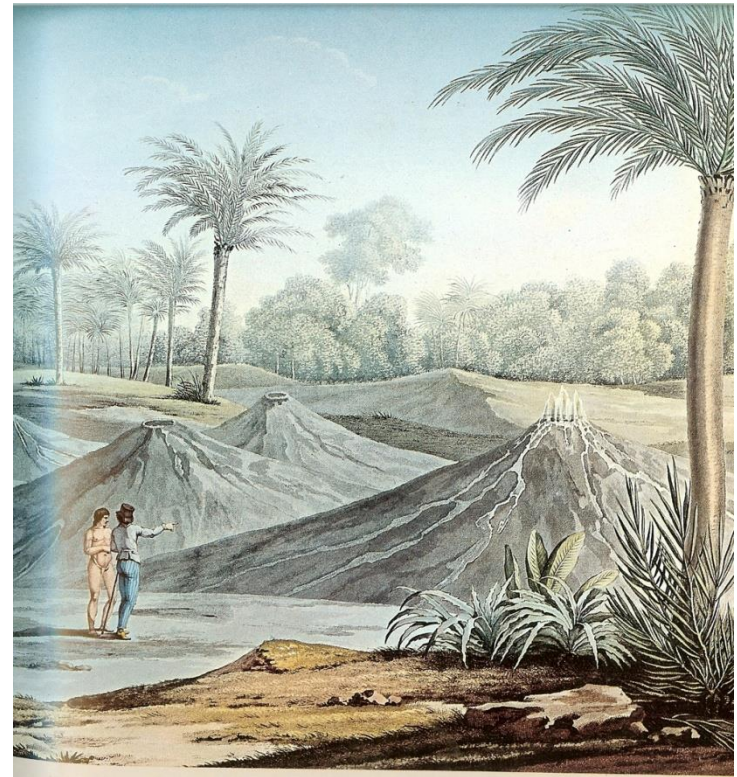


# The Humboldtian geography: connecting science, cosmopolitics and geo-poetics

- Social, economic and political problems linked to environmental issues



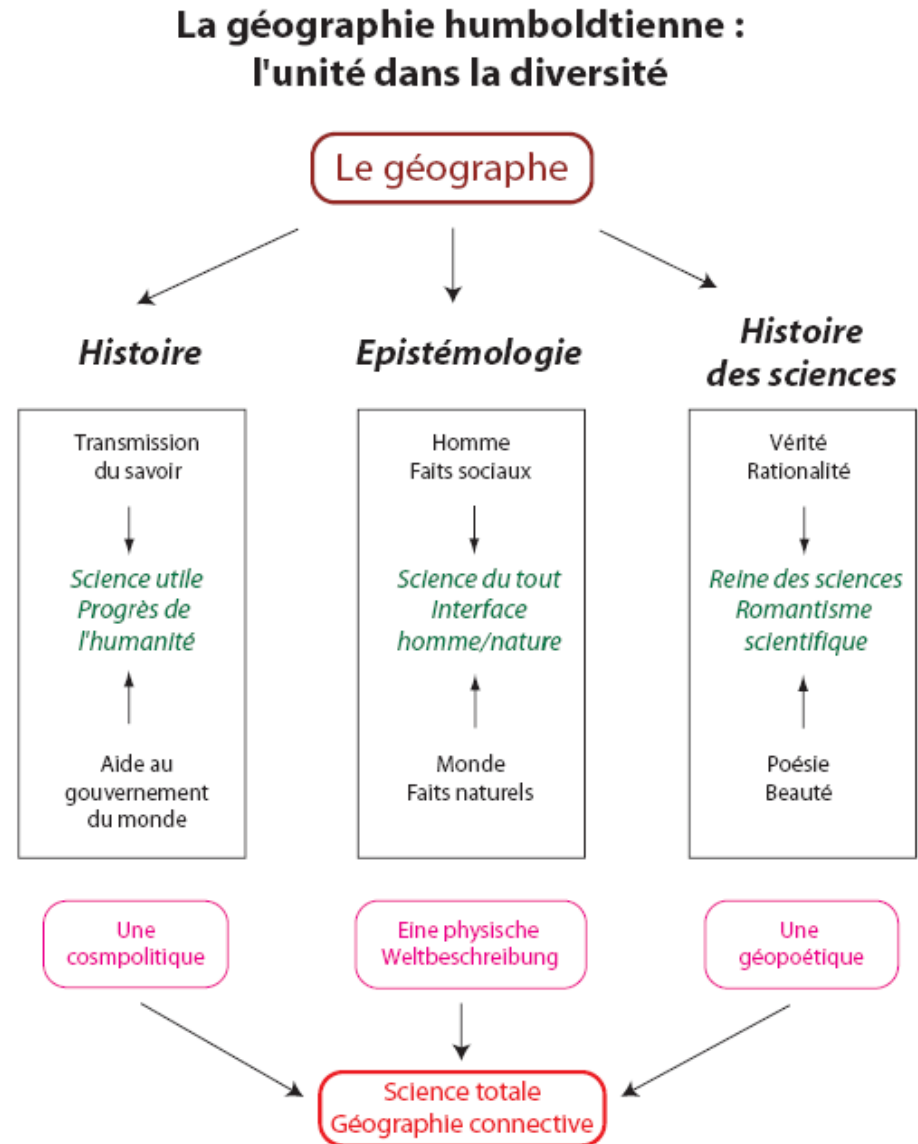
Cargueros on the arduous Quindiu Pass between Bogota and Quito, Humboldt, *Vue des Cordillères...*, 1810, table 5



Landscape as focus for both scientific and humanistic study. Gas volcanoes of Turbaco in Colombia, Humboldt, *Vue des Cordillères...*, 1810, table 41.

# The Humboldtian geography: connecting science, cosmopolitics and geo-poetics

Vision of the cosmos from  
'connective geography'  
(L.Péaud)

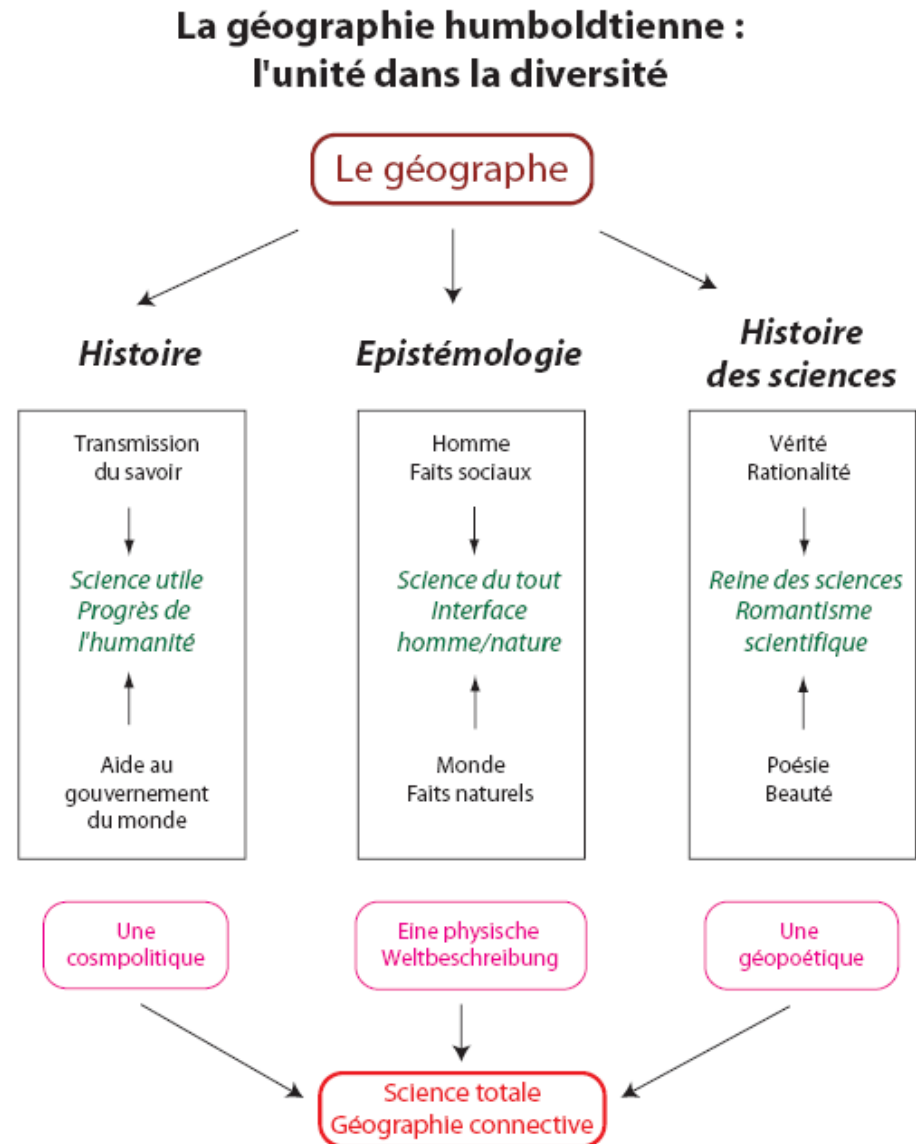




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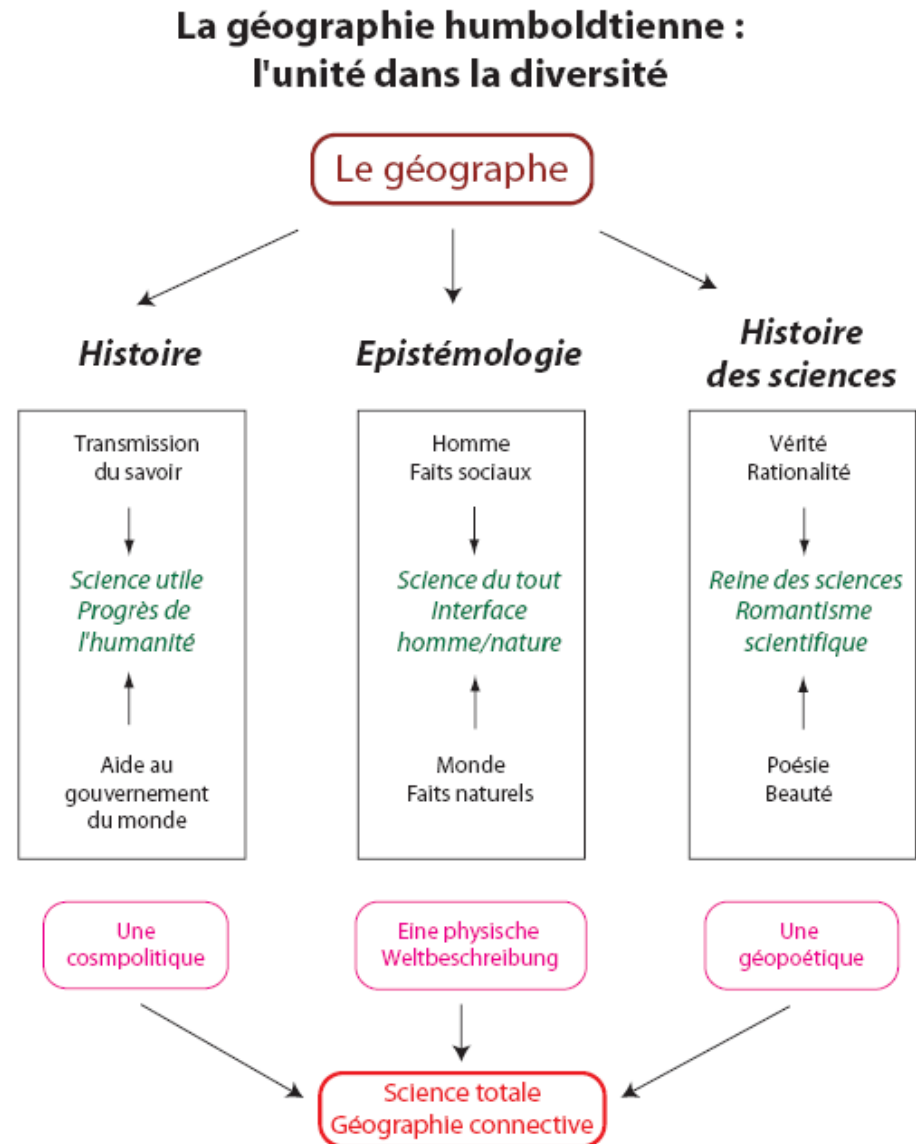
- *Physische Weltbeschreibung*: science of the whole, interface of humans and nature



# The Humboldtian geography: connecting science, cosmopolitics and geo-poetics

Vision of the cosmos from  
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- *Physische Weltbeschreibung*: science of the whole, interface of humans and nature
- **Cosmopolitics**: transmission of knowledge useful to human beings and governments





*In einem Zeitalter, wo man Früchte oft vor der Blüte erwartet und vieles darum zu verachten scheint, weil es nicht unmittelbar Wunden heilt, den Acker düngt, oder Mühlräder treibt, (...) vergisst man, dass Wissenschaften einen inneren Zweck haben und verliert das eigentlich literarische Interesse, das Streben nach Erkenntnis, als Erkenntnis, aus dem Auge. Die Mathematik kann nicht von ihrer Würde einbüßen, wenn sie als blosses Objekt der Spekulation, als unanwendbar zur Auflösung praktischer Aufgaben betrachtet wird. Alles ist wichtig, was die Grenzen unseres Wissens erweitert und dem Geist neue Gegenstände der Wahrnehmung oder neue Verhältnisse zwischen dem Wahrgenommenen darbietet*

Quoted by Soyara Nour, « Le cosmos et le cosmopolitisme d'Alexander von Humboldt », *Le Soi et le Cosmos d'Alexander von Humboldt à nos jours*, Berlin 2015, p. 27.

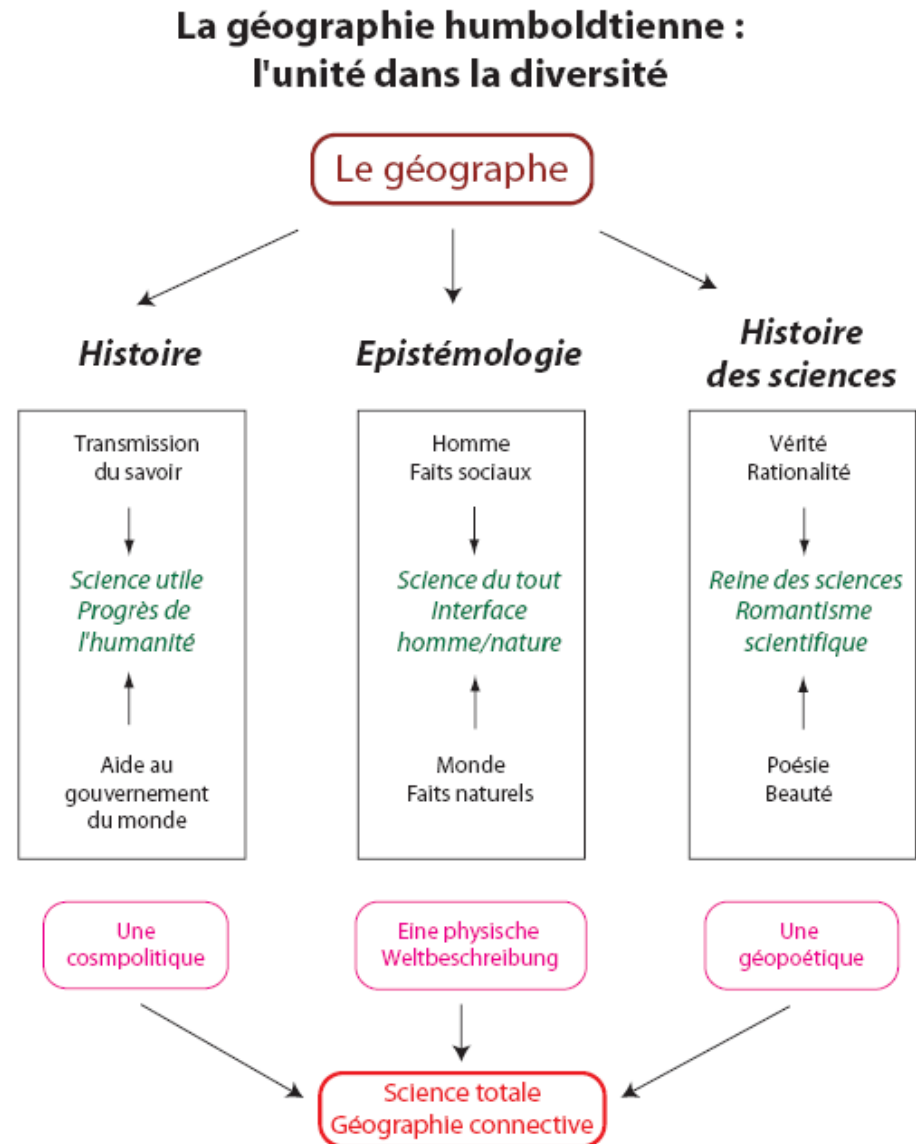
Translation:

*In an age when fruits are often expected before flowering and much people seem to despise things because they do not directly heal wounds, fertilize the field, or drive the wheels of the mill (...) we forget that sciences have an inner purpose and we lose sight of its literary interest, the aspiration for knowledge as knowledge. Mathematics cannot lose its dignity if it is regarded as the mere object of speculation, as inapplicable to solve practical tasks. Anything that extends the boundaries of our knowledge and offers to the mind new objects of perception or new relationships between what is perceived is important.*

# The Humboldtian geography: connecting science, cosmopolitics and geo-poetics

Vision of the cosmos from 'connective geography' (L.Péaud)

- *Physische Weltbeschreibung*: science of the whole, interface of humans and nature
- **Cosmopolitics**: transmission of knowledge useful to human beings and governments
- **Geo-poetics**: a book on nature must contain its objective as well as subjective side; our inner world is constructed by the impressions that nature provokes in us



# Humboldt's large-scale synthesis connecting worlds

**Sensibility, emotion & rationality: is it usual for an Enlightenment man like Humboldt?**

o

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# Humboldt's large-scale synthesis connecting worlds

Sensibility, emotion & rationality: is it usual for an Enlightenment man like Humboldt?

**Humboldt as Enlightenment man:**

o \*\*

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Sensibility, emotion & rationality: is it usual for an Enlightenment man like Humboldt?

Humboldt as Enlightenment man:

- Journey with Georg Forster on the Rhine, the Netherlands, England and France, March 25-July 11, 1790. Enthusiasm for the revolutionary Paris & the preparations for the Festival of the Federation at the Champ de Mars



Anonym, *Fête de la Fédération*, 1790

*Le spectacle des Parisiens, leur rassemblement national, celui de leur temple de la Liberté encore inachevé pour lequel j'ai transporté moi-même du sable, tout cela flotte dans mon âme comme un rêve*

Alexander von Humboldt

Translation :

The spectacle of the Parisians, their national gathering, that of their Temple of Liberty still unfinished for which I transported myself sand, all that floats in my soul like a dream



# Humboldt's large-scale synthesis connecting worlds

Sensibility, emotion & rationality: is it usual for an Enlightenment man like Humboldt?

## **Humboldt as Enlightenment man:**

- Journey with Georg Forster on the Rhine, the Netherlands, England and France, March 25 till July 11, 1790. Enthusiasm for the revolutionary Paris & the preparations for the Festival of the Federation at the Champ de Mars
- **Fight against slavery, oppression of native people in Latin America, persecution of political opponents and Jews in Prussia**

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- **Opinions are very divided among critics: some asserting his belonging above all to Romanticism or enlightenment; some see a balance between both types of thought**

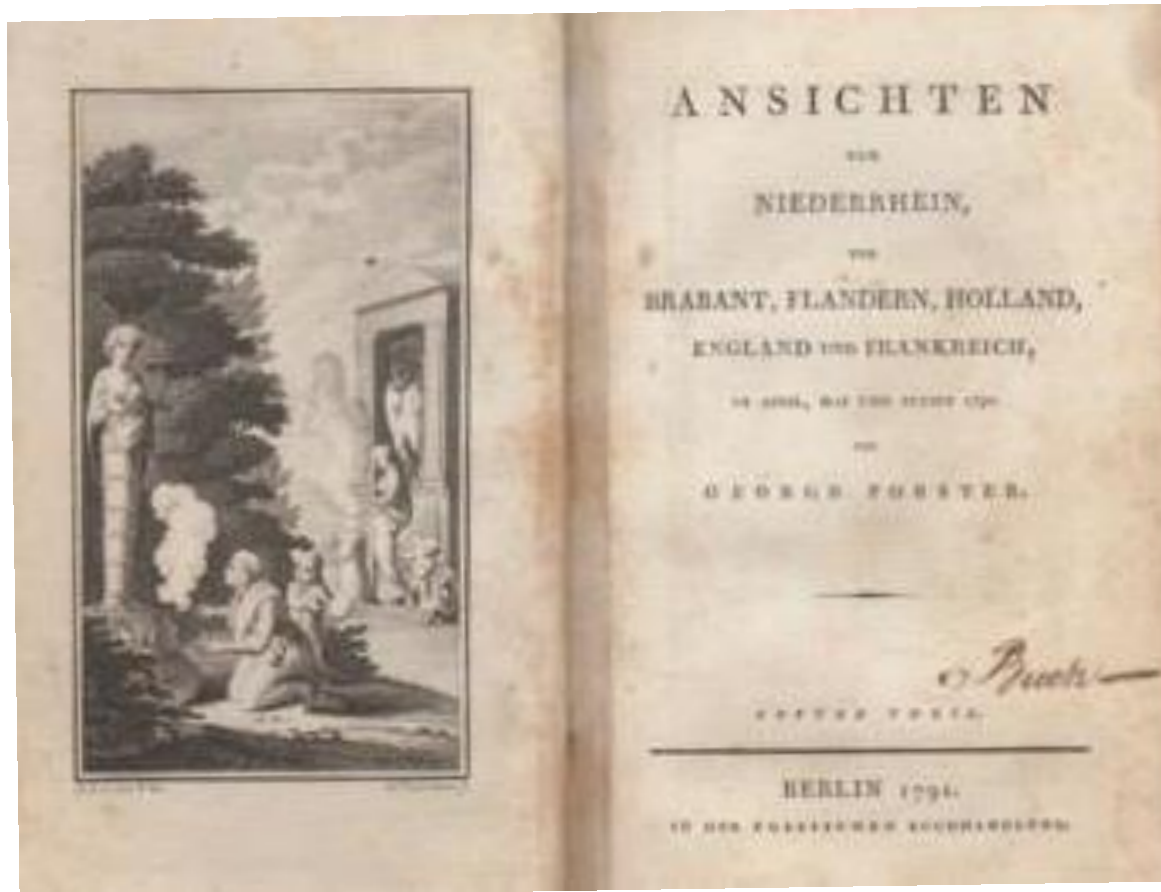


# Humboldt's large-scale synthesis connecting worlds

- Humboldt's holistic approach attributed, even partially, to the impact of *Naturphilosophie*?
- Opinions are very divided among critics: some asserting his belonging above all to Romanticism or enlightenment; some see a balance between both types of thought
- **Synthesis of the main European ideas of his time while immersing himself in the experience of his long-distant journeys and the research conducted on this occasion (*Biblioteca Americana*)**

# Forster and Humboldt: towards mobility of knowledge

- Forster's *Ansichten vom Niederrhein*



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- Forster's *Ansichten vom Niederrhein*

Humboldt on Forster in the Preface of his *Essay on the Geography of Plants* (1807):

*J'ai communiqué la première esquisse d'une Géographie des plantes, en 1790, au célèbre compagnon de Cook, M. Georges Förster, à qui l'amitié et la reconnoissance m'avoient étroitement lié.*

Translation:

*I conceived of this book during my earliest years. I gave a first sketch of a Geography of Plants in 1790 to Cook's famous colleague, Mr. Georges Forster, which whom I had close ties of friendship and gratefulness*



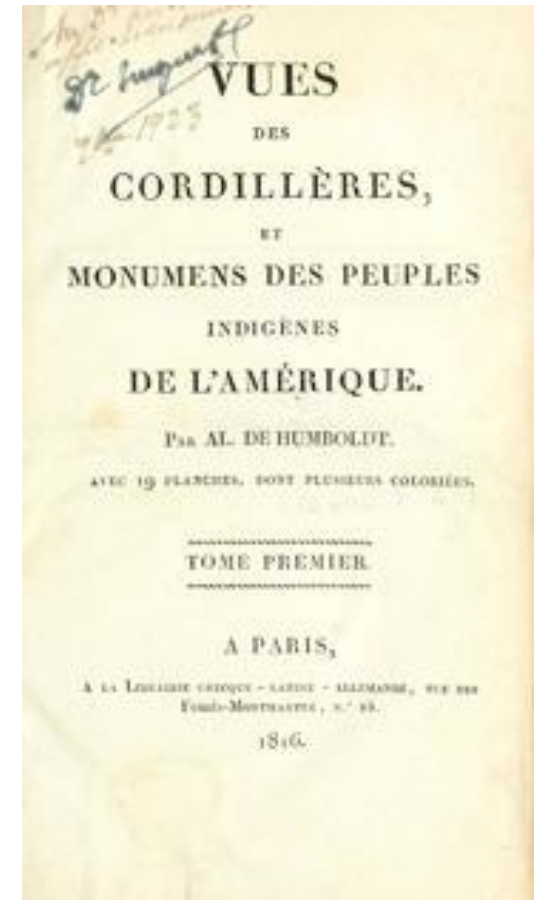
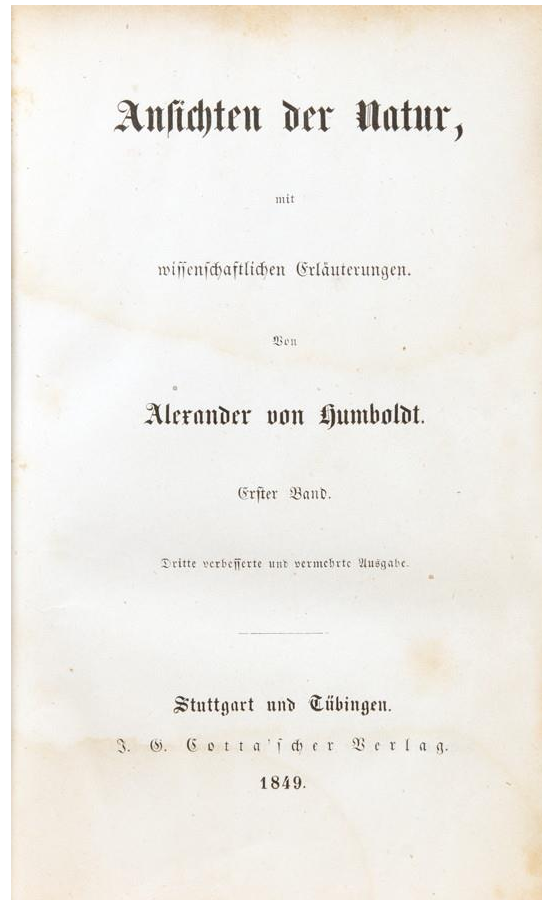
*Durch ihn begann eine neue Aera wissenschaftlicher Reisen, deren Zweck vergleichende Völker- und Länderkunde ist. Mit einem feinen ästhetischen Gefühle begabt, in sich bewahrend die lebensfrischen Bilder, welche auf Tahiti und anderen damals glücklicheren Eilanden der Südsee seine Phantasie (...) erfüllt hatte; schilderte Georg Forster zuerst mit Anmuth die wechselnden Vegetationsstufen, die klimatischen Verhältnisse, die Nahrungsstoffe in Beziehung auf die Gesittung der Menschen nach Verschiedenheit ihrer ursprünglichen Wohnsitze und ihrer Abstammung. Alles, was der Ansicht einer exotischen Natur Wahrheit, Individualität und Anschaulichkeit gewähren kann, findet sich in seinen Werken vereint*

Translation:

*Through his influence there dawned a new era of scientific travel, having for its aim the comparison of various peoples and countries. Endowed with a keen aesthetic sense, and an imagination enriched by the freshly alive scenes presented to him by Tahiti and other happy islands of the Southern Seas, Georges Forster describes with a peculiar charm the varied glories of vegetation, the conditions of climate, the varieties of food in connection with the different habits of men (...). In his works we see the reflection of a mind characterized by originality, a love of truth, and an observant thoughtfulness, a mind replete with images derived from a view of Nature in her exotic loveliness*

# Forster and Humboldt: towards mobility of knowledge

- Forster's *Ansichten vom Niederrhein*
- Humboldt borrows the term 'views' (*Ansichten* or *Vues*) from Forster's *Ansichten vom Niederrhein*



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- **Mobility of knowledge**



# Forster and Humboldt: towards mobility of knowledge

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- **Mobility of knowledge that also affects languages and disciplines**

# Humboldt visionary

- His notion of cosmos is close to our ecological and planetary thought, taking in account the interdependency of all natural, cultural and social phenomena

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- His notion of cosmos is close to our ecological and planetary thought, taking in account the interdependency of all natural, cultural and social phenomena
- **His large-scale synthesis was based on a mobility of knowledge between cultures, languages and disciplines which can be regarded as a nowadays challenge**



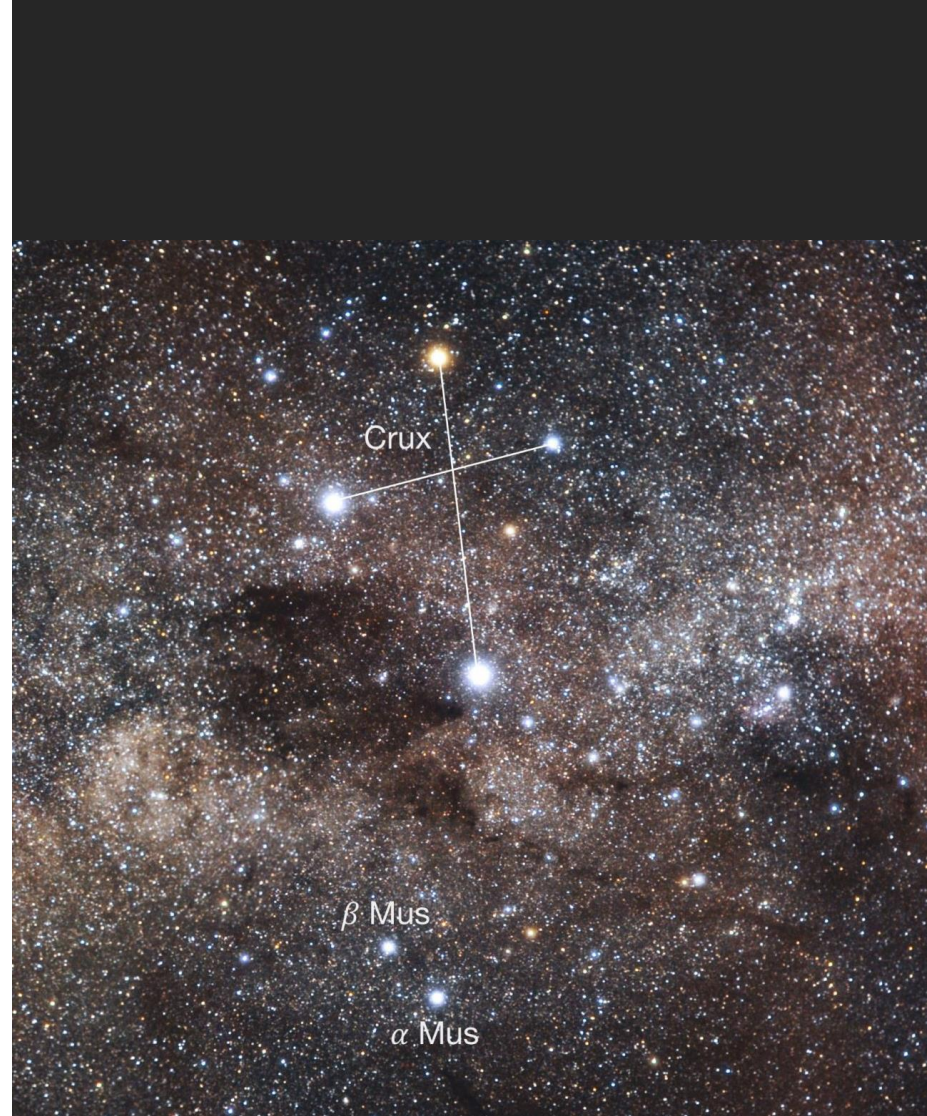
# Humboldt visionary

- His notion of cosmos is close to our ecological and planetary thought, taking in account the interdependency of all natural, cultural and social phenomena
- His large-scale synthesis was based on a mobility of knowledge between cultures, languages and disciplines which can be regarded as a nowadays challenge
- **Thanks to his great voyages of discovery in America and Russia, Humboldt was one of the few scientists of his day fully understanding the challenges of the second phase of accelerated globalization (O. Ette)**

*Forster, der hellste Stern  
meiner Jugend*

*Dans la solitude des mers (...)  
on salue une étoile comme un  
ami dont on aurait été séparé  
depuis longtemps*

Alexander von Humboldt



The southern crux

# Thank you!



Joseph Karl Stieler, *Humboldt and his Kosmos*, 1843