

# Alexander Humbold's Scientific Heritage in Geography Field

**Mirzoyeva Istat Elmurodovna**

Senior Lecturer, Department of Ecology and Geography, Bukhara State University

**Sobirova Dilorom Bobirjon kizi**

Bukhara State University, 3rd year student of Geography disciplines

**Annotation:** The article deals with detailed information about the life and work of Alexander Humboldt, as well as his geographical views.

**Key words:** Geographical discovery, Chimboraso volcano, Barometer-aneroid, Peruvian flow, Tenerife Island, Ecuador, Andes, Priney Peninsula, Emme Bonplan.

Geography is one of the oldest and at the same time young science. Based on the features of the development of geographical discoveries, ideas and knowledge, we can see the scientific discoveries of tourists in different periods in the history of science. Alexander von Humboldt, a great 19<sup>th</sup>-century naturalist and encyclopedist, was born in 1769 in Germany to a Saxon court prince. As a young man, Alexander was not interested in studying. He dreamed of traveling far away, to face with rich adventures. He studied Economics, Medicine, Physics, Mathematics, History, Botany, Literature, Foreign languages and much more. Having a large inheritance, he left the service and finally decided to become a traveler, exploring unknown places. His candidacy was rejected at the last minute as he tried to join an expedition to the South Pole. In 1799, Humboldt embarked on a six-year voyage. He explored Cuba and Mexico. He almost conquered the Chimboraso volcano and climbed to an altitude of about 6,000 m (a world-class mountaineering record at that time). The herbarium he collected contained 6,000 plants, half of which were previously unknown to science. was composed of plants. Humboldt and his companion, the geographer and botanist Emme Bonplan, experienced countless hardships and dangers during their travels. They watched volcanic eruptions and meteor showers, earthquakes, and their boats sailed through rivers overflowing with crocodiles and wild fish.

Humboldt's voyage to South and Central America ended on June 30, 1804. During those 5 years, he made geographical observations in the proximal part of Brazil, Venezuela, Peru, Ecuador, Mexico and Cuba. At more than 700 points, the absolute heights of latitudes and longitudes were determined, and the relationship between volcanic events and earthquakes was studied. Several tens of kilometers of the Orinoco River was mapped. For the first time in science, geographical profiles were formed on the slopes of the Andes, in the mountains of Mexico, and in part of the Priney Peninsula. Botanical studies using barometric-aneroid measurements have identified the slopes of the Andes, the mountains of Mexico, and the vegetation and climate zones on the island of Tenerife. More than 60,000 plant specimens - herbariums - have been collected. All of these patterns were new to Europeans, and several thousand-rock samples were taken.

In 1829, Humboldt visited Russia, where he visited the Urals and the Altai. Visits the Caspian Sea. Later, the scientist tried to summarize all his scientific knowledge in a major work called "Cosmos", but his fifth volume was not completed.

Humboldt dealt with the History of science, Astronomy, all branches of science. He founded the fields of Geography, such as Climatology, Oceanography, Cartography, Plant geography. During his lifetime, the scientist called him Columbus II and the new Aristotle, and considered him a great traveling naturalist.

The stream off the coast of South America (on our maps it was called the Peruvian), rivers and mountains, cities and islands, and the crater on the moon are named after him.

Humboldt's discovery of vegetation and climatic zones was a great breakthrough in the study of the interrelationships in nature, in Natural geography.

Humboldt also analyzed repeatedly erupted volcanic eruptions in the Andes in Ecuador, taking samples of volcanic gases from rocks. Especially noteworthy is Humboldt's attempt to conquer Chimboraso, then the world's highest peak, along with Bonplan. On June 9, 1802, they ascended the slopes of a peak of 6,267 m,

reaching 5,844 m. It was a world record at the time. In the highlands, Humboldt attributed the discomfort to the thinning of the air and the drop in atmospheric pressure. At present, this "mountain disease" is considered the result of lack of oxygen.

While Humboldt was measuring the temperature of ocean water and the rate of water exchange near Peru, it was found that water with low temperatures rose to the surface. This was one of the characteristics of the Peruvian sea current. It is also known that the scientist was interested in the lifestyle of the population.

Humboldt was an encyclopedic scientist who left a great scientific legacy for world natural science. Most of his 636 titles in various fields of natural science were large books. The formation of the science of natural geography of the new period was directly connected with the scientific ideas put forward in Humboldt's works.

These and similar ideas of Humboldt are vividly reflected in the royal work "Space - the experience of physical depiction of the universe", which he considered the meaning of his life.

Although Humboldt began writing this work in 1834, his first volume was published only in 1845. It describes the phenomena of Heaven and Earth one after another (shape, density, mass, internal structure, internal temperature, Earth's magnetism and some atmospheric phenomena). The second, third, and fourth volumes were published in 1847, 1850, and 1858, respectively. After the scientist's death only part of the fifth volume was written and published in 1862. Humboldt believed that the most important task in studying the causal relationships between events and processes occurring on Earth was to determine whether organic life was related to inanimate nature. Therefore, he himself adhered to this idea and paid special attention to determining the relationship between the plant and the climate, the structure of the climate and the surface of the earth. Climate, in turn, is thought to be the result of the Earth's atmosphere interacting with the oceans and land surfaces.

On this issue, Humboldt worked diligently to collect and analyze data on the climate and vegetation of large areas. The data collected allowed us to determine the change in vegetation cover from the equator to the poles, and in the mountains from the bottom up. It was the discovery of bioclimatic zonation. In this way, he divided the bioclimatic zones into equatorial, temperate, and cold. In the description of these zones, only the average annual temperature and the main representatives of the flora were taken into account. Humboldt insisted that there were close relationships between the earth's crust (for example, between the air crust and the ocean, between the ocean and the land, between the land and the air crust), which later became the basis for the formation of concepts about the object and subject of study of natural geography. Climatology and Plant geography, as well as private Geography, were also formed in connection with Humboldt's scientific work.

Humboldt also made significant contributions to the development of natural geography research methods. The extensive use of quantitative indicators in research has demonstrated the importance of the construction of transverse complex profiles with examples. He also stressed the need for a historical method in natural geography. Describing climates by deepening and refining the comparative geographic method introduced the use of isotherms and created an annual isotherm map of the Northern Hemisphere. Using this method effectively, he identified important climate laws. For example, Humboldt noted that while determining the existing differences in air temperature at the western and eastern edges of the continents, the appearance of the continents and the location of places in which thermal zones are important factors in climate formation. In essence, the differences between the maritime climate and the continental climate were to be identified for the first time. Humboldt fully and clearly defined the interrelationships of climate, relief, and vegetation in places, and discovered their territorial distribution and laws.

Humboldt's extensive and comprehensive use of the comparative method in the study of objects and phenomena on Earth, and his ability to draw the necessary conclusions from the data and scientific opinions of his contemporaries, made it possible to determine the subject of Natural geography. According to him, the subject of Natural geography was the study of phenomena on the earth (mainly physical phenomena). At the heart of his concept of the subject of natural geography is the idea of the integrity of the earth's air and water crusts.

In Humboldt's Doctrine of Space, special things, such as climate, relief, plants, and animals, are considered to be integral parts of an interconnected whole. Humboldt, who had a broad geographical approach to objects and phenomena in nature, tried to prove that Geography was an independent science,

rather than simply summarizing the information provided by private sciences such as Geology, Biology, and Climatology.

The idea that Natural phenomena and natural processes are causal and interrelated. The idea of development, the view of nature as a whole moving by natural forces, and the study of natural processes is the most important way to determine the laws of nature Humboldt's Cosmos. They differed from the works of other contemporaries in that a deep sense of depth, a radical understanding of the importance of large-scale study of natural conditions and natural resources in the development of the national economy. The first volume of this work was published in 1845 under the title "The Universe: A Plan to Describe the Natural World". In the introduction, Humboldt wrote: "I present to the German public the work that I have carried in my heart for almost half a century during the heyday of creative life". The work "Universe" is a collection of scientific knowledge of the first half of the XIX century. Although the knowledge covered in most parts of the book is somewhat outdated from a modern point of view, a brilliant work reflects the level of knowledge of its time.

Thus, the scientific ideas reflected in Humboldt's scientific works became of scientific importance, which could later serve as a basis for the study of objects and phenomena on the Earth's surface and the formation of natural geography as an independent science. However, Humboldt did not have students who could spread and develop his scientific ideas. In that sense, he was a lonely man in his day. However, his scientific ideas on Natural geography had a great influence on the formation of natural geography as a science later, in the late 19th century and the first quarter of the 20th century.

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Alexander Humboldt, a German naturalist, geographer, and traveler, was nicknamed "Aristotle of the Nineteenth Century" because he amazed his contemporaries with his vast scientific views. The diverse scientist has studied the nature of various countries in Europe, Central and South America. It is safe to say that Humboldt laid the foundations of natural geography with his work on the laws between solid, liquid, and air crusts in the earth's crust.

The last place the scientist studied scientifically during his trip to Russia was the city of Astrakhan, the Caspian Sea, because in one of his works he wrote, "I never wanted to be without seeing the Caspian Sea." The results of Humboldt's visit to Russia were published in a three-volume book entitled Central Asia. In 1842, A. Humboldt was awarded a military order established by Frederick II for his services to science. The scientist has also won numerous awards from various countries, governments and scientific organizations around the world. His name is immortalized in a number of geographical, botanical and zoological literatures. Various geographical features, rivers, mountains and seas are named after him.

A. Humboldt died in 1859 at the age of 90 years. According to his contemporaries, nature gave him unparalleled energy and he was still alive and well at the age of 90, working on the fifth volume of The Universe.

In short, Humboldt's scientific achievements made the high results of the culture of his time famous all over the world and for all centuries. To determine the importance of Humboldt's scientific ideas, which formed the basis of the formation of natural geography of the new period; it is necessary to have a clear idea of the general state of natural geography in his time, as well as Humboldt's life and scientific activity. All this allows us to begin the history of natural geography in connection with Humboldt's work. We are constantly studying the work of geographers and travel scientists, and we have once again witnessed the historical development of the science of geography, especially the foundations of fundamental geography.

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