

Johann Friedrich Blumenbach (1752-1840)

In eighteenth century Germany, Johann Friedrich Blumenbach studied how individuals within a species vary, and to explain such variations, he proposed that a force operates on organisms as they develop. Blumenbach used metrical methods to study the history of humans, but he was also a natural historian and theorist. Blumenbach argued for theories of the transformation of species, or the claim that new species can develop from existing forms. His theory of *Bildungstrieb* (formative drive), a developmental force within all organisms, influenced the conceptual debates among many late nineteenth and early twentieth century embryologists and naturalists.

Blumenbach was born 11 May 1752 in Gotha, Germany. His mother, Charlotte Eleonore Hedwig Buddeus, was the daughter of a high-ranking official in Gotha's government. Blumenbach's father, Heinrich Blumenbach, was the assistant headmaster at the local gymnasium, or primary school. Blumenbach completed his early education in Gotha, graduating from the gymnasium in 1769. After graduation, he attended the University of Jena, in Jena, Germany, before moving to the University of Göttingen, in Göttingen, Germany. While a student at the University of Göttingen, Blumenbach studied with naturalist Christian W. Büttner. Büttner taught Blumenbach via his lectures on exotic cultures and peoples, and he encouraged Blumenbach to write his dissertation on such communities.

In 1775 Blumenbach received his medical degree from the University of Göttingen after completing his dissertation, "*De Generis Humani Varietate Native Liber*" ("On the Natural Varieties of Mankind"). This text showed that the variations that exist in the human form do not represent differences between human species. In his dissertation, he also introduced the term *Caucasian* as a term for white Europeans. Blumenbach's dissertation is an early demonstration of comparative anatomy to objectively study human history. While earlier scholars, like Georges-Louis Leclerc, Comte de Buffon, in France, had created classifications of humans, they based their works largely on subjective behavioral characteristics and cultural biases. Blumenbach argued that there are five distinct races of mankind within a single species, a conclusion he derived from detailed studies of skulls and human anatomy. Although Blumenbach recognized distinct races, he also believed in the unity of the human species, and he combated the use of anthropology as a means to promote discrimination.

Following the publication of his dissertation, Blumenbach became curator of the natural history collection at the University of Göttingen. In 1778 he became a professor of medicine and married the daughter of an administrator at the university. The following year, Blumenbach published *Handbuch der Naturgeschichte* (Handbook of Natural History), in which he evaluated morphological and ecological evidence from which he created a system to classify organisms. Blumenbach believed that the Linnaean system of classification, developed by Carl Linnaeus in the 1735 text *Systema Naturae*, published while Linnaeus was in the Netherlands, defined species on the basis of single, often arbitrarily chosen, characteristics, a practice that many thought produced artificial groups that did not accurately reflect nature. Blumenbach hoped to correct these supposed problems with the Linnaean system by defining species based on a series of morphological characters, which he presented in his *Handbuch*. He also recognized the potential for species to change through time or to become extinct. Blumenbach later expanded on those topics in his *Beiträge zur Naturgeschichte* (Contributions to Natural History), in which he further investigated individual variability and the possibility that the Earth had a long history.

In 1780 Blumenbach presented his concept of *Bildungstrieb*, or the formative force, an idea that influenced many in an embryological debate of his time and that affected developmental research and natural philosophy for more than a century. In his paper, "*Über den Bildungstrieb* (Nisus Forma-

tivus) und Seinen Einfluss auf die Generation und Reproduktion" ("On the Formative Force and its Influence on Generation and Reproduction") Blumenbach described *Bildungstrieb* as a force within all organisms that operated on their bodies throughout development in order to give rise to their final forms.

Blumenbach's *Bildungstrieb* concept influenced the debate between preformationists and epigenesists, as it attacked the assumptions underlying preformationism. According to preformationism, an organism existed fully formed within the egg or sperm (germ cell), and the process of development was one of the animal unfolding, or growing, from its miniature germinal form to more mature and adult forms. Many scholars, such as Albrecht von Haller, in Switzerland, Marcello Malpighi, in Italy, and Jan Swammerdam, in the Netherlands, believed that some form of preformationism best explained development. On the other hand, according to epigenesis, each embryo generated anew by gradually developing from unorganized materials, a theory supported by the Caspar Friedrich Wolff, in Russia. Previous authors, such as Wolff, had offered notions similar to *Bildungstrieb*, of vital forces that shaped the body. However, Blumenbach's concept went beyond those offered by other scholars, as it reinforced the arguments for epigenesis. He provided a framework for understanding a force for development that was both teleological, in that it acted towards a final form, and constitutive, in that it could organize development.

Blumenbach applied his *Bildungstrieb* concept in his following works and various scholars utilized his concept. In the second edition of *On the Natural Varieties of Mankind*, Blumenbach used *Bildungstrieb* to explain the degeneration of an original type of human into the five varieties—which he later classified as Caucasian, Mongolian, Malayan, Ethiopian, and American—found around the world. In *Contributions to Natural History*, published in 1790, Blumenbach described how *Bildungstrieb* operated after the Biblical flood to produce new species. The concept was adopted by the writer and natural philosopher Johann Wolfgang von Goethe in Germany, and the philosopher Immanuel Kant in Prussia. Nearly one hundred years after Blumenbach's formulation of the concept, Ernst Haeckel, the chair of zoology at the University of Jena, employed *Bildungstrieb* as the foundation of his theories on individual development—theories which influenced embryological research well into the twentieth century.

Blumenbach participated in more than seventy academies and scientific organizations, and he continued to teach at the University of Göttingen during his later years. His textbook, *Handbuch der Vergleichenden Anatomie* (Handbook of Comparative Anatomy), published in 1805, influenced many throughout the history of comparative anatomy. In 1816 Blumenbach earned the appointment professor primarius of the Faculty of Medicine. Throughout his tenure at Göttingen, Blumenbach taught many students, such as the naturalist Alexander von Humboldt, and the early proponent of recapitulation theory, Carl Friedrich Kielmeyer. An active naturalist throughout life, Blumenbach was among the first to describe the woolly mammoth, *Mammuthus primigenius*, and he helped name the platypus, *Ornithorhynchus anatinus*. He helped turn the natural history collection at the University of Göttingen into one of the first anthropological museums in the world, as he amassed and catalogued skulls, hair, skins, casts, and pictures from places around the world. When Blumenbach was appointed curator in 1776, the collection housed 85 skulls; when he died on 22 January 1840, the collection had grown to 245 skulls with detailed accounts of their origin. Blumenbach's skull collection, including the skulls that formed the basis of his dissertation and his theory of the five varieties of human, persisted at the University of Göttingen into the twenty-first century.

Sources

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