

## FORERUNNERS OF THE ECOLOGICAL THINKING (THE 16<sup>TH</sup> – THE 19<sup>TH</sup> CENTURIES)

NEACȘU Petre, CIOBOIU Olivia

**Abstract.** The development of the ecological thinking in the 16<sup>th</sup> – the 19<sup>th</sup> centuries is to be assessed on the basis of many forerunners' works, that were to discover, understand and describe the way life mechanisms and processes functioned. Analysing the respective period, one may notice that the researchers from different fields of natural and human sciences understood that items in nature (plants, animals, physical phenomena, etc.) are not isolated and static, but they display dynamic interactions. This knowledge led to the appearance of ecology as a distinct science in the framework of biology in the 20<sup>th</sup> century.

**Keywords:** ecological science, forerunners, ecology.

**Rezumat. Precursori ai gândirii ecologice (secolele XVI – XIX).** Dezvoltarea gândirii ecologice în secolele XVI – XIX se regăsește în însemnările și lucrările multor precursori, care urmau să dezvolte și să descopere, să înțeleagă și să descrie desfășurarea mecanismelor și proceselor vieții. Privind retrospectiv perioada analizată se poate constata că cercetătorii din diverse domenii ale științelor naturii și a celor umane, au înțeles că lucrurile din natură (plante, animale, fenomene fizice etc.) nu sunt izolate și statice, ci în interacțiuni dinamice. Aceste cunoștințe au condus ca în secolul XX să apară ecologia ca știință biologică de sine stătătoare.

**Cuvinte cheie:** gândire ecologică, precursori, ecologie.

The development of ecological thinking intensifies between the 16<sup>th</sup> and the 19<sup>th</sup> centuries due to the development of all human fields of activity: agriculture, industry, goods market, literature, arts and sciences, highlighting the appearance of a new production pattern, the capitalist one.

In biology, research diversified passing from the simple description of the characteristics of species to multiple physiological, microbiological, soil biology, geographical distribution studies, to the elaboration of ecological concepts and principles.

The understanding germs of the phenomena, structures and functions of plant and animal life, of their relationships to the environments they live in are to be found in the notes and works of many forerunners that were to develop and discover, understand and describe life mechanisms and processes.

In a much or less aleatory succession of their mention in the history of science, of thinking and understanding of life and phenomena related to plant and animal life and not only, the recollection of those scientists who can be considered real forerunners of this science is quite welcome (BOTNARIUC, 1961; IAROSSENKO, 1962; NEACȘU, 1984).

The period 1500 – 1900 embraced certain ecological knowledge exposed by scientists from other fields of study. Thus, in the works of some physicists there appeared data about the influence of the environmental factors upon organisms. Robert Boyle tested the behaviour of animals under different conditions of atmospheric pressure. Réaumur made some observations regarding the influence of certain abiotic factors upon organisms (BOTNARIUC, 1961; DELEAGE, 1991; REAUMUR, 1749).

Francis Bacon (1561 – 1626), an English savant and philosopher, in his book entitled “*The New Atlanti*” is against scholastics and a supporter of experimental methods (BOTNARIUC, 1961; WORSTER, 1992).

Henry Hudson, an ornithologist, explained the role of the protection colours in case of birds, as well as their behaviour (BOTNARIUC, 1961; WORSTER, 1992). John Ray (1628 – 1705) is considered the greatest English naturalist before Charles Darwin. He acknowledged the existence of a stable and sustainable order in nature (RAY, 1674).

John Evelyn published the work “*Silva*” in 1664 or treatise upon forest trees, where he recommended the rational management of forests (WORSTER, 1992).

Charles Linné (1707 – 1778), 1749, published “*Treatise on the economy of nature*”, where he explained through many examples that everything interrelated in nature following a common interest by means of food chain which linked the alive and dead, the predator and prey (BOTNARIUC, 1961; LINNAEUS, 1735; WORSTER, 1992).

Gianluigi Buffon (1707 – 1788) mentioned in his work the succession of forest species and the influence of light and shadow upon this process (BOTNARIUC, 1961; DELEAGE, 1991; IAROSSENKO, 1962; WORSTER, 1992).

Gilbert White (1720 – 1793) emphasized the importance of insects and reptiles in the economy of nature. He considered nature was a remarkable organizer (WHITE, 1756; WORSTER, 1992).

Thomas Maltus (1766 – 1834) published in 1798 a brochure entitled “*With regard to the population*”, considering that alimentary products increased in arithmetic progression while population increased in geometric progression and, consequently, at a certain moment, population would exceed the available food resources (BOTNARIUC, 1961; REAUMUR, 1749).

Alexander von Humboldt (1769 – 1859), after his research in South America between 1799 and 1804, proved that all the plants present in the world had to be classified not only taxonomically but also from the point of view of geographical conditions. In 1805, he published the work “*Certain ideas upon the geography of plants*” (BOTNARIUC, 1961; SAFONOV & HUMBOLDT, 1962; WORSTER, 1992).

Charles Lyell (1797 – 1875) published the work “*Geology principles*”. The ideas exposed in this book contributed to the development of Darwin’s evolutionary concepts upon nature. He considered that the human being was a perturbing element of natural balance (DROUIN, 1993; LYELL, 1830; MALTHUS, 1817; MATAGNE, 2002).

George Emerson (1803 – 1882), an American lawyer, held conferences on nature that he also published in 1836 (DELEAGE, 1991; MATAGNE, 2002). Luis Agassiz (1807 – 1873), a zoologist at Harvard University, studied the limnology of Lake Walden (USA) (AGASSIZ, 1859; MATAGNE, 2002; WORSTER, 1992).

Henry Thoreau (1817 – 1862) is a real field ecologist. He observed the succession of plants in nature (WORSTER, 1992). Titman, in Russia, elaborated a study on steppe vegetation in 1837 (IAROSSENKO, 1962).

August Grisebach, in 1838, (WORSTER, 1992), introduced the term of formation for identical communities of plants developed under similar climatic conditions, no matter the vegetal species taken as example: humid tropical forests from Africa, South America, Indonesian Archipelago represent a single type of vegetal formation.

J. R. Lorenzo published in 1858 (LORENZO, 1858; IAROSSENKO, 1962) a work about the subalpine swamps from Salzburg (Austria). The author described not only the vegetation present in the swamp but also smaller groups such as micro-groups or micro-phytocoenoses.

The Swedish geologist Hampus von Post (IAROSSENKO, 1962), 1851-1856, published some works where he remarked that the same plant species may grow differently depending on soil and climatic conditions.

Vladimir M. Bajanov published in 1863 (IAROSSENKO, 1962) the paper entitled “*On the artificially cultivated meadows*”, which contained numerous geobotanical notions. Kerner published in 1863 the work “*The life of plants in the Danubian countri*”, where he subdivided vegetation in formations and thoroughly described each of them (IAROSSENKO, 1962).

Ernst Haeckel (1834 – 1919) proposed for the first time in 1866 the term of ecology as the science of the relationships between living organisms and their external environment, habitat (HAECKEL, 1866; NEACȘU, 1984; WORSTER, 1992).

F. I. Ruprechi, in 1866, published the work “*Geobotanical research on chernozem*”, where he used the term of geobotanics for the first time (IAROSSENKO, 1962).

Karl Moebius defined (1877) biocoenosis as a community of organisms developing within a certain territory, adapted to the environment and one to each other, forming a whole that changes as environment conditions or the number of species changes (DROUIN, 1993; MOEBIUS, 1865; NEACȘU, 1984).

Robert Hult, a Finish researcher published in 1885 a study upon the vegetation in the area of Bleking (Finland) and a study about the alpine vegetation form the north of Finland. Hult’s works marked the beginning of research regarding the succession of vegetal groups (IAROSSENKO, 1962).

I. K. Pocioski, published the paper (1891) “*Studies regarding the flora development*”, where he proposed the separation of the vegetal groups in a distinct science called “*Florology*”; he considered it the science dealing with the genesis, life, development and distribution of vegetal formations. Afterwards, the author renounce at the term of florology replacing it with the term phytocoenology in 1896 (IAROSSENKO, 1962).

Charles Darwin (1809 – 1882), an English biologist, set up the evolutionary laws as a result of natural selection (BOTNARIUC, 1961; DARWIN, 1857; NEACȘU, 1984; WORSTER, 1992).

Thomas Huxley (1825 – 1895), another English biologist, published in 1893 the work entitled “*Evolution and ethics*”, as he was a partisan of Darwin and his evolutionary theory (BOTNARIUC, 1961; HUXLEY, 1863; WORSTER, 1992).

Eugen Warming published in 1909 “*Oecology of Plants*” (WARMING, 1909). Warming considered that plant ecology had to study:

- 1 – what are the species associated within the same habitat?
- 2 – which is the physiognomy of vegetation and landscape?
- 3 – why do species have a distinct behaviour and habitat?
- 4 – why do species have a characteristic physiognomy?
- 5 – which is plant economy, their internal and external structure and their relationship to the environment?

(IAROSSENKO, 1962; WARMING, 1895; 1909).

Warming is considered the founder of vegetal ecology, in other words of a new biology branch (WARMING, 1895).

P. N. Krilov published in 1898 the work “*Characterization of the vegetation from the Siberian District Tomsk*” (IAROSSENKO, 1962).

Retrospectively analysing the aforementioned period one may notice that researchers acting in different fields of natural and human sciences understood that items in nature (plants, animals, physical phenomena, etc.) are not isolated and static but they display dynamic interactions (DELEAGE, 1991; WORSTER, 1992; DROUIN, 1993; MATAGNE, 2002).

It was clearly understood that plants and animals are not distributed at random all over the globe, but they are conditioned and modified by physical factors (temperature, light, humidity, atmospheric pressure), chemical factors (type of soil, water) and biological factors (parasites, predators, human pressure, etc.).

**As a conclusion**, along the four centuries (16<sup>th</sup> – 19<sup>th</sup>), there emerged notions and actions with different degrees of complexity and theorization regarding the living world: succession from dead to alive; water circuit in

nature; succession of plants, etc. There were synthesized different notions, such as vegetal formation, phyto-sociology, biocoenosis, geobotanics, ecology. K. Moebius' work, "*Fauna of Kiel Gulf*" is considered the start of the modern system and methodology in ecology (MOEBIUS, 1865). Charles Darwin advanced the theory about the formation of coral reefs, which, with some modifications, is accepted even nowadays. There appeared the first Laboratory of Marine Biology at Concarneau (France); it can be considered the first research resort in the world. In the United States, the zoologist Louis Agassiz inaugurated the first studies of marine ecology. In London, there was printed the first course on plant ecology.

Consequently, all the accumulated knowledge led to the appearance of ecology as an independent science in the 20<sup>th</sup> century, as well as of other adjacent branches, such as limnology, hydrobiology, animal ecology, environmental protection.

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### Neacșu Petre

University Bucharest, Faculty of Biology,  
Str. Splaiul Independenței, No. 91-95, 76201, Bucharest, Romania  
E-mail: sandaneacsu15@yahoo.com

### Cioboiu Olivia

The Oltenia Museum, Craiova, Str. Popa Șapcă,  
No. 8, 200422, Craiova, Romania  
E-mail: oliviacioboiu@gmail.com; cioboiu.olivia@yahoo.com

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