

Lecture 2&3 Topic: Autecology
(idioecology) or *Individual*

Ecology



PLAN

- *Organism and environment*
- *Adaptation of organisms to the environment*
- *Environmental factors*
- *Law of optimum*
- *Law of the Minimum*
- *Shelford's law of Tolerance*

Autecology studies such characteristics of the living organisms as adaptation to temperature, humidity, salinity and other environmental factors



Organism and environment.

Habitat is a part of the nature that surrounds a living organism and directly interacts with it. The components and properties of the environment are diverse and variable. Any living being inhabits in a complex and changing environment, continuously accommodating to it and adjusting its vital functions in accordance with changes to it.



Habitats of living beings



aqatic



Air and
terrestrial



an
underground



Different
habitats

Adaptation of organisms to the environment.

- *The ability to adapt* - one of the primary properties of life in general, because it provides the very possibility of its existence, the ability of organisms to survive and reproduce oneself.





There are a lot of examples, which shows us how living organisms adapt

Colour of polar bear and brown bear is result of adaptation



Some environmental properties or elements impacting the organisms are called *environmental factors*

The environmental factors are divided into *abiotic* and *biotic*.



Biotic factors



- ***Biotic factors*** are the form of impact of living beings on each other.

Abiotic factors

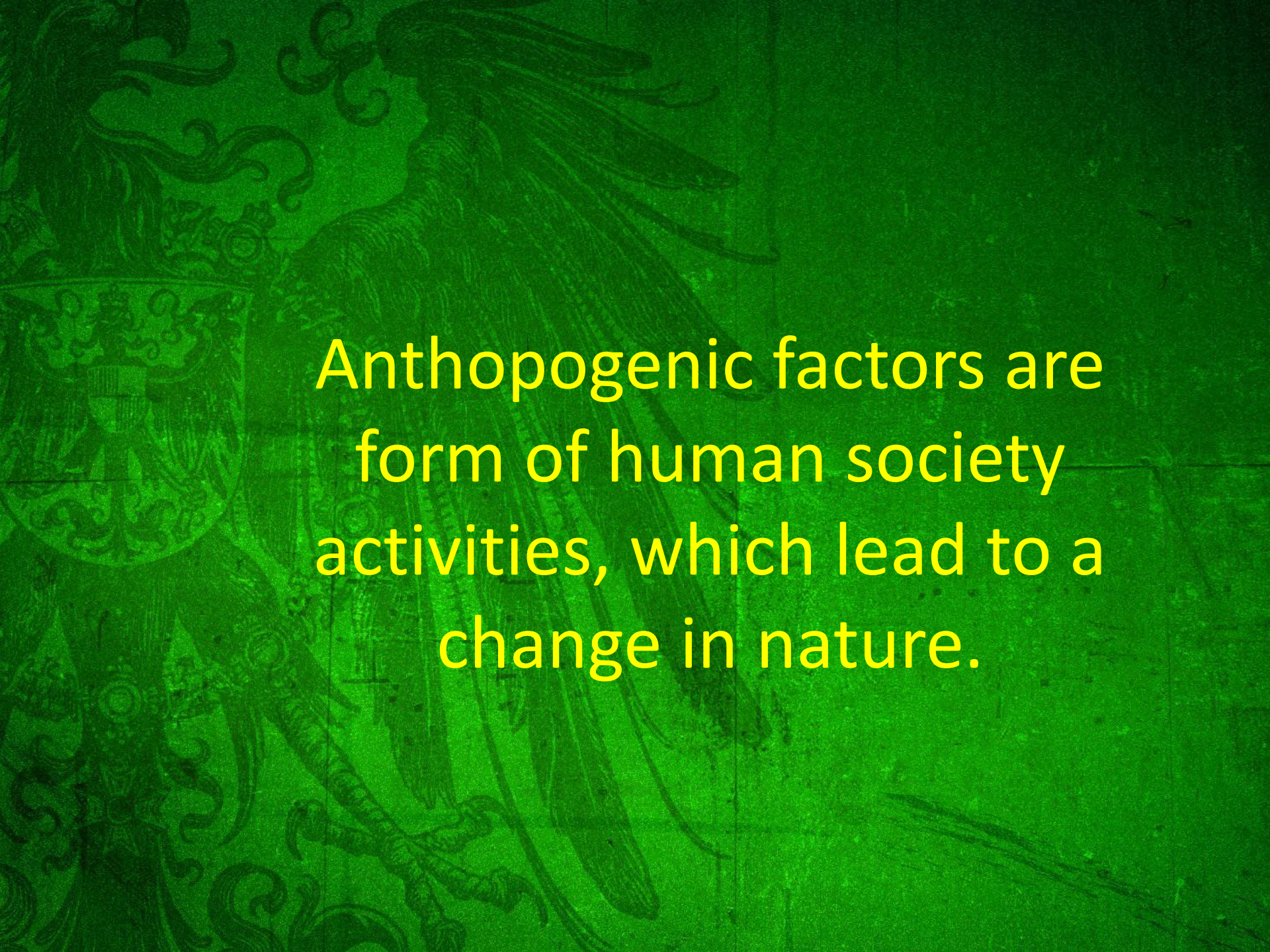
Abiotic factors cover all the properties of inanimate nature, which directly or indirectly impact the living organisms: they include both physical and chemical factors.

Physical factors of inanimate nature are as follows: space, climate, and geological.



Climatic factors are the following:
radiant solar energy, humidity,
precipitation, ventilation (wind).

Chemical factors are the
following: components of soil,
water, air, pH, impurities, etc.



Anthropogenic factors are
form of human society
activities, which lead to a
change in nature.

Anthropogenic factors

In the course of human history: first - hunting, later on agriculture, industry, transport have changed considerably our planet.

Anthropogenic effects or human impacts on the whole living world of Earth continues to grow rapidly.





Nowadays
deforestation is one
of the most important
ecological problems.

It is an example
of harmful
influence of
human activity.





But anthropogenic factors are not always harmful

Dogs are domesticated wolves. Their way of living changed, but without harm for them.

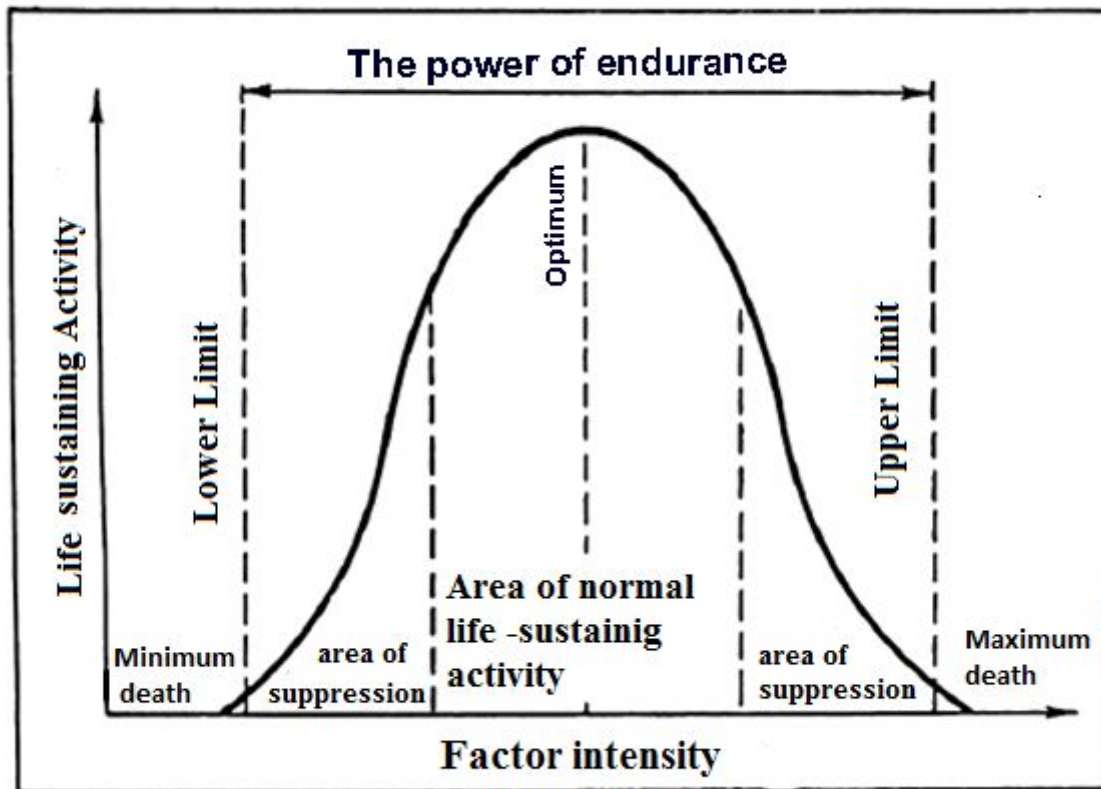


Law of optimum.

Each factor possesses only defined limits of positive effects on organisms. The result of the variable factor effect depends primarily on the extent of its manifestation. Both insufficient and excessive effects of the factor affects on the species life-sustaining activity.

Favorable effect is called an area ***of optimum environmental factor*** or simply ***an optimum*** for the given species organisms. The greater the deviation from the optimum, the more this factor's ***suppressive effect*** on the organisms (***pessimum area***). Maximum and minimum tolerable values of the factor are critical points, beyond which the existence is no longer possible, death occurs.

Effect of the factor intensity on the organisms' life-sustaining activity



- Factors limiting the ability to life activity of organisms, called limiting

Law of the Minimum

- Patterns of the environmental factors impact on the organism are determined by *Liebig's Law of the Minimum* and *Shelford's Law of Tolerance*.
- *Law of the Minimum* was formulated in 1940 by J.Liebig, the *German agricultural chemist*. According to this law, endurance of the organism is determined by the weakest link in a chain of its environmental requirements.

Development of an organism may depend not only on the major factors or substances that are required in large quantities, but also on those that are needed in small doses (eg minerals) but that are not enough in the soil.

- Potassium, sodium and phosphorus and complex of microelements are necessary for plant growth . Potassium, sodium and phosphorus are in large quantities and microelements are in very small amount. The Lack of a single microelement (eg copper), can lead to inhibited growth. Copper deficiency is a limiting factor

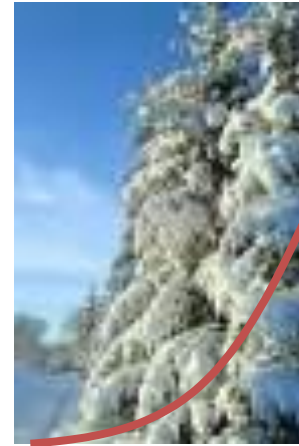
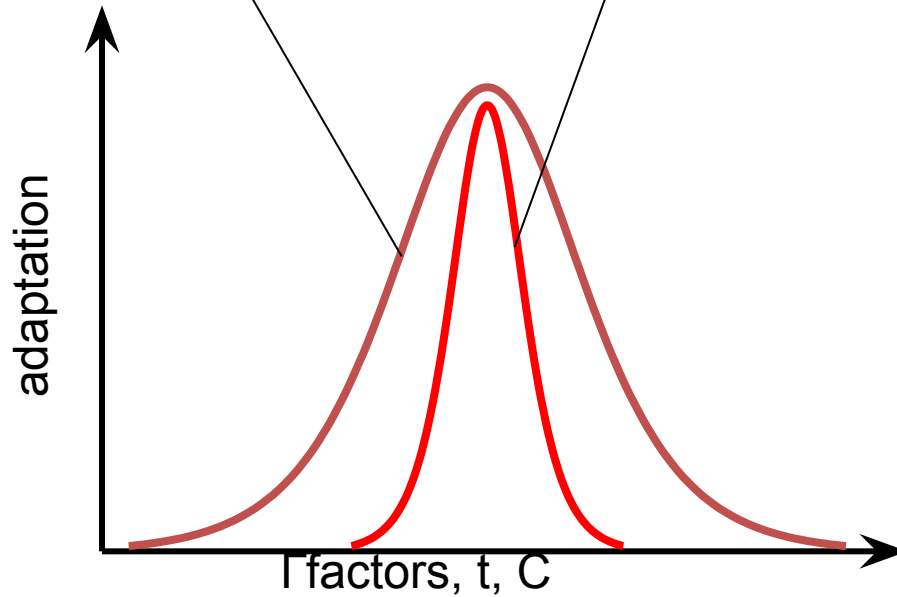
Shelford's law of Tolerance.

- The growth of organisms may be limited or restricted not only by lack but also by excess of one or another factor. Thus, demands placed by organism to environment can be characterized by two values in each factor: ecological minimum and ecological maximum . Limiting effect of maximum was set by V. Shelford in 1913 and is called Shelford's law of Tolerance. The range between the two values is called the range of tolerance (RT).

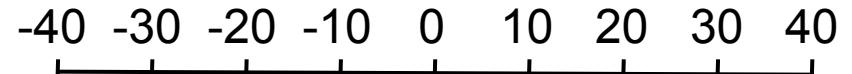
Stenobions and Evrybionts

Evrybionts

Stenobionts



Orchids



Temperature

°C

Conclucion

- Due to the "ecology of tolerance" experiments, the limit of existence for many plants and animals was defined. Theoretical justification of maximum permissible concentration (MPC) is based on the law of limiting factor. MPC means the accepted threshold values of a given factor, under which no irreversible pathological alterations can occur in the organism so far. These values are set experimentally.