

# Adaptation without selection: possible explanations



Department of Invertebrate Zoology



Saint-Petersburg State University

Andrei Granovitch

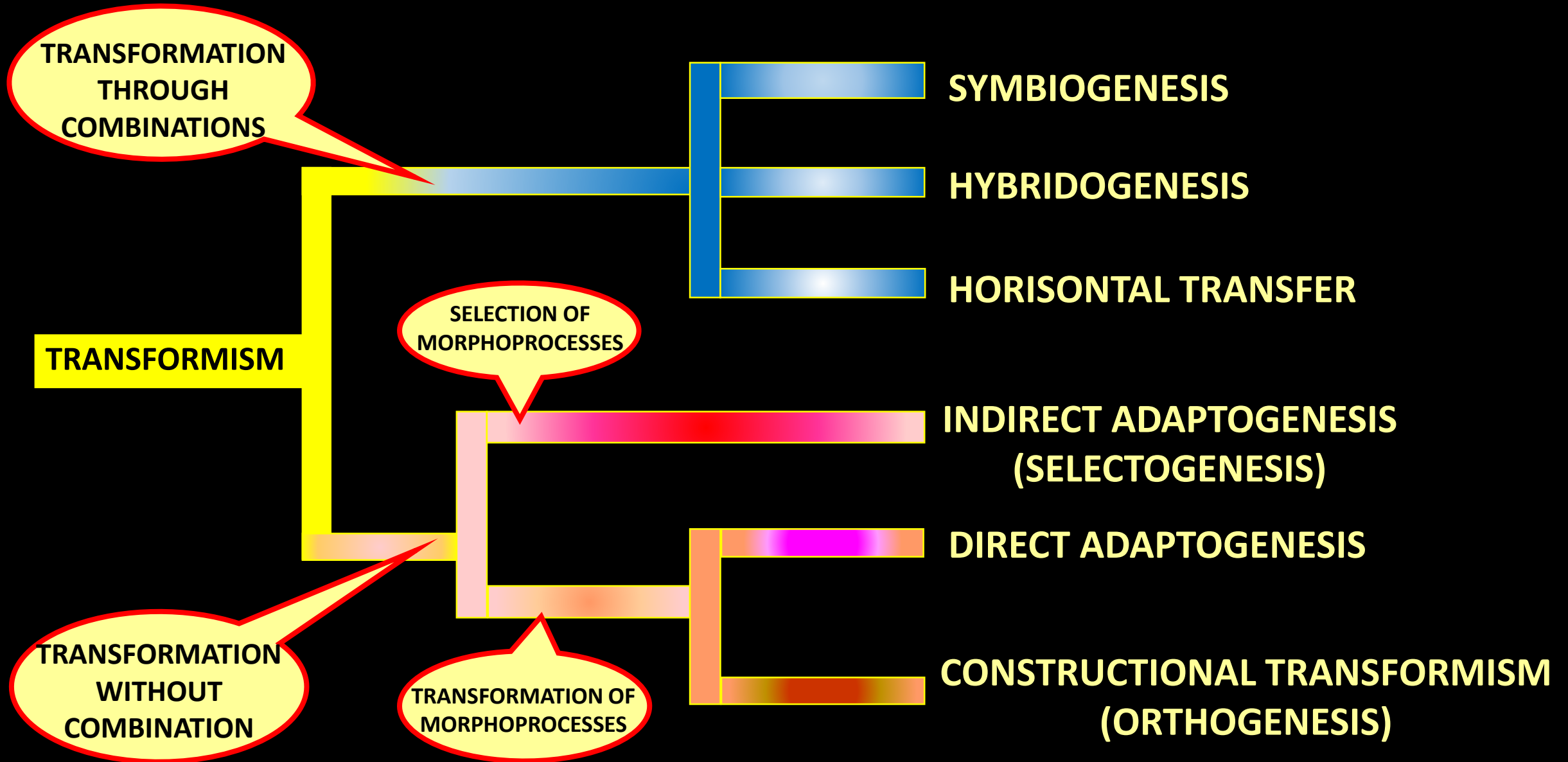
Postmodernism in evolutionary thinking

# Talking evolution

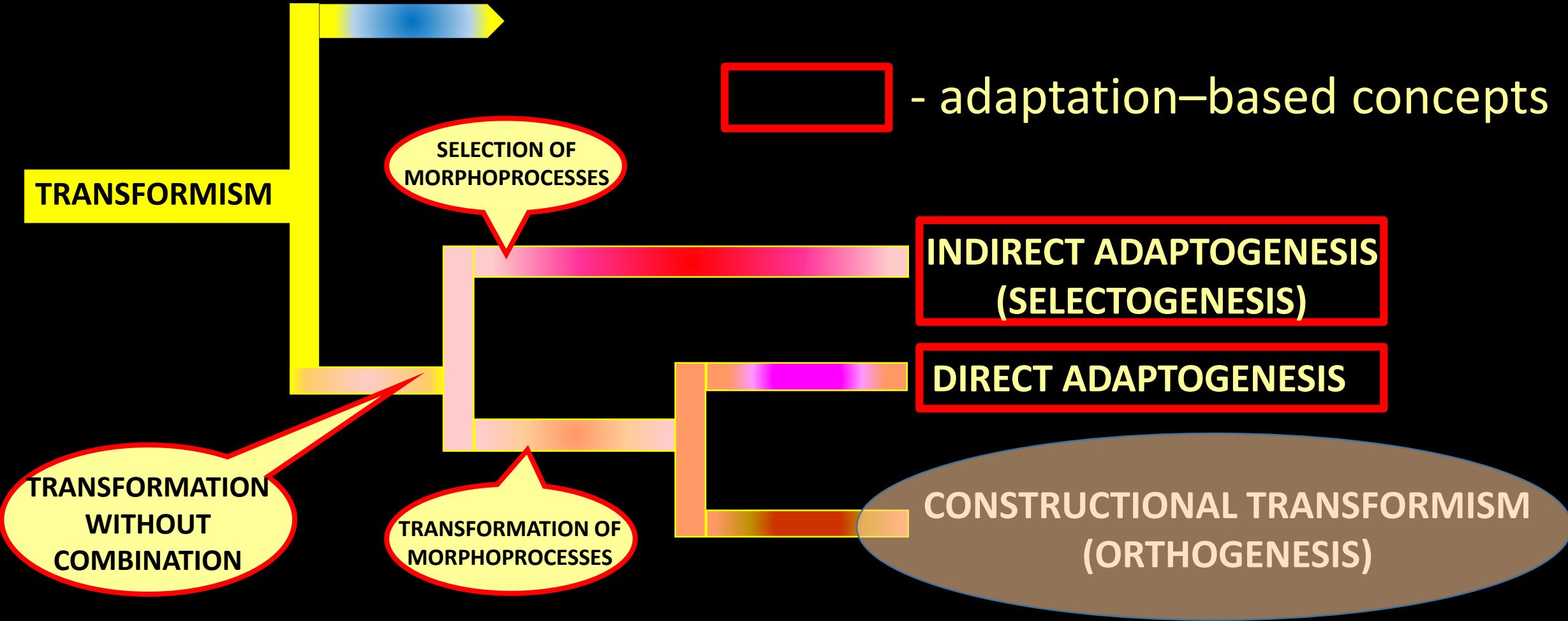


Tokyo, Japan, 1991. Architect: Kengo Kuma

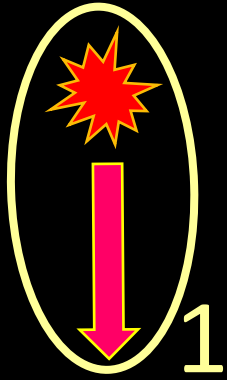
# Conceptions of evolution in brief



# Explanation of adaptation formation by different concepts



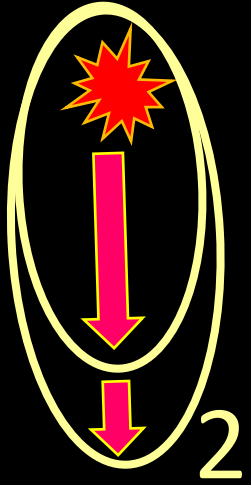
## A. System filter no. 1. Epigenetic regulation



- Regulation of genes' activity by transcription factors;
- RNA interference;
- Alternative splicing;
- DNA methylation and histone acetylation;
- Mobility control of mobile genetic elements.

System of epigenetic compensatory mechanisms  
regulating the genetic networks

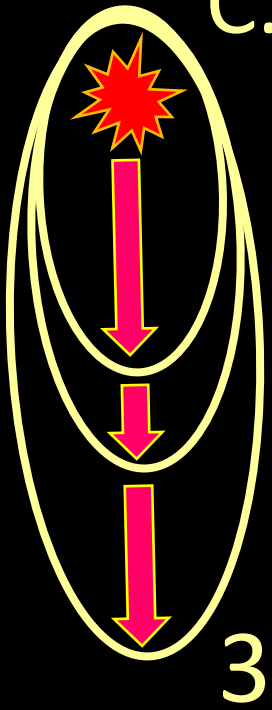
## B. System filter no. 2. Cell metabolic filter



- Compensatory biochemical reactions of the cell, which are not related to the structure or processing of the nuclear acids.

Regulatory changes of the  
cell metabolic pathways

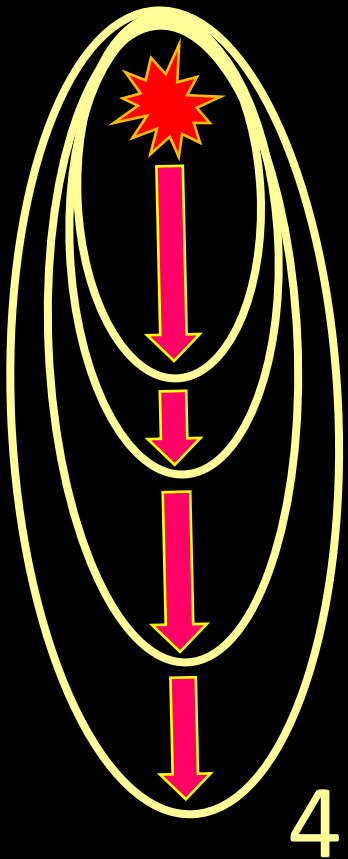
## C. System filter no. 3. Ontogenetic regulation of multicellular organism



- Cell communication.
- Positional information.
- Direction of cell differentiation.
- Character of growth and the ontogenetic features of the life cycle stages.

Dynamic self-organization of an organism with a high degree of equifinality during ontogenesis

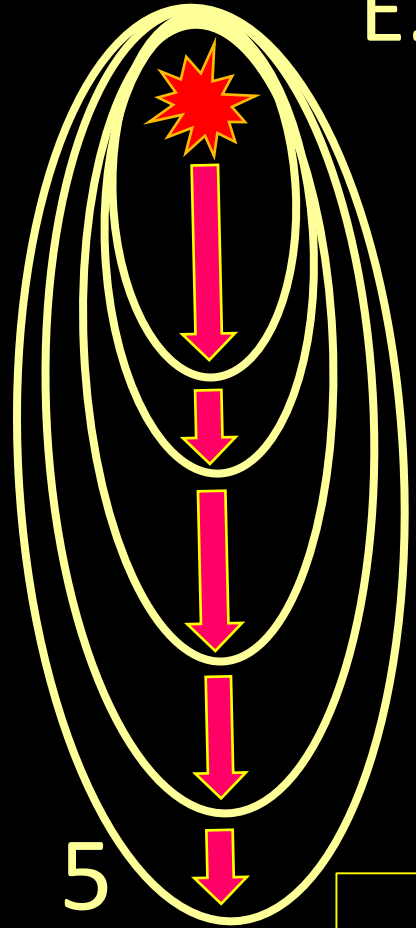
## D. Filter no. 4. Physiological regulation of multicellular body



- Maintenance of the optimal level of metabolism.
- Adequate intensity of locomotion.
- Effective functioning of the integrating systems.
- Dynamic correlations among all functions of an organism.

The system of physiological compensations and feedbacks underlying the functional stability of the entire organism



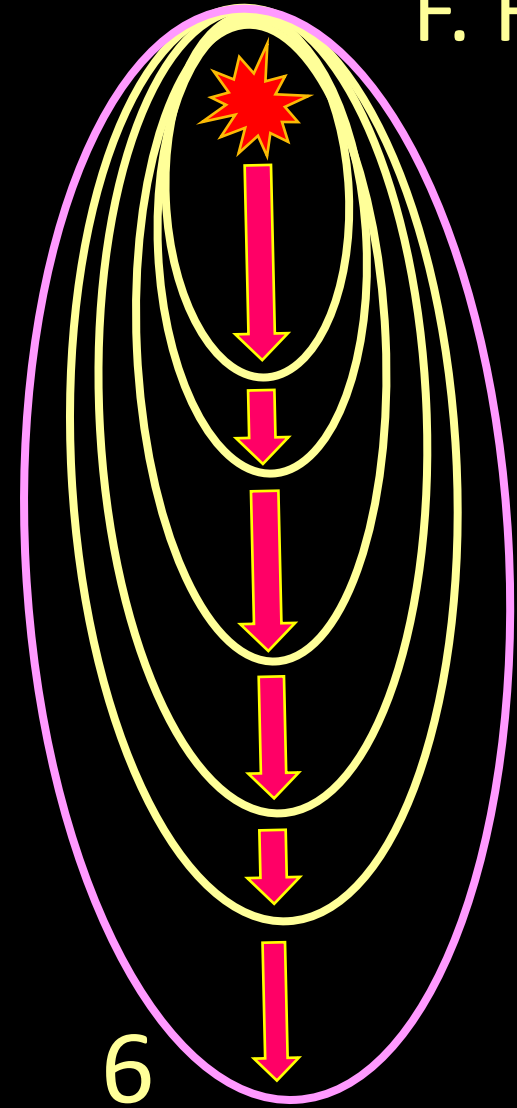


## E. Filter no. 5. Behavioural regulation

- Specific behavior is forming in ontogenesis.
- Compensations improving survival and reproductive success.
- May prompt the choice of specific microhabitats and diet preferences.
- Determine activity periods and the character of interactions with conspecific and heterospecifics.

Ensuring the existence of an organism and the implementation of its major functions in a heterogeneous environment.

## F. Filter no. 6. Populational compensations



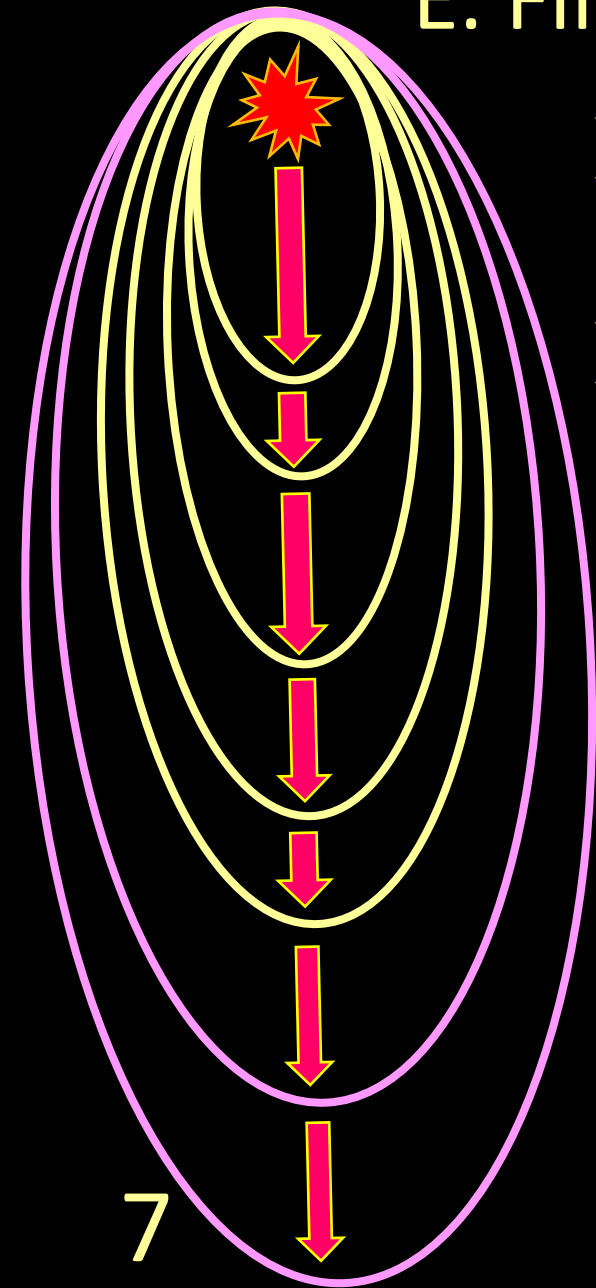
- Mechanisms of “populational mutual assistance”.
- Mechanisms ensuring populational compensations of abundance (birth and mortality rates, emigration and immigration).
- Populational compensations (feedbacks) may act during the lifetime of several generations.

Considerably modifies the significance of “hereditary signal” of the individual in question.

## E. Filter no. 7. Biocenotic (ecosystem) compensations

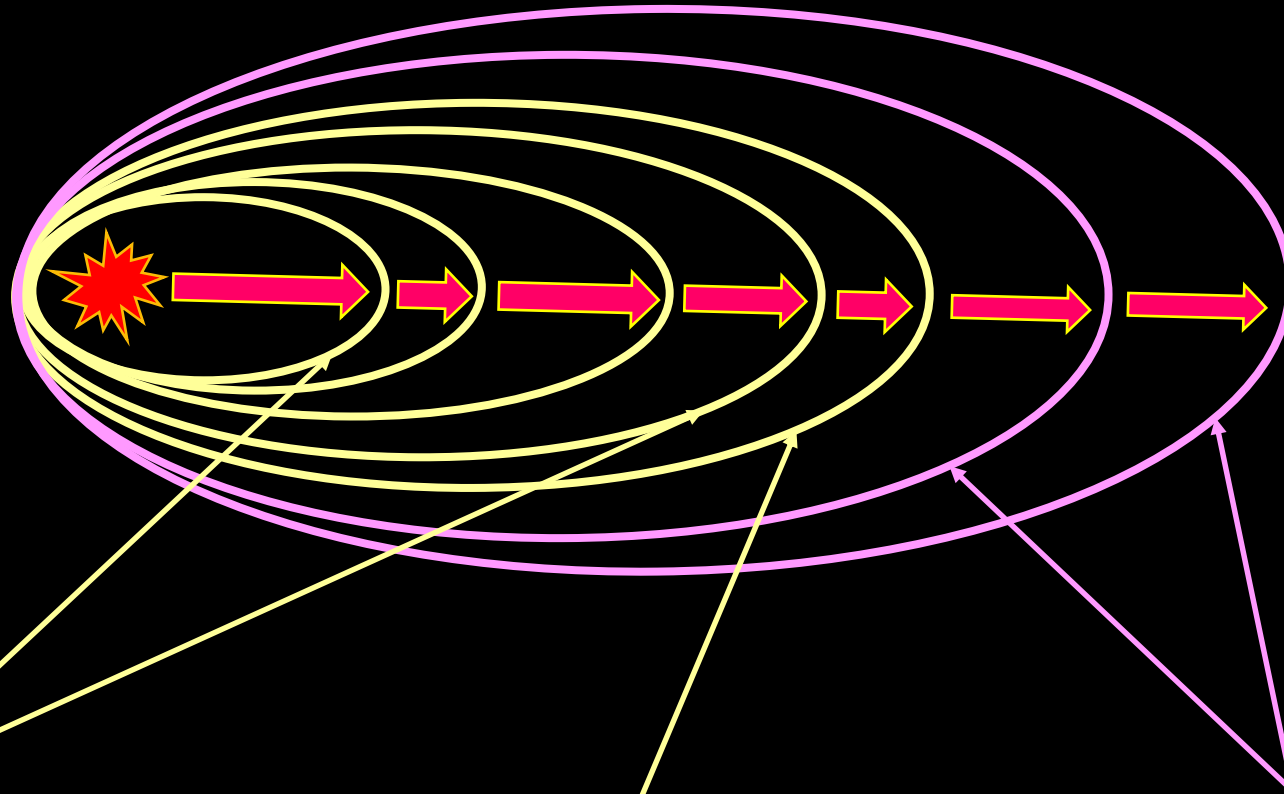
- Alter the interactions of this individual with heterospecifics in the community.
- Manifest itself most conspicuously in the interactions of the individual with organisms whose populations form stable biocenotic links in the community (parasitic and predator-prey systems, mutualistic complexes).

The value of “hereditary signal” may be assessed only in the context of the structure of a concrete ecosystem.



# Conclusions:

**“system filters” form a unified and dynamic system of hierarchical multiple compensation.**



**“1 – 4” responsible for the integrity of the organism as such**

**“5” minimizes the costs of interaction of the organism with the environment**

**“6 - 7” characterize the integrity of supraorganismic systems**

# Conclusions:

