



Structural and Semiotic Aspects of Biological Mimicry

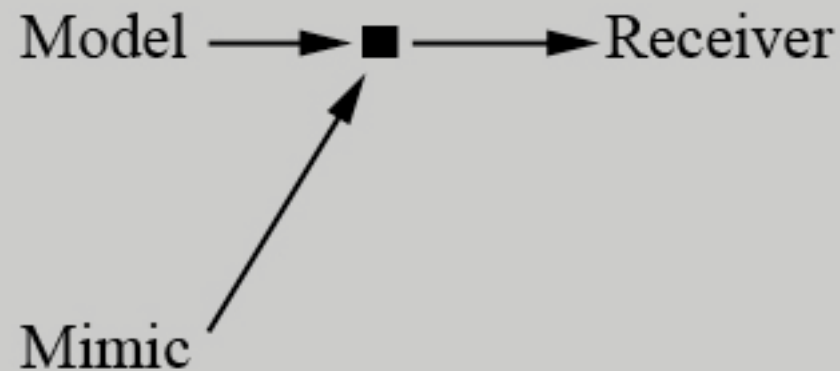
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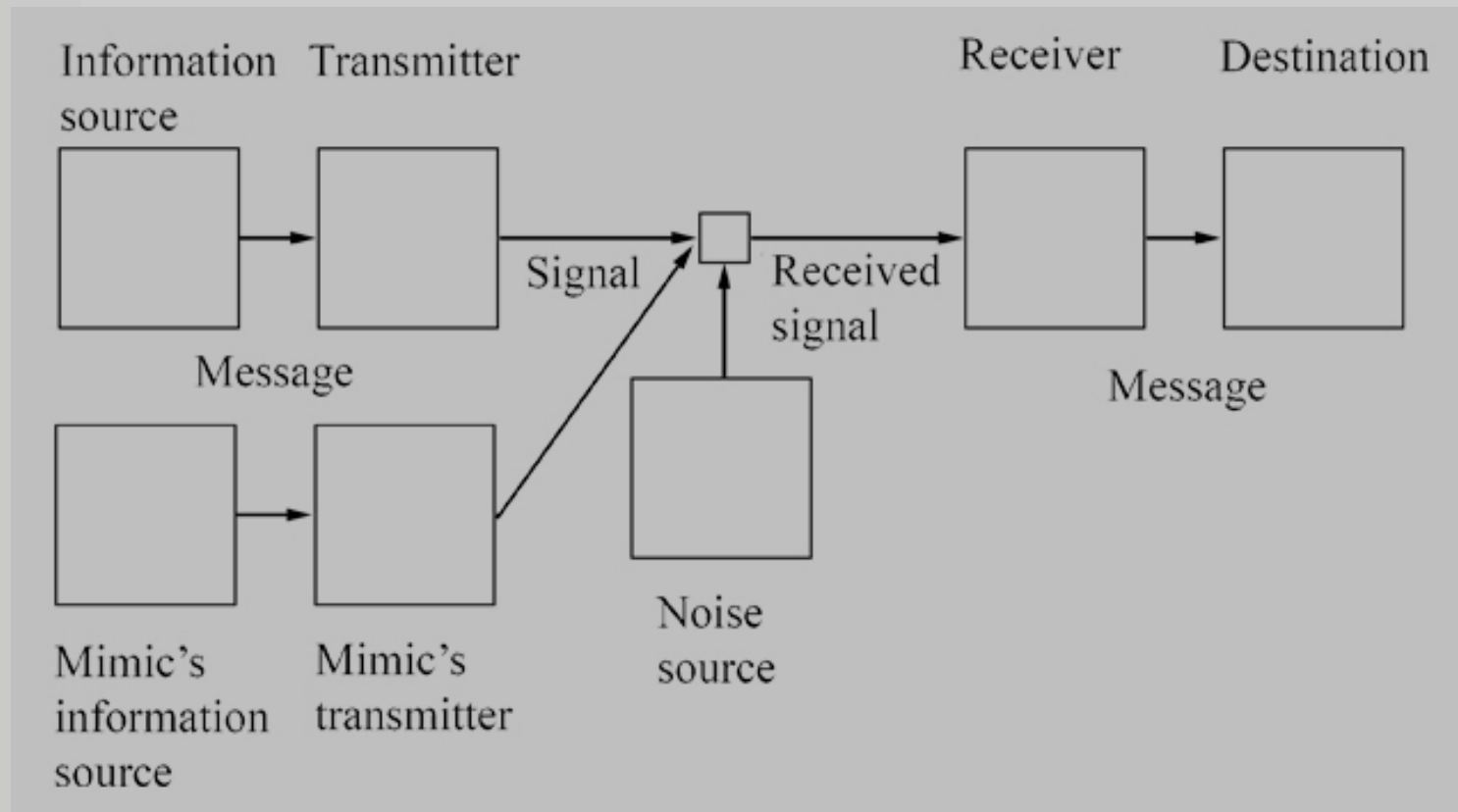
Structure of biological mimicry

Biological mimicry can be described as a structure consisting of three participants: a mimic, a model, and a receiver, and their communicative interactions.





Structure of biological mimicry



Mimicry in the terms of the Shannon-Weaver model of communication (Kopp, Mills 2002).



Structure of biological mimicry

The relations between the three participants commonly pointed out in mimicry definitions are: 1) similarity between colors, signals or species; 2) deception of one participant, or a participant's inability to recognize the difference; 3) some use, benefit for, or increase/decrease of the fitness of the participants.

Richard I. Vane-Wright: “Mimicry occurs when an organism or group of organisms (the mimic) simulates signal properties of a second living organism (the model), such that the mimic is able to take some advantage of the regular response of a sensitive signal-receiver (the operator) towards the model, through mistaken identity of the mimic for the model.”
(Vane-Wright 1976: 50).



Observer's perspective on mimicry



Henry W. Bates: “Mimetic analogies ... are resemblances in external appearance, shape, and colours between members of widely distinct families [...] The resemblance is so close, that it is only after long practice that the true can be distinguished from the counterfeit, when on the wing in their native forests.”
(Bates 1862: 502, 504).



Mimic's perspective on mimicry

Thomas A. Sebeok: “[Asiatic spider changes] its surroundings to fit its own image by fabricating a number of dummy copies of itself to misdirect predators away from its body, the live model, to one of several replicas it constructs for that very purpose.” (Sebeok 1989: 116).

“A sign is said to be iconic when the modeling process employed in its creation involves some form of simulation. Iconic modeling produces singularized forms that display a perceptible resemblance between the signifier and its signified. In other words, an icon is a sign that is made to resemble its referents in some way.” (Sebeok, Danesi 2000: 24).



Receiver's perspective on mimicry

The common denominator of mimicry is the signal-receiver's effort to make the correct recognition in a situation where perceptibly similar objects or organisms may be present.

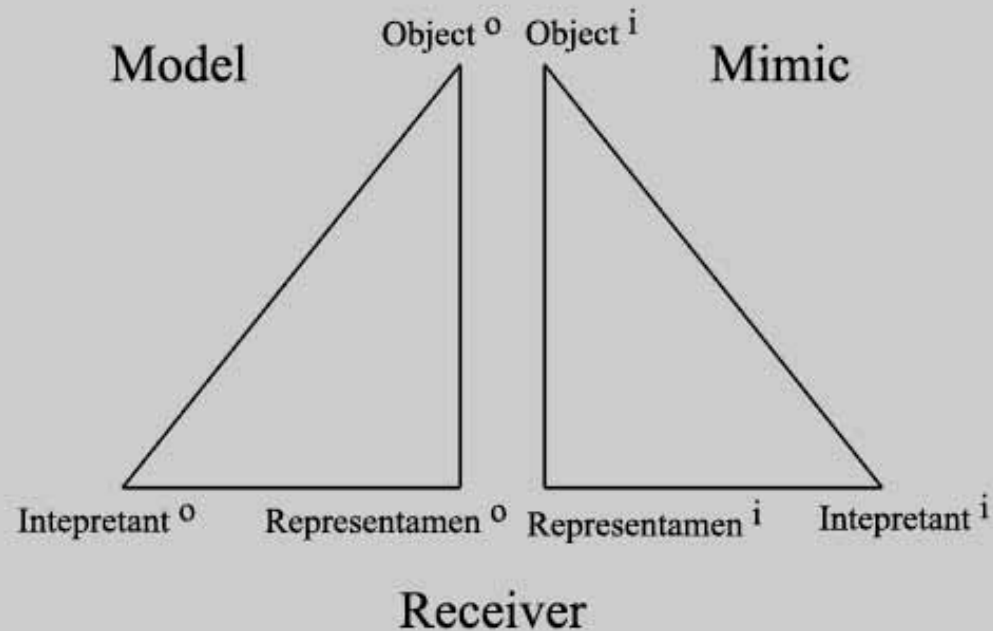
Charles Morris: "A set of similar sign-vehicles which for a given interpreter have the same significata will be called a sign-family." (Morris 1971: 96).

"A sign-vehicle is unambiguous when it has only one significatum (that is, belongs to only one sign-family); otherwise ambiguous." (ibid., 97).



Receiver's perspective on mimicry

Ambivalent sign can be described as a sign structure, which fluctuates between one and two signs and where the actual composition and number of signs emerges in the course of interpretation.





Uexküllian perspective on mimicry

Jakob von Uexküll: “The meaning of all plant and animal organs as utilizers of meaning-factors external to them determines their shape and the distribution of their constituent matter.”
(Uexküll 1982: 37).

Structures in nature that mediate meanings make it possible to consider mimicry in Uexküllian framework of contrapuntal correspondences.

Concerning mimicry, the Uexküllian approach means that any deceptive resemblance should be considered first from the viewpoint of the participants’ Umwelten.



Uexküllian perspective on mimicry

Three principles of Uexüllian perspective on mimicry:

1. Resemblance between two species is only one possibility among many possible similarities.
2. Neither the mimic nor the model needs to be a whole organism but can be just a part of an organism both in spatial or temporal terms or just a perceptible feature.



Uexküllian perspective on mimicry

Reproductive mimicry of fly orchid *Orphys insectifera*:





Uexküllian perspective on mimicry

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2. Neither the mimic nor the model needs to be a whole organism but can be just a part of an organism both in spatial or temporal terms or just a perceptible feature.
3. Also intense meanings which do not have any direct or strong relations to any specific physical forms can be imitated.



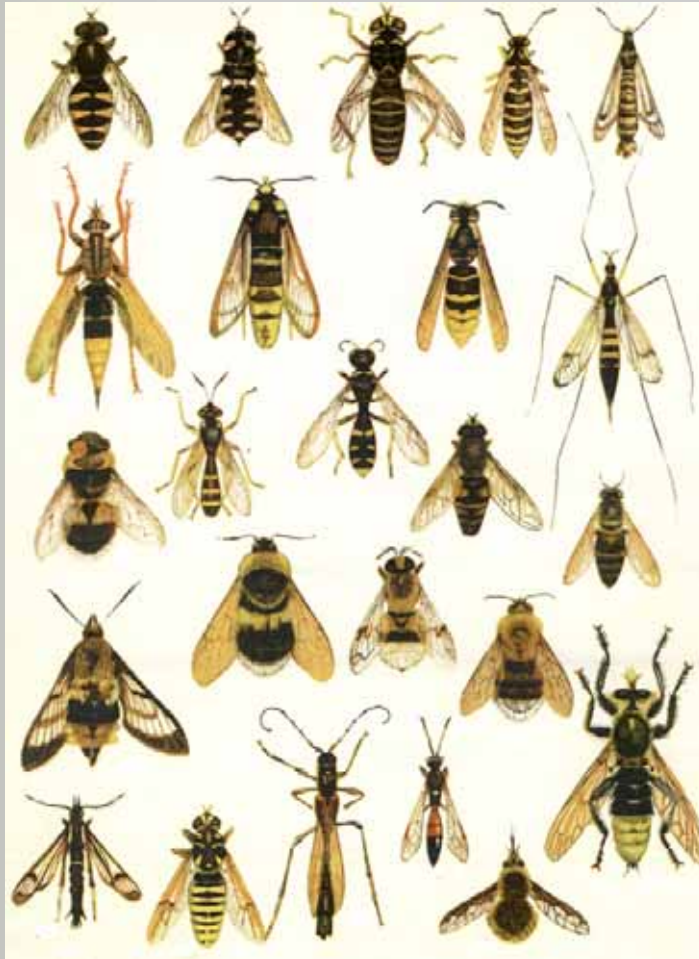
Abstract or imperfect mimicry

The defence display of common toad *Bufo bufo*:





Abstract or imperfect mimicry



Biological explanation:

Imperfect mimicry as some deviation from the 'normal situation' of drive toward absolute similarity.

Biosemitotic explanation:

No concrete species are imitated, but rather a certain combination of colours, which have the meaning of danger or unpalatability for a large group of animal receivers.



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