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## Adaptationist Program, The

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### Synonyms

[Adaptationism](#); [Adaptationist framework](#)

### Definition

An approach to testing theories about species-typical traits that focusses on the fit between an organism's traits and relevant features of that species' ancestral ecology.

### Introduction

How do birds know when to fly south? How do they find their way? How do people learn to speak and read? When are they generous? When are they cruel?

When studying these and other questions about the nature of naturally selected organisms, one can gain a distinct advantage by considering the ecology in which the organism's ancestors evolved and what problems they faced. The adaptationist program offers a framework and approach for testing theories about naturally selected organisms.

## The Adaptationist Framework

An adaptationist does not assume or purport that all (or even most) features of organisms are *adaptations*. An organism, or the “nature” of a species (e.g., “human nature”), can be dissected into an infinite number of features (e.g., having two arms, possessing a right hand, having an odd number of fingers on that hand, the relative gravity between those fingers, the configuration of those fingers that enables grasping, and so on). Not all features have specific adaptive value. The basic commitment of the adaptationist theoretical orientation is that – out of this impossibly large set – it is useful to think of a particular feature as being one of three kinds of things: adaptations, by-products, or noise (Tooby and Cosmides 1992).

Adaptations are those features that are themselves a solution to an ancestral adaptive problem. These features have an inheritable basis that increased in frequency in the population over evolutionary time *because* the individuals exhibiting these features had a reliable reproductive advantage over others (Tooby and DeVore 1987). Because of this causal relationship, the design of adaptations can be understood in part by the fit between the form of the adaptation and the function of solving its adaptive problem. Adaptations, therefore, are reliable characteristics of a species: they tend to be common or universal in the species – reliably developing at some point in the life span – given the necessary environmental input.

While adaptations are those features that solved an adaptive problem over evolutionary history, the phenotype created by this ancestral selection will have many features that did not themselves solve any adaptive problem. Rather, they are by-products of the adaptation. By-products are reliable characteristics of a species, like adaptations, but by-products were not the target of selection that drove their own existence and instead were merely carried along with the feature under selection (the adaptation).

For example, the blood of humans and most vertebrates has the features “can bind and transport oxygen” and “appears red when oxygenated.” The former feature is an adaptation, as binding and transporting oxygen through the body solves a crucial adaptive problem. The latter is probably not an adaptation, as turning red when oxygenated solved no known adaptive problem. Instead, we can best explain the reliable presence of the “appears red when oxygenated” feature as a by-product of the fact that blood cells evolved to use the iron in hemoglobin to solve the “bind and transport oxygen” adaptive problem and the physical properties of the way iron and oxygen bond.

Features that are neither adaptations nor by-products are noise. Noise refers to features that are not reliable characteristics of a species. In the blood example, a noise feature would be whether you have an odd or even number of blood cells; you might have one or have the other, but it is random and not a reliable feature of our species.

## The Adaptationist Approach

The adaptationist program provides an approach for testing theories about species-typical traits. Because of the fit between features of an adaptation and relevant features of the ancestral ecology (like the fit between features of a lock and a key), a theory that a trait is an adaptation for solving a particular adaptive problem necessarily entails predictions about the features the trait should and should not have (Williams 1966). In contrast, a theory that a trait is a by-product of another adaptation makes different kinds of predictions about the features the trait should have

(e.g., they should not be particularly well designed for solving the by-product function). That is, a primary form of evidence for testing adaptationist theories is *design evidence*: evidence that features of the trait are specialized and coordinated in such a way to solve a particular adaptive problem efficiently and economically over the range of ancestral conditions. The justification for this appeal to design evidence is that – in the absence of natural selection for features that solve a particular adaptive problem – it is exceedingly unlikely that a collection of random mutations will fixate in the genome together by neutral drift. This is a probabilistic inference similar to the inference made in hypothesis testing that the data are exceedingly unlikely if a null hypothesis is correct. Here, the implicit null model is that there was no specific selection for solving the adaptive problem in question. Following up on the blood example, consider a theory that blood involves an adaptation for appearing red when oxygenating as a signal of vitality to others. This theory predicts there should be design features enabling broadcast of the signal (perhaps arteries close to the body surface, transparent skin, obscured veins, etc.). This theory’s predictions fail, especially in contrast to the competing theory that blood evolved for oxygen transport (predicting features like a vascular system to distribute oxygenated blood, architected interaction with the respiratory system for gas exchange, etc.), and that redness is a by-product. Plausible theories about particular adaptations or by-products must make specific predictions that can be tested in this way.

## Critiques of the Adaptationist Program

The adaptationist program has been widely influential and is the foundation of work in evolutionary biology and evolutionary psychology. It has also been criticized within the academic community and the popular press, often on the basis of what has been termed “Panglossianism” and “just so storytelling” (Gould and Lewontin 1979). The Panglossian critique (named for the endlessly optimistic Dr. Pangloss) argues that work in the

adaptationist program assumes that all traits are adaptations, seeing function where none meaningfully exists. By this definition, adaptationism fails if any features of any organism are not adaptations. However, as illustrated above, the adaptationist program explicitly opposes the view that all traits are adaptations; in fact, many if not most of the features of organisms are properly construed as by-products on the adaptationist account.

The “just so storytelling” critique argues that adaptationist theories make no testable predictions and are merely an exercise in telling stories that things are “just so.” However, as illustrated above, adaptationist theories – that is, theories that a trait is an adaptation for solving a particular adaptive problem, or a by-product of a trait that is an adaptation for solving a particular adaptive problem – are explicitly testable theories because they make predictions about the designs the trait should possess. In fact, the foundational premise of the adaptationist toolkit is that adaptationist theories are uniquely generative of predictions about the features of organisms; no other class of theory can predict in advance previously unknown features of organisms.

## Cross-References

- ▶ [Adaptation and Natural Selection](#)
- ▶ [Founders of Evolutionary Psychology](#)
- ▶ [George Williams](#)
- ▶ [Leda Cosmides and John Tooby](#)
- ▶ [The Adapted Mind](#)

## References

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