

# Homology, identity and transformation

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## Abstract

Part of the “problem of homology” lies in not making a clear distinction between individuals and kinds. Another part of the problem is not distinguishing between properties and parts. A character is one of the many parts of an organism. Relative to a particular organism; a character is one of the many properties of the organism. A character also has its own, intrinsic, properties that differentiate the character from the other character parts/properties of the organism. Two different organisms are said to share the same character property when the investigator asserts an identity between the characters that is based on the intrinsic properties of the characters themselves. The question is: what is the nature of this identity? Characters share an identity because they share common properties. These properties may be associated with nominal kinds, natural kinds, or individuals. The properties of nominal kinds are set by convention and are typical of the definitional properties of common vocabularies (e.g., criminal, motorcycle). The properties of natural kinds are set by scientific theories held to be true at the time (kinds such as hydrogen or monophyletic group). Interestingly, such kind properties are not historically bound and in most cases the individuals having the property gain it by what systematists would identify as convergence. Character properties of organisms and the intrinsic properties of these characters are contingencies of history and assert some relationship among the organisms sharing the characters. Character properties shared by individual organisms may be properties of monophyletic groups to which the individuals are parts (homology) or kind properties (homoplasies); properties of polyphyletic groups. Thus, at the level of identical characters, those characters with the same identity, homology is synapomorphy and synapomorphies constitute some of the properties of monophyletic groups (PATTERSON 1982). This is taxic homology. Homology is also asserted as a relationship between characters with different identities, as in fins and legs. This is transformational homology. Although there are no sufficient conditions for asserting that a relationship of transformational homology exists for any two or more organisms, there are necessary conditions that can be tested.

## Introduction

Concepts of homology are like concepts of species; the debate seems to go on forever without any real resolution. I, like GHISELIN (2005), believe that part of the “problem of homology” relates to problems involving the distinction between kinds and individuals. A tentative resolution of this problem is presented in sections below. Before presenting this rather turgid discussion, I would like to present some examples from fishes that illustrate the problem. I will then present my solution in general terms. Finally, I will revisit the examples and see if my solution is applicable.

## Practical problems

As systematists move from phylogenetic analyses of relatively small groups analyzing increasingly large groups, the names of the character properties of organisms may become problematic. If different names are used for the same homologous structure, tree length may be artificially increased. If the same name for different but homologous structures is used, then tree length may be artificially decreased and worse, monophyletic groups missed in the analysis. If the same name or character code is used for two different and nonhomologous structures, then the matrix becomes positively misinformative, implying that a homology relationship exists when, in fact, it does not. I have picked two examples from the fishes to illustrate these problems. Figure 1 illustrates the arrangements of some skull roofing bones in sarcopterygian and

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