information, for example, Estonian. Quechua languages have three evidentiality specifications: direct evidence, conjectural, and reported.

Systems with more than four terms have just two sensory evidentials and a number of evidentials based on inference and assumption of different kinds; these include Nambiquara languages, from Brazil, and Foe and Fasu, of the Kutubuan family spoken in the southern highlands of Papua New Guinea.

The terms *verificational* and *validational* are sometimes used in place of *evidential*. French linguists employ the term *mediative* (Guentchéva 1996). A summary of work on recognizing this category, and naming it, is in Jacobsen (1986) and Aikhenvald (2004).

Evidentiality does not bear any straightforward relationship to **TRUTH**, the validity of a statement, or the speaker's responsibility. The *truth value* of an evidential may be different from that of the verb in its clause. Evidentials can be manipulated to tell a lie: One can give a correct information source and wrong information, as in saying "He is dead-reported" when you were told that he is alive, or correct information and wrong information source, as in saying "He is alive-visual" when, in fact, you were told that he is alive but did not see this. The ways in which semantic extensions of evidentials overlap with **MODALITIES** and such meanings as probability or possibility depend on the system and on the **SEMANTICS** of each individual evidential term. In many languages (e.g., Quechua, Shipibo-Konibo, or Tariana, all from South America), markers of hypothetical and irrealis modality can occur in conjunction with evidentials on one verb or in one clause. This further corroborates their status as distinct categories.

Nonvisual and reported evidentials used with the first person often refer to uncontrolled spontaneous action or have overtones of surprise, known as *mirative*.

Every language has some lexical way of referring to information source, for example, English *reportedly* or *allegedly*. Such lexical expressions may become grammaticalized as evidential markers. Nonevidential categories may acquire a secondary meaning relating to information source. Conditionals and other nondeclarative moods may acquire overtones of uncertain information obtained from some other source for which the speaker does not take any responsibility; the best-known example is the French conditional. Past **TENSE** and perfect **ASPECT** acquire nuances of nonfirsthand information in many Iranian and Turkic languages, and so do resultative nominalizations and passives. The choice of a complementizer, or a type of complement clause, may serve to express meanings related to the way in which one knows a particular fact. In English, different complement clauses distinguish an auditory and a hearsay meaning of the verb *hear*: Saying *I heard Brazil beating France* implies actual listening, whereas *I heard that Brazil beat France* implies a verbal report of the result. These evidential-like extensions are known as *evidentiality strategies*. Historically, they may give rise to grammatical evidentials.

The maximal number of evidentials is distinguished in statements. The only evidential possible in commands is the reported, to express command on behalf of someone else: "eat-reported!" means "eat following someone's command!" Evidentials often come from **GRAMMATICALIZED** verbs. The verb of "saying" is a frequent source for reported and quotative evidentials, and the verbs *feel*, *think*, *hear* can give rise to a nonvisual evidential. Closed-word classes – deictics (see DEIXIS) and locatives – may give rise to evidentials, both in small and in large systems.

Evidentials vary in their semantic extensions, depending on the system. Reported information often has overtones of probability or unreliability, while visual evidentials may develop meanings of certainty. They can be extended to denote the direct participation, control, and volitionality of the speaker. **MORPHEMES** marking tense, aspect, **MOOD,** modality, and evidentiality may occur in the same slot in the structure of a highly synthetic language.

Evidentiality is a property of a significant number of linguistic areas, including the Balkans, the Baltic area, India, and a variety of locations in Amazonia. Evidentials may make their way into **CONTACT** languages, as they have into Andean Spanish. The text's genre may determine the choice of an evidential. Traditional stories are typically cast in reported evidential. Evidentials can be manipulated in discourse as a **STYLISTIC** device. Switching from a reported to a direct (or visual) evidential creates the effect of the speaker's participation and confidence. Switching to a nonfirsthand evidential often implies a backgrounded "aside." Evidentiality is interlinked with conventionalized attitudes to information and precision in stating its source.

– Alexandra Aikhenvald

WORKS CITED AND SUGGESTIONS FOR FURTHER READING

Aikhenvald, Alexandra Y. 2004. *Evidentiality*. Oxford: Oxford University Press.

Aikhenvald, Alexandra Y., and R. M. W. Dixon, eds. 2003. *Studies in Evidentiality*. Amsterdam: John Benjamins.

Barnes, J. 1984. "Evidentials in the Tuyuca verb." *International Journal of American Linguistics* **50**: 255–71.

Guentchéva, Z., ed. 1996. *L'Énonciation médiatisée*. Louvain-Paris: Éditions Peeters.

Jacobsen, William H., Jr. 1986. "The heterogeneity of evidentials in Makah." In *Evidentiality: The Linguistic Coding of Epistemology*, ed. Wallace L. Chafe and Johanna Nichols, 3–28. Norwood, NJ: Ablex. See other papers therein.

EVOLUTIONARY PSYCHOLOGY

This term is used in several different, related senses. Among behavioral, social, and cognitive scientists, it properly refers to a new scientific paradigm or framework, together with the discipline that has grown up around this framework, and the body of knowledge produced by the researchers working within that framework. Some scholars outside the field, as well as many journalists and lay people, use it more loosely to refer to any finding, speculation, or discussion that links evolution and behavior, whether well informed or not. Evolutionary psychology as both a research framework and as a discipline is organized around the proposition that the design features of the mechanisms comprising a species' psychology reflect the character of the adaptive problems they evolved to solve. This proposition was uncontroversial when applied by biologists to other species (e.g., Williams 1966). However, it generated significant debate and opposition once it began to be applied to humans, who because of culture,

intelligence, language and complexly variable social systems appear notably different from other species (Sahlins 1977).

The field shares some tenets with early Chomskyan proposals that the human mind contains numerous mental organs specialized for carrying out different cognitive tasks, such as a **LANGUAGE ACQUISITION DEVICE** (Chomsky 1965). The anti-functionalist strain in Chomsky's thinking led him to largely set aside natural selection for communicative functions in his discussions of language (Chomsky 1972). In contrast, evolutionary psychologists such as the psycholinguist Steven Pinker (1994), argue that the existence of mental organs can only be explained as the consequence of natural selection. This is because selection is the only process known to science that builds complex functional systems into the designs of organisms (Williams 1966). By this standard, the intricate functional interdependence of the various cognitive mechanisms underlying language provides very strong evidence for the organizing role of natural selection in constructing such mechanisms (Pinker and Bloom 1992).

Evolutionary psychology began to emerge in the 1970s and 1980s when a small number of researchers tried to synthesize several distinct research orientations in a mutually consistent way (Tooby and Cosmides 1992). The most important of these orientations were cognitive science, with its commitment to information-processing descriptions of psychological mechanisms; modern primatology, hunter–gatherer studies, and paleoanthropology, which together offered the prospect of characterizing the conditions in which humans evolved; evolutionary biology (including behavioral ecology, sociobiology, ethology, and evolutionary game theory); and neuroscience, with its prospect of discovering the physical implementation of cognitive mechanisms. Evolutionary psychologists argued that cognitive mechanisms were, ipso facto, biological **ADAPTATIONS**, a proposition that inevitably connected cognitive science to evolutionary biology. If cognitive mechanisms are adaptations, they then must exhibit an evolved organization, have an evolutionary history, and have been naturally engineered to carry out evolved functions. Most importantly, the identification of cognitive mechanisms with adaptations allowed the entire technical apparatus developed within biology concerning adaptations to be imported and validly applied to cognitive science.

Evolutionary psychologists start from the premise that the brain, like our other organs, is the product of evolution. Specifically, the brain is viewed as an information-processing organ that evolved over evolutionary time in order to regulate behavior in an adaptively successful way. In a world filled with the disordering force of entropy, biologists and physicists recognize that natural selection is the only known natural physical process that can push the designs of organisms uphill into functionally organized systems. It follows that whatever functional organization there is to be found in the design of the brain reflects the history of selection that acted ancestrally on the species. Evolutionary psychologists use the cause-and-effect relationships between ancestral selection pressures and the resulting functional architectures of the brain's mechanisms as one powerful new tool to guide scientific discovery. On this view, the structure of each psychological mechanism should reflect the actions of the selection pressures that built it. Consequently, by considering ancestral adaptive problems, evolutionary psychologists believe that they can more reliably, rapidly, and effectively derive and test hypotheses about the functional organization of mental mechanisms than would be possible otherwise. They argue that many major wrong turns in the history of the behavioral sciences – for example, many important aspects of the Freudian, Skinnerian, or Piagetian paradigms – would not have been made if their core propositions had been scrutinized for consistency with the kinds of outcomes that natural selection could plausibly have produced. The practice of using models of ancestral-selection pressures as a guide to discovering previously unknown psychological mechanisms renders them untroubled by critics' accusations that evolutionary analysis inevitably consists of concocting post hoc just-so stories. To use general principles to derive predictions, and then to use these predictions to discover something previously unknown, demonstrates that such explanations are not concocted post hoc.

The primary research goals of evolutionary psychology are a) the discovery and progressive mapping of each of the evolved mechanisms of the human brain (or the brains of other species of interest) and b) the exploration of the systematic behavioral regularities and population-level phenomena that these evolved mechanisms generate in different social and cultural environments. So, for example, evolutionary psychologists claim to have discovered and mapped the information-processing structure of an evolved program in the human psychological architecture whose function is to detect the individuals who are close genetic relatives, and then to generate greater sexual aversion and greater altruism toward these individuals compared to others (Lieberman, Tooby, and Cosmides 2007). This evolved program was predicted to be a part of our species-typical psychological design, and is believed to explain some of the patterns involving family sentiments found across cultures (such as disgust at the prospect of incest with one's sibling).

Similarly, all human societies (and no nonhuman societies) have complex languages and use them as the primary means of communication. Evolutionary psychologists view languages as the population-level expression of a suite of evolved species-typical programs tailored by natural selection to facilitate communication, especially of propositions (Pinker 1994). Although the evolutionary **ORIGINS OF LANGUAGE** are obscure, evolutionary psychologists consider it inevitable that the present design of the cognitive mechanisms underlying language competence were naturally selected to function in a linguistic environment that is normal for our species. In consequence, a) they should be selected to assume the presence of a linguistic environment that conforms to human language universals, and b) they should be designed to exploit the presence of these regularities to accomplish the functions of acquisition, comprehension, and production (as they appear to; Musso et al. 2003). Natural selection thus provides a causal explanation for Chomsky's assertion that strategies employed by the language acquisition device reflect abstract uniformities across human languages (see UNIVERSAL GRAMMAR).

One central element that distinguishes evolutionary psychology from other approaches is its focus on integrating what is known about evolution into the research process, rather than ignoring this knowledge. Applying information about ancestral conditions and selection pressures allows evolutionary

psychologists to derive hypotheses about the design of human information-processing mechanisms from the large preexisting body of theories already developed and empirically tested within modern evolutionary biology. For example, evolutionary biologists know that for organisms like humans, mating with close relatives causes genetic defects to express themselves at far higher rates in the incestuously produced children. This has led evolutionary psychologists a) to the general prediction that natural selection had built a program in humans designed to identify close genetic relatives; b) to detailed predictions about the cues that the program would use to identify genetic relatives; and c) to detailed predictions about how this kin detection program would be coupled to increased sexual aversion to individuals it identified as genetic relatives (as well as increased altruism, as predicted by kin selection theory). The analysis of ancestral selection pressures and hunter–gatherer conditions made it possible to design studies that could test (and did confirm) these propositions. These studies, in turn, mapped the information-processing architecture of these functionally specialized programs (Lieberman, Tooby, and Cosmides 2007). In contrast, the disregard by sociocultural anthropologists (and Freudians) of the selection pressures that select strongly against incest prevented them from discovering the existence of these evolved mechanisms. Once a mechanism is mapped, its population-level social and cultural expressions can also be analyzed – such as moral attitudes about incest in the case of kin detection and human linguistic variation in the case of language.

Evolutionary psychology originally emerged among anthropologists, cognitive scientists, biologists, and psychologists, although it has subsequently diffused into many other disciplines. Evolutionary psychology is not a subfield of psychology, and it is not devoted to the study of a specific class of phenomena. Rather, it is an approach to the behavioral, social, cognitive, and neural sciences that can be applied to any of the topics they deal with. Originally reacting against the mutually contradictory claims about the mind and human nature advanced in different disciplines, evolutionary psychologists constructed what they argue is a logically integrated scientific framework that attempts to reconcile into a single body of knowledge the results drawn from all relevant fields. Its advocates view it as an interdisciplinary nucleus around which a single unified theoretical and empirical behavioral science is being crystallized. Of course, not everyone in behavioral science agrees, with disagreements ranging from disputes over specific analyses to broader rejection of the program, often in favor of culturalist and social constructionist views.

A second feature that distinguishes evolutionary psychology is the importance it places on achieving information-processing descriptions of the designs of evolved mechanisms, rather than stopping at behavioral or neuroscience descriptions. Along with most cognitive scientists, evolutionary psychologists believe that the brain, like any other computational system, can usefully be mapped both in physical terms (which, for the brain, means in neurophysiological and neuroanatomical terms) and also complementarily in information-processing terms. Evolutionary psychologists go on to stress that the brain and its subsystems evolved as an organ (or set of organs) of computation: The brain evolved in order to regulate behavior and physiology adaptively based on information it is exposed to. Because the evolved function of a neural (or psychological) mechanism is inherently computational (i.e., as a program mapping informational inputs to outputs), the only form of description that can accurately characterize how its organization solves its adaptive problem is an information-processing description. Physical descriptions of brain subsystems cannot, by their nature, fully capture the information-processing interrelationships that embody the function of an evolved program (mechanism, adaptation, etc.). So, for example, however interesting it is to identify the brain regions implicated in various aspects of language processing, it is still important to develop a parallel account in terms of computational steps (data structures, operations, etc.). Similarly, simply observing that humans behaviorally tend to avoid incest inside the nuclear family is very different from having mapped the information-processing steps in the evolved programs that take prespecified cues to kinship as input, compute from them magnitudes that capture estimated genetic relatedness, and then pass these magnitudes into the sexual-choice motivational subsystem, where they generate sexual disgust at mating with those it identifies as genetic relatives.

A third difference in perspective between evolutionary psychologists and most other behavioral scientists is in how numerous and functionally specialized they expect the psychological mechanisms of a species to be. For most of the last century, the majority view among learning theorists, cognitive scientists, and neuroscientists has been that the psychological mechanisms that operate on experience to produce knowledge are likely to be small in number, and to be primarily content independent and general purpose (Pinker 2002; Tooby and Cosmides 1992). Content independence means that a cognitive procedure (such as association formation in **CONNECTIONISM**) operates in the same way regardless of the content it is processing. Hence, on this view, the same cognitive procedures are expected to operate on all contents uniformly, whether language, fighting, eating, sex, family interactions, or intergroup conflict. This blank slate or environmentalist view can be expressed by comparing the operation of learning mechanisms or cognitive mechanisms to the operation of a tape recorder that processes all sounds uniformly, regardless of their meaning: The content that ends up on the tape reflects only the content present in the environment, and nothing in the tape-recording machinery itself introduces content of its own that was not present in the environment.

From a selectionist perspective, however, such a blank-slate viewpoint seems extremely implausible, as well as inconsistent with what is known about the cognitive architectures of nonhumans (Gallistel 1990). Mutations for specialized design features that exploit the rich recurrent structure of particular problem domains should spread by natural selection whenever they cost-effectively improve the organism's propensity to solve important adaptive problems in a fitness-promoting way. That is, if there is a particular set of cues that solves the problem of kin detection, then the mind could evolve a specialization that is designed to take only those cues as input. For a problem-solving strategy to be applied generally across contents, it cannot employ problem-solving shortcuts that work only on particular problem subsets, such as grammar acquisition, depth perception, kin detection, or mate selection. Hence, evolutionary psychologists consider it

likely that the mind solves the diverse computational problems posed by stereopsis, color vision, echolocation, face recognition, object mechanics, navigation, and reasoning about social exchange by using at least some principles and operations that are particular to each respective domain. Evolutionary psychologists argue that evolved specializations that are activated only by certain content domains or adaptive problems seem virtually inevitable, rather than implausible or exceptional outcomes of the evolutionary process. This is because selection inherently favors efficiency and puts no weight per se on uniformity or simplicity (Tooby and Cosmides 1992).

Moreover, unlike a tape recorder, the designs of such evolved psychological mechanisms might be expected to regularly introduce particular contents, motivations, interpretations, and conceptual primitives into the human mind that are not simply derived from the environment. From an engineering perspective, it is easy to see how such reliably developing contents could enhance adaptive performance. For example, the environmental regularity of venomous snakes posed an evolutionarily long-enduring adaptive problem. This regularity appears to have selected for an evolved computational device implemented in the brains of African primates (including humans). This adaptation contains a psychophysical specification of snakes linked to a system that motivates snake avoidance. Additionally, this avoidance is up-regulated to the extent that the individual is exposed to conspecifics who display fear toward snakes (Ohman and Mineka 2001). This depends on mental content about snakes being built into the mechanism. The human mind is suspected to contain neurocomputational versions of what philosophers would once have called innate ideas, such as *snake*, *spider, mother, predator, food, word, verb, agency, object,* and *patient* (Tooby, Cosmides, and Barrett 2005). By augmenting the cognitive architecture in such a fashion, natural selection could supercharge perceiving, learning, reasoning, and decision making in evolutionarily consequential domains.

At a minimum, evolutionary psychologists expect that in addition to whatever general-purpose cognitive machinery humans have, we should also be expected to have a wide array of domain-specific mechanisms, including specialized learning mechanisms. So, for example, although the snake phobia system, the kin detection mechanism, and the language acquisition system are all learning mechanisms, they are each specialized only for their particular type of content (snakes linked to fear intensity, kinship cues linked to incest aversion and altruistic motivation, and language inputs linked to linguistic **COMPETENCE**). For this reason, evolutionary psychologists do not regard *learning* as constituting an alternative explanation for the claim that a particular kind of behavioral output was shaped by evolution. Evidence that something is learned is not in the least inconsistent with the claim that much of the knowledge produced was supplied by specialized learning mechanisms permeated with evolved content. Critics of evolutionary psychology view its multiplication of hypothesized cognitive mechanisms (e.g., specializations for language acquisition, kin detection, mate selection, and so on) to be unparsimonious. Evolutionary psychologists respond that although parsimony may have been a useful principle in physics, evolutionarily engineered systems are not designed to be simple but, rather, to be adaptively effective.

Evolutionary psychology has grown rapidly in numbers and acceptance over the last three decades, and it is now presented in many sources alongside Freudianism, behaviorism, cognitive science, and neuroscience as one of the basic approaches to psychology. In that time, evolutionary psychologists have used evolutionarily derived predictions to discover scores of previously unknown mechanisms and design features in the human psychological architecture (Buss, 2005). Nevertheless, it remains significantly more controversial than other young fields, such as cognitive neuroscience, and is still a minority viewpoint whose specifics are vigorously disputed. Indeed, many researchers who are reluctant to associate themselves with the controversies surrounding evolutionary psychology have nonetheless quietly adopted many of its core principles, so that claims of evolved functional specializations and evolutionary origins are far more common and unabashed in the behavioral sciences than they were even a decade ago. For example, the modularist tradition in cognitive development adopts what is largely an evolutionary psychological stance: Various specialized competences – the theory of mind module, intuitive physics, and intuitive biology – are viewed as evolved, reliably developing, domain specific, and designed to reflect the special task demands posed by the adaptive problems special to each domain (Hirschfeld and Gelman, 1994).

Some controversies over evolutionary psychology are generated by misunderstandings, while others concern unsettled theoretical and empirical issues (e.g., how can neural plasticity be reconciled with the existence of evolved specializations in the brain?). However, heated resistance is perhaps attributable to the sensitivity of applying evolutionary theories broadly across human experience. For example, cognitive science originated in philosophy and linguistics, and as a result tends to focus on reflective issues, such as knowledge acquisition and speech comprehension, which have only limited intrinsic personal or social meaning. In contrast, evolutionary psychologists' ambitions extend to characterizing the mechanisms underlying all human action. These include social interactions such as aggression, sexual attraction, exploitation, and cooperation. Evolutionary biology provides rich theories about these domains, but analysis of the causes of these phenomena inevitably triggers strongly felt personal and ideological reactions.

Language is commonly viewed by evolutionary psychologists as the expression of a set of reliably developing cognitive mechanisms that evolved to convey propositional information through a serial channel (Pinker 1994). The high degree of functional elaboration in language suggests that it has been shaped by selection over long expanses of evolutionary time. Although it seems likely that many mechanisms involved in language are general in that they are used in other cognitive tasks, it is difficult from an evolutionary psychological perspective to see how such an important activity would not have strongly selected for the emergence of proprietary cognitive specializations designed to solve language's constituent subtasks with special efficiency. Several lines of evidence argue that at least some (if indeed not most) of the cognitive mechanisms underlying language are adaptations designed by natural selection for language. The competing hypothesis is that language is a by-product of *general intelligence*, *symbolic capacity*, *the capacity for culture*,

neo-associationistic mechanisms, or other general-purpose alternatives (Pinker 1994). First, computationally intricate linguistic capacities develop precocially – far earlier than comparable cognitive achievements in other domains. Second, genetic and developmental conditions can doubly dissociate language and general intelligence (i.e., one can speak well with low intelligence and be unable to speak but have otherwise unimpaired intelligence). Third, underneath linguistic variability are design features like linear order, constituency (see CONSTITUENT STRUCTURE), predicate-argument structure, **CASE** markers, morphophonemic rules, and phonological rules that are a) universal and b) well designed to communicate propositional information, such as who did what to whom, but poorly designed for many other cognitive tasks, such as statistical induction, imagery, face recognition, and so on (see PHONOLOGY, UNIVERSALS OF; MORPHOLOGY, UNIVERSALS OF; SYNTAX, UNIVERSALS OF; SEMANTICS, UNIVERSALS OF).

Finally, some evolutionary psychologists propose that language was a critical ingredient allowing humans to enter their peculiar adaptive mode, the cognitive niche. On this view, the cognitive niche is a way of life in which massive amounts of contingent information are generated and used for the regulation of improvised behavior that is successfully tailored to local conditions (Tooby and DeVore 1987; Pinker 1994). Essential to increasing the supply of useful propositional information was dramatically lowering the cost of its acquisition from others. Language appears admirably designed to accomplish this task.

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WORKS CITED AND SUGGESTIONS FOR FURTHER READING

Buss, D. M., ed. 2005. *The Handbook of Evolutionary Psychology*. Hoboken, NJ: Wiley.

Chomsky, N. 1965. *Aspects of the Theory of Syntax*. Cambridge, MA: MIT Press.

———. 1972. *Language and Mind*. New York: Harcourt, Brace, and World.

Gallistel, C. R. 1990. *The Organization of Learning*. Cambridge, MA: MIT Press.

Hirschfeld, Lawrence A., and Susan A. Gelman, eds. 1994. *Mapping the Mind: Domain Specificity in Cognition and Culture*. New York: Cambridge University Press.

Lieberman, D., J. Tooby, and L. Cosmides. 2007. "The architecture of human kin detection." *Nature* **445**.7129: 727–31.

Musso, M., A. Moro, V. Glauche, M. Rijntjes, J. Reichenbach, C. Büchel, and C. Weiller. 2003. "Broca's area and the language instinct." *Nature Neuroscience* **6**: 774–81.

Ohman, A., and S. Mineka. 2001. "Fears, phobias, and preparedness." *Psychological Review* **108**: 483–522.

Pinker, Steven. 1994. *The Language Instinct*. New York: Morrow.

———. 2002. *The Blank Slate*. New York: Viking.

Pinker, Steven, and Paul Bloom. 1992. "Natural language and natural selection." In *The Adapted Mind: Evolutionary Psychology and the Generation of Culture,* ed. J. Barkow, L. Cosmides, and J. Tooby, 451–93. New York: Oxford University Press.

Sahlins, Marshall. 1977. *The Use and Abuse of Biology*. Ann Arbor: The University of Michigan Press.

Tooby, John, and L. Cosmides. 1992. "The psychological foundations of culture." In *The Adapted Mind: Evolutionary Psychology and the Generation of Culture,* ed. J. Barkow, L. Cosmides, and J. Tooby, 19–136. New York: Oxford University Press.

Tooby, J., L. Cosmides, and H. C. Barrett. 2005. "Resolving the debate on innate ideas: Learnability constraints and the evolved interpenetration of motivational and conceptual functions." In *The Innate Mind: Structure and Content,* ed. P. Carruthers, S. Laurence, and S. Stich, 305–37. New York: Oxford University Press.

Tooby, John, and I. DeVore. 1987. "The reconstruction of hominid behavioral evolution through strategic modeling." In *The Evolution of Primate Behavior: Primate Models,* ed. Warren Kinsey, 183–237. New York: SUNY Press.

Williams, George C. 1966. *Adaptation and Natural Selection: A Critique of Some Current Evolutionary Thought*. Princeton, NJ: Princeton University Press.

EXEMPLAR

This term occurs importantly in research and theorization in category identification, recognition, categorization, and learning. It is used interchangeably with the terms *instance* or *item* across various strands of research, including psychology, religion, and history.

Within the context of category learning, for instance, the term *exemplar* refers to a specific instance, such as a specific cat to which a parent points when teaching a child the concept and name of *cat*. Alternatively, during remediation of language skills in children with severe disabilities, researchers have utilized various exemplars of graphical symbols to improve communication (Schlosser 2003). In studies examining category relearning in individuals who have suffered brain damage, training in naming of a subset of exemplars results in improved naming of untrained exemplars within the category (Kiran 2007).

Within the topic of categorization of semantic concepts, the term's specific usage comes in the context of **EXEMPLAR THEORY**. Briefly, this theory suggests that a category is represented by a collection of members (exemplars) that have been previously encountered, experienced, and stored as unique and individual memory traces. A new object/item is judged as a member of a given category provided that it is sufficiently similar to the stored exemplars (Komatsu 1992). This specific interpretation of exemplar is at odds with an alternate view of categorization, namely, the **PROTOTYPE** theory, which suggests that a category is represented in terms of a single summary representation (i.e., a prototype).

Not all theorists agree that exemplar and prototype models are competitors; there is yet another class of models according to which categorization decisions are made using exemplars, although the effect of using exemplars necessitates the creation of abstractions that can be later applied to novel exemplars (Ross and Makin 1999). Similarly, some **CONNECTIONIST** networks assume that a category is represented by summary information across the entire network and, depending upon the input provided, specific connection strengths in the network have greater influence on the overall activation (Knapp and Anderson, 1984).

Finally, the interpretation of the term *exemplar* can also be influenced by the level of category structure. As Edward Smith and Douglas Medin (1999) argue, the term can refer to a specific instance of the concept (e.g., "your favorite blue jeans" in the category clothing) or to a subset of the concept ("blue