

IS PSYCHOLOGY UNDERGOING A PARADIGM SHIFT? PAST, PRESENT, AND FUTURE ROLES OF EVOLUTIONARY THEORY

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Psychology as a Proximate Science

Scientists, in their endeavors, deal with different levels of causation, which can be conceptualized on a continuum of proximate to ultimate. Proximate causes refer to more immediate variables, ultimate to those more remote. For example, if you were asked why you were reading this chapter, a proximate explanation might be that it was recommended for a course you were teaching or taking; an ultimate reason might be that your species is innately curious.

Levels of causation have much to do with the role of evolutionary theory in psychology. Consider this quote from Einstein and Infeld (1961, p.31):

"In our endeavor to understand reality we are somewhat like a man trying to understand the mechanism of a closed watch. He sees the face and the moving hands, even hears it ticking, but he has no way of opening the case."

Now envision visiting scientists from some extra-terrestrial domain, with no concept of time as we know it, trying to understand a watch (circa 1960s). Assume further that they are divided into two schools. One, the proximate school, maintains that the proper study of the watch is what it does and how it does it, the here and now of the watch's existence. They focus on observable variables associated with the watch, such as the moving hands and the ticking sounds, and develop their theories based on the relationships of these to each other and to external events.

The rival school harbors no objection to the study of proximate causes, but claims that one must also ask the ultimate questions. Why does the watch exist? How was it created and for what purpose? Proximists disparage questions of this kind for various reasons, described

below. Ultimists, however, remain convinced that their ways will bring them closer to the essential facts about the watch.

For psychology, the watch is analogous to mind, or brain, or psyche, or whatever concept is used to describe the processes that propel and direct behavior. In this vein, psychologists have been traditionally proximists. Their attempts to understand the processes that propel and direct behavior are largely limited to ontogenetic development, events that occur during the lifespan of an organism. Phylogenetic development, comprising evolutionary bases of behavior and the genetic predispositions that these have engendered, has a very insignificant role in psychological theorizing.

Consider, for example, the question of why most people enjoy sweet tastes and find bitter unpleasant. The proximate explanation is that stimulation of taste receptors that are sensitive to sweet evoke central nervous system responses that are experienced as pleasurable, while stimulation of taste receptors sensitive to bitter elicit disagreeable sensations. But why should this occur? Why should our tongues and brains be connected in this manner? The ultimate cause is that in our evolutionary history as forest dwellers, individuals with an innate preference for sweet and aversion to bitter tended to eat only ripe fruits, which were rich with sugars, while those without this preference were less discriminating. The former would have been more apt to survive and reproduce, and so the genetic predisposition for these particular tastes was passed on by natural selection (Barash, 1982, p. 146).

Psychologists in the area of perception have been thorough in their studies of neural processes underlying taste and all other modalities. One would be hard pressed, however, to find the evolutionary theory of why sweet is sweet and bitter is bitter. Nor are there any attempts to explain, beyond the occasional superficial conjecture, how and why particular perceptual processes evolved in any sensory domain.

This eschewal of evolutionary theory and ultimate causation pervades every area and conceptual approach within psychology. Ask psychologists why men tend to be more aggressive than women. A physiological psychologist will probably answer that male testosterone levels are higher. A social psychologist might say that males possess stronger tendencies to establish status hierarchies within their social groups. A developmental psychologist will tell you that males are socialized to be more aggressive by their parents and society. All are valid answers, as far as they go. None, however, deal with ultimate origins. Why is testosterone level linked to aggression? Why do some species, humans among them, form social groups and status levels within these and some not? Why do parents, across cultures and species, tend to treat male offspring differently than females?

The topic of family occupies much of psychology. Clinical, developmental, personality, and social psychologists devote considerable resources to questions about familial processes.

Who is attracted to whom? Who marries whom? What determines how they get along? How will they socialize their children? How will the children be affected by their socialization, etc., etc.? Nowhere in the process, however, does the question arise of why people tend to live in families in the first place. Of the million or so identified animal species on the planet, some live in families, others do not. Those that do show a variety of patterns in addition to the so-called nuclear family of mother, father and dependent children which characterizes our species. For example, there are family units comprised solely of a mother and her offspring, or multiple mothers and their offspring, or multiple mothers with fewer fathers. For the evolutionist, the primary questions for the scientific study of families, human or otherwise, are why does family living sometimes occur and sometimes not, and why does it take the various configurations that it does (Trivers, 1985; van den Berghe, 1979)

Human language is another topic that attracts considerable attention in psychology, but again, theories begin and end in ontogeny. Psychologists endeavor to explain the progression from babble and coo to the most complex levels of communication, but none attempt to incorporate their concepts into the ultimate question of why we have language. All species have communication systems of varying nature and complexity, and it seems critical for the study of human language to know how and why our particular version originated.

This pure proximate approach to language was probably basic to psychology's most futile quest, the attempts over decades to teach human language skills to chimpanzees and other infrahuman primates (see Gardner, Gardner and Van Cantfort, 1989). Of course, no one expected the chimps to chat. Perhaps they would learn five symbols, perhaps 50 or 500. They might even learn to put two together, as Washoe appeared to in the well-known watermelon anecdote. But what conceptual goal could be served by such information? Whatever the results of these studies, they were bound from the outset to be uninterpretable in the absence of theory about the ultimate reasons for communication systems and their diversity.

Neural organization, family structure, status hierarchies, socialization practices, language; all are included among the givens of traditional psychology. They are regarded as a priori, simply there, like the movements and sounds of the watch to our proximate, inter-planetary scientists.

Psychologists' Traditional Arguments for Eschewing Evolution and Their Refutations

The primacy of culture argument

How do traditional psychologists justify their exclusive proximate outlook? The most common argument is that evolutionary theory may be highly relevant to infrahuman species but not to humans, inasmuch as human behavior is largely determined by culture.

The attribution of behavior to culture, however, does not in itself represent a scientific explanation. It relegates the development of the behavior to happenstance. An individual does what he does because he happened to be born in such and such region, or ethnic group, or social class, or whatever. Inuits isolate their aged parents because that is what Inuits do; it is part of their culture. West Indians take their aged parents into their households because that is what West Indians do; it is their culture. The assumption appears to be that somewhere along the way, some influential Inuit happened to treat his aged parents one way and some influential West Indian happened to treat his aged parents in another, and both groups have followed suit ever since.

The theory of culture has no explanatory value unless it includes the ultimate question of how and why cultural traits evolved in the ways that they did (Tooby and Cosmides, 1992). To say simply that something is due to culture is to say that it came about by accident. One is privileged to believe that accidents occur, but the epistemology of science is rooted in the premise that all events have definable causes.

Form and function

The intrinsic interrelatedness of evolution and culture may be demonstrated in another manner. If asked why human hands evolved, the apparent answer is that the things that hands do, like gripping, carrying, and manipulating, conferred adaptive advantages to their owners. This illustrates the axiom of evolutionary theory that form follows function.

The evolutionary approach to psychology is that this axiom applies as well to the brain. Thus, the cognitive and communicative functions of the brain involved in the group enterprises called cultures evolved because these enterprises conferred adaptive advantages to those who engaged in them. In contrast, the primacy of culture argument rests on the premise that function follows form; that is, the expanded functions of the human brain simply appeared for some reason and the cultural developments that represent the expression of these functions followed (e.g. Kuper, 1994), a proposition that breaches both the rules of parsimony and logic.

The teleology argument

Another frequent defense of the proximate view is that evolutionary explanations tend to be teleological; that is, they embrace the fallacy of explaining causes in terms of consequences.

Evolutionary based explanations are often referred to by critics as, "just-so stories," signifying that the investigator began with a notion of the apparent purpose of a behavior and then created a suitable story of its origins.

This also is misguided epistemology. Though teleological explanations may sometimes be misleading, as suggested in the frequently cited satirical paper by Gould and Lewontin (1979), they play an indispensable role in the inductive stages of inquiry. Mayr (1983) has shown that most major advances in physiology began with observations about the purpose of a given structure or system for the organism.

Paradoxically, not only has traditional psychology failed to reap the benefits of insightful, generative, just-so stories, but its eschewal of evolutionary theory has rendered it more susceptible to the potential pitfalls of teleological thinking. In the absence of a conceptual basis for formulating explicit assumptions about ultimate origins, psychological theories often harbor implicit and simplistic assumptions that mirror casually observed consequences. For example, because people kill and maim others in warfare, psychologists' assumptions are that the causes of war are to kill and maim others, and it has been explained in terms of the effects of frustration on aggression or displaced death instincts or the like. Because the rapist inflicts harm and suffering upon women, it is assumed his motive is to inflict harm and suffering upon women, and psychological explanations of his motives focus on variables such as anger toward women or impaired capacity for normal sexual function. Because learning often results in concrete, immediate rewards, psychologists assume that animals and humans learn in order to obtain concrete, immediate rewards, and the conditioning paradigm became psychology's prevailing, general theory of behavior.

Furthermore, evolutionary oriented psychologists are as committed to operationalism and empiricism as their traditional counterparts. They do not regard their theories as truisms, but as conceptual tools, assessed in terms of the scope and predictive value of the testable hypotheses they engender. It will be on these grounds that the contributions of evolutionary theory will be judged.

The alternative approaches argument

Not all traditional psychologists reject the relevance of evolutionary theory to modern human behavior. They maintain, however, that proximate and ultimate causation represent separate approaches, and one can effectively pursue psychological knowledge within one or the other. This is also a flawed notion. First, the dichotomy is not between proximate and ultimate explanations, but between a purist experiential model and a model based on the interaction between evolutionary based innate predispositions and environmental events.

Additionally, explanations that rely exclusively on proximate causation characterize a primitive mode of thinking. If a young child asks where rain comes from, an adult will probably tell him from the clouds. If the child asks how babies are made, the answer will probably be that they grow in mommies' bellies or something similar. Most young children are content with proximate answers of this sort; in fact, they may become confused and upset by more detail. But as they mature, they will require more definitive, ultimate level explanations. Thus, the infusion of evolutionary theory into psychological science may signal its emerging maturity. In fact, no sciences other than the behavioral sciences ignore their ultimate questions. Biologists are deeply concerned with the origins of life, physicists with the origins of matter, and progress on these questions are a mark of the progress of the disciplines.

The Contemporary Evolutionary Movement in Psychology

Beginnings

Most writers (e.g. Buss, 1999; Crawford, 1998) attribute the current evolutionary trend in psychology to the neo-Darwinian movement in behavioral biology heralded by Hamilton (1964), Williams (1966), Trivers (1971), Maynard Smith and Price (1973), and others, and reaching an apex with Wilson's (1975) treatise on sociobiology as the grand synthesis of the biological and behavioral sciences.

Though the biological movement was undoubtedly significant, there was a quieter revolution within psychology at about the same time, largely in response to shortcomings of behaviorism as the prevailing general theory in the field.

Breland and Breland (1961) was a classic contribution in this vein, describing the spontaneous substitution of behaviors which had been conditioned by food reinforcers by "instinctive behaviors having to do with the natural food getting behaviors of the particular species," (for example, a chicken conditioned to propel plastic capsules with its beak suddenly tried to peck them open, as if they were seed pods; a raccoon conditioned to place coins in a bank began to rub them together instead, as if washing its food). The authors concluded that, "... the behavior of any species cannot be adequately understood, predicted, or controlled without knowledge of its instinctive patterns, evolutionary history, and ecological niche." (pp. 683-84)

Shortly thereafter, Garcia and Koelling (1966) demonstrated that, contrary to behaviorism's core principle of equipotentiality of reinforcers, organisms were programmed in an apparently adaptive manner such that specific behaviors conditioned more or less readily to specific consequences. Attempting to condition taste aversions in rats, they discovered that a small dose of ionizing radiation, sufficient to cause nausea, was highly superior to any other

negative reinforcer. Furthermore, counter to the behavioristic principle of contiguity, conditioning could be accomplished in one trial even if nausea was induced several hours after the animal had tasted the food in question (Garcia, Ervin and Koelling, 1966).

A third example was Harlow and Zimmerman's (1959) finding that monkeys placed from birth with inanimate surrogate mothers with either wire or terrycloth surfaces developed attachments to the latter, to whom they could cling, even when the former functioned as their source of food and water. Thereby, the behavioristic explanation of filial attachment as an acquired drive was refuted in favor of the notion that infants possessed an innate, adaptive need for continuing contact with an appropriate maternal figure. Follow-up studies (Harlow, 1971) revealed that optimal social development required that this contact occurred within an innately programmed critical period.

Among other notable psychological contributions of this era relating to evolutionarily adaptive aspects of early attachment were Fantz (1961), who demonstrated an innate preference for newly born human infants to gaze at a schematic of a frontal human face, and Moltz (1960), whose theory of the precise role of genetic and environmental factors in social imprinting represented a prototype for the interactionist perspective of contemporary investigators.

Progress

How salient is the evolutionary movement? How much of an impact has it had on traditional psychology? In the following studies, we searched for answers among the archives and among our colleagues.

Database survey: The PsychINFO database is one of the largest and most comprehensive in psychology. Its sources are journal articles, books, book chapters, technical reports, and dissertations, encompassing all areas within or related to the field.

Table 1 shows the results of a search of specific keywords within PsychINFO, separately for the years 1970-79, 1980-89, and 1990-99. Our primary interest was in changes in the frequencies of publications containing evolution as a keyword during these 30 years. Our comparison samples comprised other broad keywords in diverse areas of traditional psychology, selected on the basis of a perusal of chapter headings in current introductory psychology texts.

Evolution showed the largest increase across the 30 years at 308%, significant by Chi-squared analyses from other headings at $p < .001$ in all cases. Memory showed the second largest gain, which may be a function of advances in brain imaging techniques and/or current emphasis on gerontological issues paralleling increased proportions of the elderly in the population. Conditioning was the only keyword showing a decrease, possibly reflecting the

beginnings of a "paradigm shift" (Kuhn, 1970) toward evolution and genetics in favor of purely environmental theories.

Introductory Text Survey: Has the increase in evolutionary content in primary sources become manifest in textbooks? We compared samples of traditional introductory psychology texts published during the years 1977-79, 1987-89, and 1997-99, using ten books in each interval. The source was York University's library and selection was random, with the qualifications that later editions by the same author(s) and texts specifically oriented to or containing one or more chapters devoted to evolution were excluded¹.

The index of each text was used to locate evolutionary related content, which we measured first in terms of pages. If the content occupied less than a full page, a proportion was calculated by counting lines. Upon discovering that psychology introductory textbooks increased in size over time², page counts were converted to percentages of space within the text.

Based on the decrease for conditioning observed in the database survey and its possible implications for a paradigm shift, we did a similar analysis for conditioning related content.

Results are shown in Figure 1. The anticipated pattern over time of an increase for evolutionary content and a decrease for conditioning content was discernible, but the interaction term for a 2x3 ANOVA for content by time interval did not reach significance ($F = 2.11$, $p = .13$). A one way ANOVA, however, showed that the trend for evolutionary content approached significance ($F = 2.80$, $p = .08$). Given the directions and strength of these trends, it is plausible that the failures to achieve significance were due to small Ns.

There was a significant main effect for content ($F = 77.21$, $p < .001$), favoring conditioning. Despite the contrasting trends over time, the percentage of space devoted to conditioning in 1997-99 was still six times greater than that for evolution. Considering the close numbers between the two in psychology literature keyword frequencies for the 1990s (Table 1), we might conclude that evolutionary theory does not yet seem to be receiving its deserved attention in introductory texts.

We also examined the distribution of topics within evolutionary related content for 1997-1999 texts. This was done by recording brief topical descriptions for relevant references. For each text, if a reference was cited multiple times or if multiple references were used to describe

¹ Three texts (Brown and Cook, 1986; Buss, 1978; Gray, 1991; Hall, 1984) of this nature were encountered, but only Buss was published during the designated year intervals.

² Page means were: 547 (SD=88) for 1977-97, 644 (SD=76) for 1987-89, and 709 (SD=71) for 1997-99 ($F = 10.80$, $p < .001$).

the same specific body of research, the topical description was included only once. These topical descriptions were then subsumed into more encompassing headings and tabulated across texts.

Results showed a diverse distribution. The heading, learning, language and cognition received 17 counts; sexual attraction and mate choice, 15; personality and emotion, 11; broad theoretical issues, 5; family and social processes, 4; sleep, 3; and general sources, 2.

Faculty and Graduate Student Survey: Another way to ascertain the beginnings of a paradigm shift, as Kuhn (1970) described the process, is to compare the attitudes of neophyte and established academics. The former, having had less time to develop vested personal interests in traditional paradigms, would be expected to be more open to new movements.

Thus, we conducted a brief e-mail survey of the psychology faculty and graduate student lists at York University. We asked for opinions on three items, regarding: (1) the extent to which Darwinian and neo-Darwinian theory had influenced their own careers, (2) the extent to which it had influenced psychology in general and, (3) the extent to which it will influence psychology in future generations. Responses were given on a scale of (1) not at all, (2) slightly, (3) moderately, (4) extensively, and (5) very extensively. We also asked for number of years since the Ph.D. for faculty respondents and year of study for graduate students, and for both, the academic areas within psychology with which they were primarily identified. The latter were categorized in terms of Clinical (including Clinical Developmental), General Experimental (including History and Theory), and Social Psychology and Personality.

Replies were received from 31 faculty and 66 graduate students, which represented respective response rates of 50% and 31% based on published list memberships. It may be assumed, however, that not everyone on the published lists was currently active; hence, actual response rates were probably higher. Two respondents in each group did not answer the questions directly and were excluded.

Means for faculty vs. graduate student status, by question, are presented across areas in Table 2. Means for area by question, across status, are shown in Table 3. Proportions of graduate students and faculty were approximately the same for two of the three areas, but there were significantly more graduate student respondents in the Clinical area sample. Based on the overall data analyses, however, it did not appear that this difference could have contributed to spurious effects.

Using a 2x3x3 ANOVA, significant main effects were observed for question ($F = 13.02$, $df = 2$, $p < .001$) and area ($F = 4.25$, $df = 2$, $p < .05$), and borderline significance was found for status ($F = 3.86$, $df = 1$, $p < .05$).

Main effects for question and status were attributable to a significant interaction between them ($F = 3.28$, $df = 2$, $p < .05$), with faculty giving more positive responses on the question regarding influences upon their scholarly careers. Congruent to this finding, the correlations of

item responses with time in the field yielded one at borderline significance ($r = .37, p < .37$), for faculty on the same question. Thus it appears that for academics at all levels, those with more experience are more open to evolutionary contributions. This may represent an encouraging finding for the field but was inconsistent with the Kuhnian based hypothesis.

There were no interactions at or approaching significance involving the main effect for area; thus, the conclusion was that members of the Social Psychology and Personality area attributed less influence to evolution, across items, than did their counterparts in other areas. This seemed incongruous inasmuch as research on evolution and behavior of the past three decades has intersected more with the topics of social psychology than any other area of the field. As illustration, Buss's (1999) popular evolutionary based text contains three chapters on sexual and mating strategies, two on family dynamics, two on intergroup interaction, one on conflict between the sexes, and one on status and social dominance. Crawford and Krebs (1998) edited Handbook of Evolutionary Psychology includes chapters on social reciprocity, mate choice, culture, morality, family violence, sexual aggression and environmental crises.

On the other hand, given that the traditional perspectives of social psychology would be most compromised by the new evolutionary paradigm, these data do provide indirect support for Kuhn's theory.

Future Prospects

Our findings suggest that the evolutionary movement in psychology is expanding at a rapid rate, though more extensive data will be required to assess whether this truly represents a paradigm in transition. There is another basis, however, on which to expect that the movement will continue to thrive.

The pristine environmentalist paradigm of psychology is largely a social construction, mimicking the historic antipathy of the public toward evolutionary explanations of molar human behavior. There are several reasons for this antipathy. One is the erroneous assumption that genetic causation implies immutability, which is antithetical to peoples' strongly held beliefs that they are capable of and responsible for individual and social change. Another is the specter of Social Darwinism evoked by the "naturalistic fallacy", the mistaken premise that what is biologically natural is also morally righteous. The third, and probably the most salient reason, is that evolutionary theory confronts seminal questions that often reveal the dark side of human nature, exposing the self-serving hypocrisies that characterize our species. For the most part, people prefer to repress their dark sides.

What, then, has prompted current changes in attitudes? One possibility is that breakthroughs in the science and technology of genetics render it difficult to deny the influences

of genes in human psychological development. Furthermore, our rapidly increasing capacity to manipulate genetic structures and functions are bound to create a host of individual and societal ethical issues, requiring decisions by an informed populous.

According to some theories, self-deception is ubiquitous in our species because it has been and remains adaptive in a range of situations (see Lockard and Paulhus, 1988). But if self-deception ceases to be feasible, the alternative adaptive strategy may be to learn to live with the realities.

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Figure Headings

Fig. 1. Mean percentages of space given to evolutionary and conditioning related content in introductory psychology textbooks by time intervals.

Table 1

Frequency of Keywords Across Topics and Time Intervals

Term	1970-1979	1980-1989	1990-1999	% increase (+) or decrease (-) from 1970s to 1990s
Evolution	1615	3888	6590	+308.0
Conditioning	9948	7001	7381	-34.8
Personality	27837	36308	44227	+58.9
Memory	9998	16235	30558	+205.6
Psychotherapy	9792	17298	24738	+152.6
Socialization	1624	3158	3855	+137.4
Perception	30188	35863	48854	+61.8

Table 2

Perceived Influences of Evolutionary Theory By Academic Status

Question	Position	N	Mean	Standard Deviation
Own scholarly career?	Professor	29	2.93	1.25
	Graduate Student	64	2.27	1.17
Psychology in general?	Professor	29	3.28	0.92
	Graduate Student	64	3.53	0.76
Psychology in future generations?	Professor	29	3.52	0.87
	Graduate Student	64	3.27	0.87

Table 3

Perceived Influences of Evolutionary Theory By Academic Area

Question	Area	N	Mean	Standard Deviation
Own scholarly career?	Clinical	50	2.32	1.10
	General Experimental	22	2.95	1.46
	Social/ Personality	20	2.30	1.22
Psychology in general?	Clinical	50	3.58	0.70
	General Experimental	22	3.45	0.86
	Social/ Personality	20	3.15	0.99
Psychology in future generations?	Clinical	50	3.34	0.80
	General Experimental	22	3.64	1.05
	Social/ Personality	20	3.00	0.79

