

How to Keep our Meta-Theories Adaptive: Beyond Cosmides, Tooby, and Lakatos

By Geoffrey Miller

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If Popper had never existed, would we need Lakatos to set us straight? Probably not. Good philosophy of science is useful mainly in inoculating scientists against bad philosophy of science, so we can get on with our business. Such preventative medicine is necessary only when pathological memes such as falsificationism are endemic in the academic population. Nevertheless, Popper did exist, and remains the only philosopher of science known to most scientists. Ketelaar and Ellis (K&E) do us the important service of providing an equally venerable philosopher we can invoke to protect our meta-theories against the ghost of Sir Karl.

My quibbles with K&E are that (1) they overlook some important features of evolutionary psychology's meta-theory, and some of these features are ripe for re-thinking and extending; and (2) the Lakatosian framework seems inadequate to describe evolutionary psychology's scientific success, popular appeal, or institutional challenges. These quibbles do not undermine the power of K&E's anti-Popper antidote. Their paper usefully introduces the concept of meta-theory to mainstream psychologists, many of whom have never encountered a useful meta-theory before, so cannot distinguish between meta-theory and ordinary hypothesis.

For a young science barely a decade old, evolutionary psychology has achieved a remarkably strong meta-theoretical consensus. In part, this is because the meta-theory was imported wholesale from contemporary adaptationism in evolutionary biology. As K&E point out, standard biological adaptationism includes many psychologically relevant ideas such as kin selection, reciprocity, and sexual selection. Yet evolutionary psychology's meta-theory was also shaped very strongly by a series of ambitious, persuasive, and visionary papers by Leda Cosmides and John Tooby in the late 1980s and early 1990s that showed how adaptationism could be applied to the human mind (Cosmides, 1989; Cosmides & Tooby, 1987, 1994; Tooby & Cosmides, 1990a, 1990b, 1992). The Cosmides-Tooby vision of evolutionary psychology profoundly influenced the thinking of other leading researchers such as David Buss (1995), Gerd Gigerenzer (Gigerenzer & Todd, in press), Steven Pinker (Pinker & Bloom, 1990), and Randy Thornhill (1997). It was also adopted as the conceptual framework in the most influential popular accounts of evolutionary psychology (Buss, 1994; Ridley, 1993, 1996; Pinker, 1994, 1997; Wright, 1994).

The Cosmides-Tooby meta-theory was a special form of adaptationism that stressed (1) functional efficiency criteria for identifying adaptations shaped by natural selection, (2) the context-sensitive psychological adaptation (rather than the "instinctive behavior") as the appropriate level of analysis for human nature, (3) a highly modular view of the mind as comprising hundreds of domain-specific psychological adaptations, (4) a computational metaphor for the mind imported from cognitive psychology, (5) the universality of evolved human nature rather than the heritability of individual differences, (6) hominid small-group living in Pleistocene Africa as the most relevant ancestral environment for understanding most of human nature. These six emphases are consistent with evolutionary biology's adaptationism. However, the last five out of six are not currently shared by most researchers in animal behavior who would consider

themselves adaptationists. Thus, they are the most distinctive aspects of evolutionary psychology's meta-theory. Yet K&E do not discuss them, focusing instead on the more standard evolutionary concepts of kin selection, parental investment theory, and reciprocity theory that evolutionary psychology shares with the rest of biology.

Ten years after the Cosmides-Tooby meta-theory was developed, it is worth asking which of its six core emphases remain adaptive guides to further research, and which could be viewed as historical accidents due to the field's peculiar intellectual phylogeny. I will briefly assess the computational, modularity, efficiency, and universality emphases here.

The computational emphasis has been rhetorically important in making evolutionary psychology palatable to cognitive science, but very few evolutionary psychologists do any real computational modelling of psychological adaptations. Those who do attempt to identify specific algorithms for solving ecologically important problems, such as Gerd Gigerenzer's group in Berlin (Gigerenzer & Todd, in press), often find their algorithms are generally useful across a wide range of content domains, contrary to the strong modularity view. For example, the "Take the Best" heuristic, originally developed to model how people judge which of two German cities is larger given probabilistic cues, appears useful for almost any pairwise choice or categorization task, regardless of content (Gigerenzer & Goldstein, 1996; Gigerenzer & Todd, in press; Martignon, in press). So far, evolutionary psychology's evidence for domain-specificity is almost all at the level of environmental cues, rather than at the level of computational mechanisms for integrating cues to guide behavior (Miller, 1997; Miller & Todd, 1998). This research strategy of identifying perceptual cues and assessing their ecological validity owes more to Egon Brunswik's (1956) "probabilistic functionalism" than to cognitive science. Given the success of this neo-Brunswikian approach, perhaps evolutionary psychology no longer requires the pretense of computationalism. Biology's adaptationist meta-theory is enough for evolutionary psychology; we may not need cognitive science's mind-as-computer meta-theory.

Adaptations and Indicators

I have more serious concerns about the Cosmides-Tooby claims for modularity, efficiency, and universality, which are central parts of evolutionary psychology's current meta-theory. One worry is that some of the strongest empirical research traditions in psychology appear to contradict these arguments. The existence of the *g* factor (the "general intelligence" factor) in psychometrics (Jensen, 1998) appears to contradict the strong modularity view of the mind. The moderate to high heritability of almost every reliably measurable human mental trait (Bailey, 1998; Plomin et al., 1997) appears to contract the universality claim. The high costs in time and energy of many human cultural behaviors (art, music, religion, gossip, conspicuous consumption), in the absence of any manifest survival value, appears to contract the efficiency claim. Most of these contradictions are more apparent than real, but evolutionary psychology needs to address them explicitly.

In particular, evolutionary psychologists standardly argue that natural selection should eliminate genetic variation underlying the functional efficiency of psychological adaptations, producing low heritability and low individual differences (Tooby & Cosmides, 1990b). Evolutionary psychologists also argue that selection should partition the mind into functionally specialized units, each optimized to solve particular adaptive problems (Cosmides & Tooby, 1994). These arguments make sense for adaptations shaped by survival selection, but the opposite arguments make more sense for adaptations that have been shaped by sexual selection as indicators of heritable fitness

(Rowe & Houle, 1996). Sexually-selected fitness indicators such as peacock's tails are expected to show high coefficients of genetic variation, often producing moderate to high heritabilities, and large individual differences (Pomiankowski & Moller, 1995). Such indicators are also subject to a game-theoretic constraint called the handicap principle (Zahavi & Zahavi, 1997; Miller, 1998b): to function as reliable indicators of fitness, they must incur high marginal fitness costs. These high costs can make indicators look very wasteful in every domain of efficiency other than signalling efficiency. Finally, indicators may be modular in phenotypic design, but must not be modular in underlying physiological mechanisms. If they were modular at both levels, they could not function as fitness indicators, because total modularity would undermine their reliability as signals. For example, if a peacock's tail used developmental and physiological processes quite distinct from the rest of the peacock's body, the tail could not function very well as an indicator of general bodily health.

It remains an open question what proportion of the human mind's adaptations have been shaped as sexually-selected fitness indicators rather than naturally-selected survival devices (Miller, 1998a,b). The Cosmides-Tooby criteria for recognizing psychological adaptations would exclude most fitness indicators. For example, many evolutionary psychologists have argued that human music may not be a legitimate adaptation, because it shows such large individual differences in ability, such high heritability, such a high correlation with general intelligence, and such low apparent survival utility (e.g. Pinker, 1997). Likewise for art and humor. Yet these are precisely the features we would expect of sexually-selected fitness indicators.

Evolutionary psychology's meta-theory seems to have become too restrictive. The rhetorical emphasis on natural selection, engineering efficiency, and modular adaptation was useful in overcoming the "Standard Social Science Model" of the human mind as a domain-general computer that soaks up culture (Tooby & Cosmides, 1992). But we should learn from our successes: sexual selection theory, not natural selection theory, has guided most of evolutionary psychology's best research. In the last ten years, sexual selection theory has become less concerned with a narrow emphasis on sex differences, and more concerned with the reliability of animal signals and the heritability of fitness. This can lead some evolutionary psychologists like Randy Thornhill to the paradoxical position of defending the Cosmides-Tooby meta-theory concerning naturally selected modular adaptations (Thornhill, 1997) while doing excellent research on sexually selected fitness indicators such as facial symmetry that violate the efficiency, modularity, and uniformity assumptions of their own meta-theory (Thornhill, 1998). Biologists are developing new methods for identifying fitness indicators (e.g. Johnstone, 1995; Moller & Swaddle, 1997), but they do not resemble the Cosmides-Tooby criteria for identifying psychological adaptations. If our minds are largely advertisements for our fitness, we need to re-think our meta-theory. We need to emphasize signalling theory, sexual selection theory, behavior genetics, and real evolutionary game theory (the kind that economists do) much more, and stop being so obsessed with altruism, kin selection, and reciprocity. This is the direction mainstream animal behavior research has gone in the last ten years, and it would be unfortunate if evolutionary psychology were left behind.

Evolutionary psychology's claims to be the privileged meta-theory for psychology rest on its claim to use the same concepts and methods as the rest of animal behavior research. For that claim to hold true, we have to update evolutionary psychology's meta-theory as animal behavior researchers update theirs. At the moment, evolutionary psychologists use the new ideas concerning sexual selection and signalling in our day-to-day research, but we have not revised our meta-theoretical manifestos to reflect that practice. K&E's points remain valid, but they are illustrated with examples drawn from a

relatively old-fashioned viewpoint of 1970's sociobiology and cognitive psychology, when altruism was the central question in animal behavior, and when minds plausibly resembled computers.

Can Lakatos Account for Evolutionary Psychology's Strengths and Weaknesses?

The second major problem with the Lakatosian framework is that it overlooks many scientific, personal, media, social, and institutional effects that have influenced evolutionary psychology's strengths and weaknesses. The Lakatosian vision of one meta-theory per science under-estimates the importance for scientists of achieving consilience between different research fields (Wilson, 1999). Evolutionary psychology has powerful appeal not just because it has a good isolated meta-theory, but because it uses largely the same meta-theory as biology, and because it touches on almost every aspect of human behavior, society, and culture. Thus, it promises a seamless integration between the biological sciences, the social sciences, and the humanities. This dedication to consilience is what leads evolutionary psychologists to defend and promote our meta-theory with such passion. From our point of view, evolutionary adaptationism as a meta-theory for understanding animal behavior has already been validated by a century of research in biology, and does not need to prove itself anew in our particular species of primate.

The Lakatosian framework advocated by K&E also under-estimates the importance of personal satisfaction and media appeal in the success of evolutionary psychology. Many areas of mainstream psychology are alienating to students and young scientists because they ignore human sexuality, friendships, families, status, conflict, politics, power, birth, death, age, animals, plants, morality, and aesthetics. Textbooks in cognitive, perceptual, and even social psychology do not usually address such topics, whereas evolutionary psychology embraces them. When behaviorism and cognitivism dominated psychology, Ph.D. programs had to socialize psychologists to expect very little personal insight from their research. Evolutionary psychology does not demand that young scientists forget about human nature when they become psychologists. It even accepts personal experience, interpreted from a Darwinian viewpoint, as a valid basis for generating hypotheses (though not for testing them). This appeal to natural human interests also explains evolutionary psychology's success in attracting popular media attention. Until philosophy of science incorporates an explicit, detailed model of the human nature that underlies the behavior of scientists, it cannot explain why some meta-theories seem alienating, while others seem naturally congruent with human interests.

This puts evolutionary psychology in a unique position. In the physical sciences, the power of meta-theory is usually inversely proportional to its popular accessibility, because strong meta-theories (such as Superstring Theory) tend to be highly mathematical, and most people cannot follow mathematics. Since psychology has long suffered from physics envy, psychologists tended to assume that a good psychological meta-theory should also be highly mathematical. This led to a distrust of candidate meta-theories that were non-mathematical and popularly accessible. Such distrust is misplaced in assessing evolutionary meta-theories, which can be expressed verbally to the general public without sacrificing much content. Evolutionary psychology has perhaps the first meta-theory that is both scientifically fruitful and popularly accessible. This explains why it was able to circumvent the usual institutional channels of scientific acceptance, attracting a ground-swell of popular interest long before it became scientifically reputable within psychology departments. Lakatos might have been surprised that a meta-theory could be accepted by the general public before it is accepted within its nominal science.

Yet evolutionary psychology's popularity has also brought problems in assessing the success of its meta-theory. When there is a very high proportion of media coverage to research effort, research break-throughs can appear to come more slowly than expected. Because journalists writing about evolutionary psychology greatly out-number evolutionary psychologists (probably less than a thousand, world-wide), the journalists become frustrated with the relative scarcity of new findings, and convey that frustration to the public, creating the impression of a meta-theory that has not lived up to its initial promise. Yet accurate assessment of a meta-theory's fruitfulness must take into account the resources and personnel devoted to exploring the meta-theory. When media hype creates the impression that a new meta-theory has attracted many more active researchers than it really has, such media-based assessments of success tends to be biased against the new meta-theory. The proper measure of a meta-theory's success is research productivity rate per scientist, not research break-through rate per journalist. Lakatosian philosophy of science misses these effects because it overlooks the relationships between science, the media, and the public.

Finally, the Lakatosian view has trouble predicting what happens when a powerful, institutionalized, but fragmented science lacking any meta-theory meets a small group of scientists who offer a meta-theory that threatens to unify the science. Lakatos offers a rather rosy image of scientists cherishing meta-theories and appreciating their power to unify previous unconnected research areas. This overlooks the institutional boundaries that tends to keep research areas separate: separate journals, societies, funding agencies, university courses, textbooks, departments, degrees, academic job descriptions, and career tracks. New meta-theories easily fall between such cracks, whatever their empirical success as research enterprises. Most of the physical sciences were fortunate enough not to expand institutionally until they had a workable meta-theory in place. Psychology was unusual in growing institutionally long before it grew up meta-theoretically, largely by promising results of immediate relevance to intelligence testing, social policy, education, crime, and mental illness. The most pressing philosophy of science question for evolutionary psychology is ethical rather than epistemological: will mainstream psychologists with vested interests in rejecting a unifying meta-theory behave with sufficient altruism and foresight to allow a psychological meta-theory to flourish?

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