BOOKS: ANTHROPOLOGY

Sex on the Brain

Catherine Marler

Why do humans have such a high level of intelligence? What selection pressures led to the evolution of complex language? Why do humans have such well-developed artistic abilities? What has led to our capacities for creativity, morality, and humor? These are questions that have been extensively debated, with an emphasis on survival function or on by-products of selection for survival. For Geoffrey Miller, the roots of the explanations for these traits instead lie in sexual selection: the idea that aspects, including such conspicuous and flamboyant ones as the peacock's tail, evolve because they attract sexual partners. Such traits can even lead to a decrease in survivorship; hence Darwin's categorization of sexual selection as a type of selection different from natural selection. Miller bases his discussion in *The Mating Mind* on an extensive set of animal behavior and evolution studies, which draw from different models of sexual selection including runaway sexual selection, Zahavi's handicap principle, and sensory exploitation. He uses this framework of mate choice to explain different aspects of complex human behavior.

The Mating Mind
How Sexual Choice Shaped the Evolution of Human Nature
by Geoffrey F. Miller

Doubleday, New York, 2000. 509 pp. $27.50, C$42.95. ISBN 0-385-49516-1. Heinemann, London, 2000. 528 pp. £20.00. ISBN 0-434-00741-2.

Miller, a cognitive psychologist, addresses several disciplines as he applies sexual selection theory to the human mind. For language researchers, he implies that there should be a focus on individual variation in language generated through factors such as mate choice instead of focusing only on traits that are universal across humans. For artists, he argues that art is not simply a nonadaptive by-product of evolved intelligence, as suggested by Pinker, but rather a trait that has been shaped by sexual selection. For cognitive psychologists, he implies that cognition cannot be explained solely by treating the mind as a neural computer that focuses on problem solving. The mind may also function as an ornament used to attract mates. For evolutionary psychologists, he extends the approach of applying sexual selection to humans by addressing psychological traits beyond those normally considered sexual. Miller views psychology as being "a driving force in biological evolution" because he views mate choice as a psychological process. Social psychologists in particular may find it valuable to use sexual selection theory for understanding a range of human behaviors, as Miller asserts that "few theories of comparable power" have emerged in psychology.

Some of these ideas listed above will, of course, be controversial. For example, the application of sexual selection theory to humans by authors such as David Buss and Randy Thornhill, and indeed the whole area of human sociobiology as originally summarized by E. O. Wilson, has already stimulated strongly critical responses. There are a number of reasons for these reactions. One, certainly, is the difficulty of performing controlled manipulative studies in humans. Another may be that alternative hypotheses are often not addressed. Researchers, often primatologists, have argued that sex differences have been overemphasized and hypotheses related to higher levels of paternal care and monogamy are often ignored. In humans, paternal care occurs and sex differences may therefore be less obvious than in many of the polygynous species. Thus, we should focus on how much of the variation in behavior can be explained by sexual selection hypotheses and design studies to select among alternative hypotheses. Miller, to his credit, focuses on individual variation and not species characteristics. His approach reflects the current state of animal behavior studies, which historically emphasized species-specific behaviors but now focuses on individual variation. A third reason for the controversies may be that some of us do not like to see our own behavior explained as a product of evolutionary history. Despite these misgivings, researchers will still apply theories such as sexual selection to humans because they provide a theoretical framework (with biological roots) from which we can form testable predictions.

Although the beauty of Miller's book is that it describes how one theoretical framework can potentially explain numerous aspects of human behavior, this is, perhaps, also its flaw. Miller tries to explain too many human traits. He is, however, creative enough to pull together a hypothesis from existing studies that could potentially explain each trait he discusses. For example, Miller asks, "Why do women have higher verbal ability than men, if language was sexually selected?" He argues that though there may be selection for men to have a greater language production, there also may be selection for better language comprehension in women to allow discrimination among verbal displays from different men. If men had higher verbal ability than women, one suspects that Miller may well have developed another sexual selection hypothesis to explain that result. It remains to be seen whether Miller's ideas can give rise to falsifiable hypotheses that can be rigorously tested.

Miller covers an incredibly broad range of topics, but he still misses a few areas of interest. For example, significant discoveries from sensory bias research by Michael Ryan and Walter Wilczynski and by Alexandra Basolo are absent. They have found examples that demonstrate sensory biases can evolve before the expression of the male traits, and researchers have begun investigating the neural bases for such biases. In another case, when Miller describes the mind as a "sexually selected entertainment system that plays not just on our sensory biases, but upon our thirst for pleasure," he refers to a unified pleasure system. Unfortunately, he does not discuss the nucleus accumbens (a brain area associated with reward) or whether there is evidence for other areas of the brain functioning as a pleasure system.

Miller is an extremely talented writer, and he has produced a beautifully written book that is a genuine pleasure to read. The strength of this work, however, goes well beyond style. Miller has ambitiously described a scenario that provides insight into a number

CREDIT: DILBERT/WITH PERMISSION FROM UNITED FEATURE SYNDICATE, INC.

The author is in the Department of Psychology, University of Wisconsin, 1202 West Johnson Street, Madison, WI 53706, USA. E-mail: camarler@facstaff.wisc.edu

of puzzles about the human mind. *The Mating Mind* will clearly stimulate thinking across a wide range of topics that are woven together under the rubric of sexual selection in humans. We will find it increasingly difficult to ignore the power of mate choice, a subset of Darwin's second theory, that is perhaps equally as important as natural selection for understanding how behavior evolves.

BOOKS: SECURITY POLICY

Terrorists and Toxins

John T. Finn

"Great men, great nations, have not been boasters and buffoons, but perceivers of the terror of life, and have manned themselves to face it." When Emerson wrote these words, he probably did not have chemical and biological terrorism (CBT) in mind, but policymakers concerned with the issue today would do well to heed his advice. The most effective preparations for CBT will be based on a realistic appreciation of the threat.

The United States has invested heavily in preparedness for CBT since the Aum Shinrikyo cult released sarin in the Tokyo subway in March 1995. But preparations have been centered on worst-case scenarios. Planners have focused on the staggering vulnerability of civilian populations to CBT while neglecting to assess the actual threat given the motivational and operational constraints on terrorists, such as the ideology, resources, and organizational structure needed to perpetrate CBT.

Toxic Terror provides a much-needed perspective by examining 12 terrorist groups and individuals that have allegedly acquired or used chemical or biological agents since World War II. Through their case-studies approach, the authors seek to ascertain the who, why, and how of CBT—the types of people and organizations that have attempted such attacks, their purpose in doing so, and their means of acquiring and delivering toxic agents—with the aim of contributing to an empirical basis for cost-effective preparedness.

Perhaps the most striking finding is that incidents of CBT have been infrequent and have caused relatively few casualties. Although the cases examined were chosen because they have been often cited in the literature on terrorism, only three involve groups that were successful. In 1946, "Avenging Israel's Blood," a group of Jewish Holocaust survivors, sought revenge by lacing with arsenic the bread of German prisoners of war. Over two thousand became ill, but it is not known whether any died. In 1984, the Rajneeshee cult used *Salmonella* bacteria to contaminate salad bars in an Oregon town in a plot to influence a local election. Hundreds were sickened, but no one died. And in 1995, the Japanese cult Aum Shinrikyo released sarin to delay an imminent police raid on its headquarters. Twelve were killed and more than a thousand injured. Significantly, these successful attacks employed low-tech means of delivery. Even Aum Shinrikyo, despite its vast financial resources and team of university-trained scientists, apparently failed to cause casualties in previous more-sophisticated attacks that involved aerosol dispersal of anthrax bacteria and botulinum toxin.

Toxic Terror
Assessing Terrorist Use of Chemical and Biological Weapons
Jonathan B. Tucker, Ed.
MIT Press, Cambridge, MA, 2000. 320 pp. $45. ISBN 0-262-20128-3. Paper, $20. ISBN 0-262-70071-9.

Four of the often-cited cases turn out to be apocryphal: no chemical or biological agents were sought, acquired, or used. This emphasizes the need to examine primary sources before accepting the authenticity of an incident. For example, the story of the Weather Underground's alleged 1970 attempt to obtain toxic agents from the U.S. Army's biological research facility at Fort Detrick, Maryland, originated in a *Washington Post* column that was never corroborated. Similarly, the allegation that sodium cyanide was incorporated in the 1993 World Trade Center bomb was based on an apparently spurious statement by a judge. Yet scholars of terrorism have cited one another in reference to these cases for years, a phenomenon that one of the authors calls "incestuous inter-quote."

Another important finding is that CBT has been a diverse phenomenon. Objectives have ranged from assassination of federal tax officials (Minnesota Patriots Council, 1991) to extermination of most of humanity in order to repopulate Earth with a select few (the R.I.S.E. group in Chicago, 1972). Intended methods have ranged from spraying botulinum toxin from a modified attaché case (Aum Shinrikyo, 1995) to poisoning urban water supplies with potassium cyanide (the survivalist group The Covenant, the Sword, and the Arm of the Lord, 1986). Still, a few preliminary observations about the nature of CBT can be made.

Groups that have attempted CBT often have had a charismatic leader, a sense of paranoia or grandiosity, an apocalyptic ideology, and a posture of "defensive aggression" against a real or imagined threat. Perhaps most important, none of the perpetrators had an outside constituency: isolated groups and loners are prone to distorted perceptions and do not risk alienating potential supporters by using CBT. ("We do not ask American people to support us; in fact, we don't give a damn whether they like what we have to offer or not," proclaimed the Alphabet Bomber, a disgruntled aerospace engineer who in 1974 threatened to attack the Supreme Court with sarin.) In contrast, politically motivated terrorists generally have not pursued CBT. Additional case studies are needed, however, to determine which traits of chemical and biological terrorists might help identify them because charisma, paranoia, and grandiosity are also found to varying degrees among, for example, leaders of political parties, large corporations, and academic departments.

Terrorists on the street. Shoko Asahara (left) planned Aum Shinrikyo's deadly sarin attack on Tokyo's subways in 1995 to keep police from raiding cult headquarters.

CREDIT: KYODO/AP PHOTO

The case studies suggest that mass-casualty CBT is unlikely because most terrorists lack the technical know-how to produce and deliver toxic agents on a large scale, although the threat posed by the availability of former Soviet bioweapons scientists should not be underestimated. Of more immediate concern is the use of toxic agents for small-scale terrorist attacks, such as assassination or food contamination. *Toxic Terror* also illustrates the importance of surveillance and intelligence in preventing CBT, as intervention by law enforcement foiled several of the plots.

It would be imprudent to place too much significance on these few cases, and policymakers must always prepare for a spectrum of attacks (including mass-casualty scenarios). Yet this book is a useful resource for evaluating the CBT threat, and its empirical methodology offers a powerful approach for future studies. *Toxic Terror* is also good reading. The authors provide fascinating glimpses into our darker nature with stories of ambition, greed, betrayal, and revenge—the real terrors of life.

The author is at the Center for International Security and Cooperation, Encina Hall, Stanford University, Stanford, CA 94305-6165, USA. E-mail: jfinn_cisac@yahoo.com