H-Diplo | ISSF

Roundtable, Volume I, No. 1 (2010)

A production of H-Diplo with the journals *Security Studies*, *International Security*, *Journal of Strategic Studies*, and the International Studies Association's Security Studies Section (ISSS).

http://www.h-net.org/~diplo/ISSF
http://www.issforum.org

Christopher Ball, H-Diplo/ISSF Managing and Commissioning Editor
Diane Labrosse, H-Diplo/ISSF Editor at Large
George Fujii, Web and Production Editor

H-**Diplo | ISSF Roundtable on "Biology and Security"**

Roundtable Editors: Rose McDermott, Brown University and Peter K. Hatemi, University of Iowa.

Commissioned for H-Diplo/ISSF by **Robert Jervis,** Columbia University

Stable URL: http://www.h-net.org/~diplo/ISSF/PDF/ISSF-Roundtable-1-1.pdf

Contents

Introduction by Rose McDermott and Peter K. Hatemi

This roundtable broadly addresses the application of recent developments in biology, behavior genetics and neuroscience to topics in international relations and security studies. Advances in the life sciences have been applied to topics in political science; most of those applications have been restricted to the realm of voting behavior and public opinion broadly construed[1]. However, several are directly related to topics of greater interest to International Relations scholars, such as strategic decision-making and morality. These contributions have proven enormously provocative and interesting, and have spawned entire new research agendas into the myriad ways in which biology may contribute to human political and social development and behavior. However, up until now, very little of this work has explicitly taken on problems and issues related to the topics that typically preoccupy IR scholars and done so in manner engaging those scholars. Such topics include conflict processes, the formation and maintenance of alliances, the dynamics of intra-group and inter-group aggression, the emergence of status hierarchies, and prospects for trade and cooperation.

The reasons for this lack of integration seem obvious. Biological processes take place at a micro level, in the past, often too difficult to even be observed by the naked eye, while international relations topically occur on a much larger scale. Many find it too difficult to imagine, much less trace, the chain of cause and effect between then. But macro-level outcomes are due in part to micro-level activity. The implications of individual difference, founded in biological and genetic reality, exert their influence on behavior that in sum dramatically affects aggregate level international outcomes. Anyone who believes that Hitler provided a critical and unique catalyst to the cataclysm that became World War II cannot argue otherwise. But the processes by which biological differences can manifest effects on international relations have not been well, or systematically, thought out previously. This roundtable is designed to begin thinking about these issues in a more systematic way. In part, our goal is to provide a forum for discussion that departs a bit from the more traditional causal variables explored in international relations research, but still engages the central issues of concern.

[1] Peter Hatemi et al., "The Genetics of Voting: An Australian Twin Study," *Behavior Genetics* 37:3 (May 2007): 435-448. http://www.springerlink.com/content/q42q0l51557391n8/ ; Brad Verhulst, Peter K. Hatemi, and Nicholas G. Martin, "The nature of the relationship between personality traits and political attitudes," *Personality and Individual Differences* In Press, Corrected Proof, http://www.sciencedirect.com/science/article/B6V9F-4XWMGG5-2/2/6fadb0c5ee898b7d773bffa99eb7fc4d. ; James H. Fowler and Darren Schreiber, "Biology, Politics, and the Emerging Science of Human Nature," *Science* 322, no. 5903 (November 7, 2008): 912-914; Antoine Bechara et al., "Deciding Advantageously Before Knowing the Advantageous Strategy," *Science* 275, no. 5304 (February 28, 1997): 1293-1295.http://www.sciencemag.org/cgi/content/abstract/275/5304/1293; Yoel Inbar, David A. Pizarro, and Paul Bloom, "Conservatives are more easily disgusted than liberals," *Cognition & Emotion* 23, no. 4 (2009): 714; http://www.informaworld.com/smpp/content~content=a794011402&db=all ; Alan G. Sanfey et al., "The Neural Basis of Economic Decision-Making in the Ultimatum Game," *Science* 300, no. 5626 (June 13, 2003): 1755-1758. http://www.sciencemag.org/cgi/content/abstract/300/5626/1755.

Many people argue that the world has changed since the terrorist attacks of 9/11. This may or may not be true from the perspective of international relations, but it is certainly true in terms of how we understand human behavior. The last decade has witnessed a veritable explosion in the kinds of technologies that are available to explore the foundations of human development, expression, and behavior. In addition to the near ubiquitous use of functional magnetic resonance imaging (fMRI) to show which parts of the brain "light up" during a particular task, the study of human genetics has similarly made huge advances in the ability to ascertain, analyze, compare, understand, and interpret the meaning of individual variance in genetic structure across individuals.

These technical developments hold tremendous implications for security concerns, particular in areas related to screening for terrorists. What if it were possible to discover particular biological screening mechanisms that would indicate that an individual was at greater risk for engaging in impulsive aggression? What if there were screening mechanisms that would help identify potential terrorists at a higher rate than random screening or behavioral profiling? What if advances in epidemiology allowed scholars to uncover parts of the world where the population structure appeared more vulnerable to threats and provocations? For better or worse, these possibilities now exist. These realities would change the nature of the security game for both domestic and international security experts alike by allowing us to more accurately model and monitor behavior. The implications for governance, democracy, protection of individual freedoms and rights are unknown. This could contribute not only to a safer society, but would be better for the strength and accuracy of our military as well; it could also require important global legislative change to protect individuals. If enemies can be more accurately separated from potential supporters, targeting could become more accurate, and prospects for blowback might diminish as well.

We do not yet take a stand on biological profiling; rather, we encourage transparency and advocate for people to obtain more useful information about themselves, and their inherent strengths, weaknesses, vulnerabilities and resiliencies. While such opportunities may frighten some with their potential for misuse, such screening might also operate to help create more positive outcomes for many as well. If soldiers coming into the service could be screening for vulnerability to post-traumatic stress disorder, for example, and assigned to mission according to inherent strengths and weaknesses, it might be possible not only to reduce the number of suicides and other adverse outcomes, but to improve unit morale, cohesion, and performance as well, once people were placed in jobs that actually feel like the best fit with inherent characteristics. In addition, developing treatment programs more tailored to individual needs and vulnerabilities can improve recovery times and prospects as well.

Biology is not destiny in any way; genetics cannot "determine" complex behavior independent of environmental interactions. However, we do suggest that recognition of the importance of basic endogenous factors should become part of the discourse in understanding what makes people believe and behave as they do in a wide variety of circumstances, including those pertaining to international relations, conflict, and combat. Biology needs to be part of how we deal with understanding the motives and mechanisms

of human action. The physical reality is simply part of who we are as humans, and like every other species on the planet, we are affected by our endocrinology and by our environment. Just as in comparative politics, scholars have looked at how the impact of a particular region or economic structure influences political outcomes of interest; we suggest that exploring the internal territory of the human mind could produce similar beneficial results in understanding the sources of human preferences and actions.[2] Indeed, attempting to explain or predict outcomes devoid of either half of this mutually interacting equation not only ignores important input, but is destined to a failure born of incomplete incorporation of all relevant data.

Topics in the roundtable

This roundtable compiles a list of contributions by mostly junior scholars interesting in applying such topics to the study of international security. These cutting edge contributors each focus on a different area of inquiry. The contribution by Michael Bang Petersen also uses insights provided by evolutionary psychology to examine the implications of how thinking about security evolved in the context of much smaller scale societies involved in much smaller conflict. Brad Verhulst explores this topic from a different perspective, taking a biological approach to examining the nature of attachment to one's nation. Yet humans use the same cognitive architecture to make decisions about war and peace in the context of much larger scale militarized conflicts. Anthony Lopez offers an evolutionary psychological take on the nature of coalitions and war. Jonathan Renshon examines the experimental study of leadership within the context of national security decision-making, considering some of the constraints that exist in studying this population, and thus also pointing to potential areas for growth in future research. Our piece provides a slightly more optimistic take on prospects for experimental investigation of phenomena that might affect leaders and others through a consideration of the potential impact of endocrinology on one important aspect of behavior, namely the tendency to engage in aggression Finally, the piece by William English takes a more cautious view toward the potential of biology and genetics to inform our understanding of security and war, noting both the promise and limitations inherent in the applications of these new areas to enduring challenges facing international politics

We hope that this roundtable will not only spawn discussion and debate about the topics raised by these essays, but will also encourage others to explore substantive related topics in international security with a more biologically oriented perspective in mind.

Participants:

Bill English is a Ph.D. candidate in the department of Political Science at Duke University. His areas of interest include political theory, political economy, political theology, and public policy. He works on wide-ranging debates concerning the methodological foundations of social science, with a particular focus on the nature of ethical convictions

[2] P.K. Hatemi, "Genetic and Neurocognitive Approaches for Comparative Politics: A Partnership Between Science and Culture" *APSA-CP* newsletter symposium on "Politics and the Brain," (2010).

and the phenomenon of persuasion. He also writes on philosophical appraisals of biological-behavioral research, supported in part by his own empirical criticisms of certain claims surfacing in behavioral genomics.

Peter K. Hatemi is an Assistant Professor of Political Science at the University of Iowa. He has conducted foundational work in the area of genopolitics. He works on a wide range of topics, including political attitudes and preferences, ideology and partisanship, sex and gender, fear, personality and mate selection. He has published extensively in *Journal of Politics, Behavior Genetics, American Journal of Political Science, Political Research Quarterly,* and elsewhere.

Anthony C. Lopez is Ph.D. candidate in Political Science at Brown University. He has also received graduate training at the Center for Evolutionary Psychology at the University of California, Santa Barbara. His research focuses on the evolutionary psychology of coalitional behavior and the application of these findings to international politics.

Rose McDermott is a Professor of Political Science at Brown University. She works in the area of political psychology and international relations. She has held fellowships at the John M. Olin Center for Strategic Studies and the Women and Public Policy Institute, both at Harvard, and at the Center for Advanced Study in the Behavioral Sciences. She has written four books and over 70 articles on a wide variety of topics including experimentation, prospect theory, emotion and decision-making, identity and intelligence reform.

Michael Bang Petersen (michael@ps.au.dk) is an Assistant Professor at the Department of Political Science, Aarhus University. His research focuses on the psychology of public opinion formation and draws on theories and insights from evolutionary psychology and neuroscience. Recent publications include articles in *Journal of Politics*, *Journal of Cognition and Culture*, and *European Journal of Political Research*.

Jonathan Renshon is a Ph.D. candidate in the Department of Government at Harvard University, a Bradley Fellow, and a National Security Studies Program fellow at the Weatherhead Center for International Affairs. Renshon studies national security decision-making, foreign policy analysis, and political psychology. He is the author of *Why Leaders Choose War: The Psychology of Prevention* (Greenwood, 2006), and his work has appeared in *Journal of Strategic Studies, Political Psychology, Foreign Policy* and *Journal of Conflict Resolution*. He is also a researcher in the Emotion and Decision-Making Group at the Harvard Decision Science Laboratory (http://content.ksg.harvard.edu/lernerlab/).

Brad Verhulst is a Ph.D candidate in Political Science at Stony Brook University. His research interests focuses on dispositional differences and how these dispositional differences alter attitude expression. He has published papers on implicit attitudes and the cognitive structures that underscore those attitudes and the genetic and environmental relationships between personality traits and attitudes.

Essay by William English, Duke University

"Unlocking the Secrets of Human Biology: Implications for Diplomacy, Security, and War."

The role of biology in human conflict has been a perennial concern for those who reflect on the causes and nature of war. Now, revolutionary advances in the bio-medical sciences are reorienting how we think about these issues, as well as providing new tools to deal with them. The implications for security studies will undoubtedly be widespread. However, the sheer quantity and scope of novel biological research confronts us with the challenge of understanding where its true promises lie. From a theoretical perspective we need to ask whether new research fundamentally changes important paradigms in the field. From a practical perspective, finite resources force us to make bets on which research is likely to be most useful to pursue. Thus it is worth taking a bird's eye view to survey and appraise the promises and limits of biological research as it relates to security issues across the board.

Connections drawn between biology and conflict are indeed old. The greatest war epic of the ancient world begins with the "wrath of Achilles" and the devastation it wrought. Throughout *The Iliad*, the actions of Achilles and other heroes such as Agamemnon, Odysseus, and Hektor are described in animal terms, likened to the fury of a lioness trying to regain her cubs, the rampage of hounds against a savage boar, and the desperation of two beasts vying for control of a little spring of water.[1]

These comparisons are more than mere literary device. The association of war with animality in the history of political thought, of which Homer is but one originative example, points to deep concern about the foundations of aggression in human biology. As "rational animals" humans appear truly exceptional. However, in the face of conflict human rationality is often focused and transformed by what is characteristically described as destructive, animalistic passion. *Homo homini lupus* — man is a wolf to man — as the ancient saying goes. Moreover, there is a strong tradition of associating human "passions" with baser animal instincts, as something to be mastered and controlled by higher capacities of reason and judgment.

Thucydides described the tremendous destruction and social upheaval of the Corcyrean Revolution, spun out of control through the intrigues of a few political elites, in terms that raised basic questions about human nature: "the sufferings which revolution entailed upon the cities were many and terrible, such as have occurred and always will occur, as long as the nature of mankind remains the same...In peace and prosperity states and individuals have better sentiments, because they do not find themselves suddenly confronted with imperious necessities; but war takes away the easy supply of the daily wants, and so proves

[1] Homer. *The Iliad* trans. Richmond Lattimore (Chicago: University of Chicago Press, 1951) Bk. 18.318; 11.292; 16.825.

a rough master that brings most men's characters to a level with their fortunes." In the midst of violent revolution Thucydides claimed "revenge was held of more account than self-preservation" and observed that "human nature gladly showed itself ungoverned in passion." [2]

Thucydides diagnosis of the causes and effects of human conflict is suggestive on many fronts. Not only does he share the classic perspective that sees ungoverned passions as a source of conflict, but he also draws attention to the permanence of conflict, due to its roots in human nature, as well as the liability of that nature to be vexed by both daily wants and more complex concepts like honor and revenge.

Our understanding of human nature has changed dramatically since ancient times, due in large part to advances in the bio-medical sciences. The dichotomies we draw between passions and interests, emotions and rationality, dispositions and habits have been reconfigured and complicated in various ways. However, the basic insight — that decisions about, and conduct within, war alerts us to the animality of the human animal — remains a profound one. What is dramatically new is the possibility of understanding and manipulating biological dimensions of human behavior in ways that can be useful for security, victory, and peace. In the past we could do little more than describe and lament the limitations and complexities of human nature. However, over the last few decades developments in genomics, neuroscience, and molecular biology have granted unprecedented insights into our biological constitution, many of which hold significant implications for security, broadly construed.

The pace of these discoveries is fast and their implications widespread. The modest purpose of this essay is to offer a brief introduction to the technologies that are currently revolutionizing biological research, followed by a quick-moving overview of the actual and possible security applications of our emerging knowledge. In particular, I will consider the implications for security under three main categories: elite decision-making and diplomacy, domestic security and counter-terrorism, and the conduct of war. However, in illustrating the relevance of biological research to a broad range of security questions, I also mean to draw attention to potential limits of this research for many larger, theoretical debates in the field. Advances in biology will fundamentally change the way we think about many security dilemmas and the resources we have to deal with them. However, there are also perennial questions that cannot be addressed by this research —understanding that will be an important part of using biological insights to our greatest benefit.

A New Universe of Biological Research

Gene sequencing and brain imaging technologies have been the driving motor of the current revolution in biological knowledge. Each has opened up new areas of biological

[2] Thucydides. *The Peloponnesian War* trans. Richard Crawley (New York: Random House, 1962). Bk 3.82-85.

inquiry that were unthinkable only a generation ago and dramatically contributed to advances in molecular biology.

The human genome contains some three billion nucleotide base pairs comprising over 20,000 genes, which together form the blueprints of human life. The genetic architecture we inherit from our parents is ground zero of human nature. Although our genetic endowment interacts with and is modified by the "environment" in countless ways throughout our lifespan, it is an obvious place to start looking for explanations of disease and behavior. Indeed there are a many diseases that are well characterized by their genetic causes and inherited in classic Mendelian fashion — sickle cell, Huntington's disease, cystic fibrosis — and others that appear to be strongly influenced by particular gene mutations — breast cancer, colon cancer, Alzheimer's. Also, various genetic conditions are known to cause or contribute to certain psychological and behavioral deficits, such as Down syndrome, fragile X, and Lesch Nyhan syndrome. When it first became clear that advances in gene sequencing techniques would enable researchers to map the entire human genome there was considerable excitement in the hope that we would discover simple genetic explanations for a wide range of diseases and that the explanatory power of genetics could extend to patterns of human behavior, psychological dispositions, and character traits.

Unfortunately, progress in disease genomics has been slower going than many envisioned. Although our genetic architecture must necessarily be part of the story of how diseases arise in conjunction with environmental interactions, the degrees of complexity involved are increasingly understood to be far greater than previously imagined. The classic model of Mendelian inheritance, in which a single trait (or phenotype) is caused by a single gene (or gene variant, called an allele), is the exception rather than the rule when it comes to understanding the origins of most diseases. These may depend on multiple gene interactions combined with extensive environmental influences, not to mention complicated dynamics at the level of epigenomics and ongoing mutations. To take but one example, schizophrenia is highly heritable and thus should presumably be an ideal candidate for genetic analysis. However, studies have repeatedly failed to identify any particular genetic variations significantly associated with the disease.[3] More recently, researchers have suggested that there may be many small, random mutations that occur on dozens of various genes involved in brain function, any of which can produce symptoms classified as schizophrenia.[4] If true, this tremendously complicates attempts to pharmacologically ameliorate the genetic sources of "schizophrenia," as there may be hundreds of different, particular mutations that lead to the disease — or, to be more accurate, hundreds of discrete diseases.

---

[3] B. Riley and K. Kendler, "Molecular Genetics of Schizophrenia" in *Neurobiology of Mental Illness* (Charney and Nestle eds.) pp. 247-262, Oxford: 2005. (http://books.google.com/books?id=5Cr7ABelO1EC)

[4] Duke Medicine News and Communications, "Schizophrenia Genetics: Evidence Fingers Emerging Class of Culprit" (http://www.dukehealth.org/health_library/news/schizophrenia_genetics_evidence_fingers_emerging_class_of_culprits)

If understanding the genetic sources of disease is complicated, investigating the genetic sources of human behavior promise to be even more complex — although there have been notable discoveries (discussed below). To statistically enable the kind of studies that could hope to tease out higher orders of complexity requires massive amounts of data. It is possible to sequence targeted areas of interest in the genome (examining particular "single nucleotide polymorphisms," i.e. genetic variations) for a low cost. Already there is a flood of genetic data coming down the research pipeline, and we will increasingly have access to an expanding universe of genetic information matched to varieties of survey and behavioral data. However, only time will tell if more complex and informative genetic relationships can be discovered through statistical innovations utilizing larger and more refined data sets.

A few immediate consequence of the genomic revolution for the social sciences are worth noting. First, it has refocused debates about human nature on the phenomenon of variation. There have always been significant controversies in the anthropology, sociology, psychology, and philosophy concerning whether human nature should be understood as something fundamentally universal (and, if so, the basis for that universality) or segregated into meaningfully different types (ranging from caste hierarchies to neutral, complementary diversities). Positions in these debates fall along a spectrum, but our increasing recognition of the amount of genetic variation present (or possible) in the human species has led many to re-conceive of human nature as itself fundamentally diverse. This has in turn led to a renewed interest in identifying "character types" with an eye towards establishing their roots in human genetic variations. Also, this perspective has led many to suspect that explanations of abnormal/deviant behavior are to be found at the genetic level (or in physiological states derivative of particular gene-environment interactions).

Second, increasing recognition of the complexity involved in our genetic architecture has also illuminated the limits of "purely" genetic explanations of the human organism. Genes are always part of the story, but they are seldom the full story. Our genetic architecture puts in motion biological systems that recursively interact with and are modified by their environments and which reflect many stochastic influences as well. This is particularly the case with the most complex and plastic of genetically engineered organs, the human brain.

Research at the intersection of "Mind, Brain, and Behavior" has also been subject to radical advances in recent years driven by technological developments. Various imaging and measurement techniques such as electroencephalograms (EEG), positron emission tomography (PET), and functional magnetic resonance imagining (fMRI) have granted a window of sorts into the brain. They promise to shed new light, not only on various brain pathologies, but also on the very nature of human perception, decision-making, and consciousness. These technologies bring us much closer to understanding the biological dynamics immediately underlying human behavior and, like genomic technologies, they have spurred an enormous quantity of new research. According to one estimate, in 2007

about eight peer-reviewed articles employing fMRI were published per day.[5] Neurological research has also greatly expanded our understanding of chemical pathways and systems in the brain, illuminating the influence of neurotransmitters (e.g. dopamine, norepinephrine, and serotonin), hormones (e.g. cortisol, testosterone, oxytocin) and other chemicals on brain function and human behavior.[6]

The human brain is in some sense the final frontier of biological research. Going forward, deep debates about the relationship between the mind and the brain will undoubtedly persist and become richer, but many of the findings in neuroscience will prove useful regardless of how these deeper debates develop.

Implications for Elite Decision -Making and Diplomacy

Perhaps no concept in the social sciences has been more heavily influenced by biological research in recent decades than rationality. The history of this concept is complex, but to a large extent the social sciences in the 20th century treated rationality as a normative ideal. Rationality could mean consistency in preferences (reflexivity, transitivity, and completeness), the use of probability theory to deal with risk, Bayesian updating from past experiences, or even scientific induction more generally. Rationality, thus construed, had to do with whether people chose the best means to instrumentally achieve their goals and the logical consistency of those goals. Irrationality was something that should not persist because it is suboptimal from an agent's perspective and enables exploitation by others. Thus, "rational behavior," subjectively defined, could be expected from most people, and on the basis of such expectations social scientists could make useful predictions.

However, behavioral research of the last few decades increasingly demonstrated that people often do not adhere to normative ideals of rationality. Rather, people exhibit inconsistent preferences, perceptual biases, inefficient strategies, and so on. This led to the development of more sophisticated accounts of rationality that attempted to explain apparent irrationality by deeper rational considerations. These included accounts such as rational ignorance, bounded rationality, satisficing (accepting suboptimal outcomes in light of the disproportionate costs of achieving optimal ones), and minimaxing (minimizing the maximal potential for loss). Although there does appear to be some method to the apparent madness of many human behaviors — which is to say we are often "predictably irrational" to use Daniel Ariely's term — biological research has shown why it is likely a mistake to think there is a universal, single, underlying unity to human decision-making. Although there may be some conceptual unity to an agent's beliefs, goals, and strategies, our physiology also makes us liable to various deviations from intellectual coherence. The traditional catalog of vices — lust, gluttony, sloth, anger, envy, greed, pride, etc — is not a

[5] " Jonah Lehrer, "Picture Our Thoughts: We're Looking for Too Much in Brain Scans," The Boston Globe (August 17, 2008). Cited by Selim Berker, "The Normative Insignificance of Neuroscience"

[6] For a good overview see J. Blaustein and A. Lajtha, *Handbook of Neurochemistry and Molecular Neurobiology: Behavioral Neurochemistry and Neuroendocrinology* 3rd Edition, (Springer: 2006).

bad place to start looking for manifestations of our biological liabilities. Moreover, many of these liabilities have a good biological rationale. We need biases, heuristics, and dispositions in order to cognitively manage our world. The question for those interested in diplomacy is whether these liabilities adversely influence elite decision -making and, in the likely event they do, how to predict and mange these influences.

To approach this as a central question for security studies is to already to adopt, or at least entertain, Kenneth Waltz's so-called "first image" of international relations, according to which, "the locus of the important causes of war is found in the nature and behavior of man."[7] War, on this account, can result simply "from selfishness, from misdirected aggressive impulses, from stupidity." This explains why studying the psychology of leaders could be such a valuable enterprise, unless it turned out everyone's psychology is either unpredictable or identical. Writing in the 1950s Waltz noted, "the assumption of a fixed human nature, in terms of which all else must be understood, itself helps to shift away from human nature — because human nature, by terms of the assumption, cannot be changed, whereas social-political institutions can be."[8] However, contemporary biological knowledge challenges Walt's assumption that human nature is homogenous. If, instead, there are significant variations in the biological factors that underlie human behavior and these are things we can understand and control, this would provide new hope for addressing some of the fundamental causes of war.

The range of research investigating the neurobiology of decision-making and brain genomics is vast. Many neuroscientists have presented evidence for modular theories of the brain, according to which certain functions are localized in different brain regions. Antonio Damasio has popularized much of his own work that highlights the ways in which emotional centers of the brain are engaged in different cognitive tasks.[9] He argues that "rationality" often depends on significant emotional contributions, which provides a key to understanding many behavioral abnormalities and paradoxes of reason. Others, such as William Uttal, have cautioned against the temptation to reduce brain processes to specific regions and modules, arguing that cognition is always a process that involves the whole brain.[10] His defense of distributed processing places a greater emphasis on the complexity and plasticity of the brain. However, many of the most interesting and robust findings in neuro-chemistry hold regardless of one's theory of brain organization. These

[7] Kenneth Waltz, *Man, the State, and War: a theoretical analysis*. (New York: Columbia University Press, 1954), 16

[8] Ibid, 41.

[9] Antonio Damasio, *Descartes' Error: Emotion, Reason, and the Human Brain*. (New York: Penguin, 2005).

[10] William Uttal, *The New Phrenology: The Limits of Localizing Cognitive Processes in the Brain*. (Boston: MIT Press, 2003).

include associations between sex hormones (testosterone, estrogen) and aggression[11], neurotransmitters (dopamine, serotonin) and depression[12], oxytocin and trust[13], cortisol and stress[14] -to name some of the more prominent discoveries.

The biology of decision-making has a special relevance to international relations and diplomacy because decisions to go to war have provided social scientists with the greatest paradoxes of rationality. According to a prominent line of thinking in the tradition of rational choice analysis, war doesn't make sense. Since war imposes tremendous costs, and one side generally looses, both parties (but particularly the weaker) should be able to negotiate a better outcome *ex ante*. James Fearon's classic article, "Rationalist Explanations for War," forcefully explored this paradox, suggesting that few mechanisms can account for war on strictly rationalist terms and those that can depend in various ways on incomplete information.[15] While there may be rational reasons that complete information is difficult to obtain, there are also plenty of "irrational" factors that might obstruct information as well. Thus, for both rationalist and non-rationalist theories of international relations, one way of explaining why war happens is to point to information asymmetries and misperceptions. In retrospect, it is often quite clear that at least one party made a miscalculation about the enemy's strengths or interests. History also suggests that personalities, tempers, and shifting sentiments of honor and vengeance can fuel misperceptions and short-sighted decisions in strategic contexts.

Robert Jervis famously investigated the sources and nature of misperception in international politics while demonstrating their profound impact on the course of world events in his 1976 book, *Perception and Misperception in International Politics*.[16] We now have good reasons to believe that biological research will further illuminate the systematic cognitive and perceptual biases that Jervis documents. The genetic and neurological foundations of such biases should become clearer, and with this understanding many hope we can better guard against their detrimental influences.

---

[11] R. McDermott,. et al, "Testosterone and Aggression in a simulated Crisis Game" in *The ANNALS of the American Academy of Political and Social Science* (2007): 614 (http://ann.sagepub.com/cgi/reprint/614/1/15)

[12] P. Willner, "Dopamine and Depression" in Dopamine in the CNS Vol 2 (DiChiara ed.): 387-416 Springer: 2002.

[13] P. Zak, et al. "Oxytocin is associated with human trustworthiness" in *Hormones and Behavior*, 48:5 (2005): 522-527.

[14] K. Vedhara, "An Investigation into the relationship salivary cortisol, stress, anxiety, and depression" in *Biological Psychology* 62:2, (2003): 89-96.

[15] J. Fearon, "Rationalist Explanations for War" *International Organization*. 49:3 (Summer 1995): 379-414

[16] R. Jervis, *Perception and Misperception in International Politics*. (Princeton: 1976).

In the introduction to *Perception and Misperception* Jervis noted that psychologists were already working on similar issues surrounding the nature of perception. However, he identified five major faults in the psychological literature that made its findings of questionable use for problems of elite decision-making and diplomacy. I believe at least four of these apply with almost equal force to much of the current research in neuro-decision theory and behavioral genomics.

The first of Jervis's complaints was that more attention is paid to "emotional rather than cognitive factors" in explaining human behavior. Research such as Damasio's complicates this accusation — if emotion and cognition are two sides of the same coin, then it would be hard to neglect the study of the latter in favor of the former. However, I believe the majority of biological-behavioral research today focuses on what we might generally describe as "semi-cognitive" factors — factors that may influence decisions and reasoning but do not have any appreciable connection with larger belief systems or conceptual frameworks. This is only a slight concern, as I expect there is much to learn from the nature of sub-cognitive influences, but one of the challenges for bio-behavioral research going forward will be its ability to say something meaningful about the "ideational" sources of human action.

Jervis's second charge was that data are derived from laboratory experiments that are extremely remote from processes of interest in the real world. Indeed, experimental protocols typically deal with very small stakes and use highly artificial simulations that bear only the slightest analogy to the phenomena researchers would ultimately like to explain (consider the research on the "dictator gene" discussed below). The external validity of laboratory findings is a concern across the board in social science experiments, but the problem is particularly pronounced when dealing with the unique circumstances of diplomatic crises.

Jervis's fourth concern (setting aside his third concern with policy bias), is that research often disregards the institutional settings and particular dangers/opportunities of political circumstances, and thus threatens to "over psychologize" (we might say over-biologize) people's decisions when there are much simpler explanations at hand in terms of beliefs, interests, and political realities. This concern expands upon the previous one questioning the portability of findings, but also explains why seemingly robust findings may not be portable. There are many instructive illustrations of this problem in behavioral finance.

Systematic biases in economic behavior found in the general population (overbidding in certain types of auctions) are often not found in seasoned traders, who are subject to strong arbitrage pressures to rationalize their decisions and thus have learned not to pursue low probability bets.[17] Although behavioral economics has shed a great deal of light

[17] See P. Burns, "Experience in Decision Making: A comparison of students and businessmen in a simulated progressive auction" in Research in Experimental Economics (Smith ed.) JAI: 1985- as well as M. Haigh and J. List, "Do Professional Traders Exhibit Myopic Loss Aversion? An Experimental Analysis" in *The Journal of Finance*. 60(1), 2005. pp. 523-534. Interestingly, the habitual risk aversion of traders often leads them to make less in laboratory settings than naïve participants.

on the nature of animal spirits in financial markets, it is less likely to be useful for predicting the unique, high stakes economic decisions of business leaders. Likewise, when an eminent primate biologist recently suggested in a talk that George W. Bush's invasion of Iraq was nothing more than an "in-group out-group" reaction of an alpha male, his perhaps tongue in cheek comment exemplified Jervis's concern that overly psychologized (biologized) explanations could exclude important dimensions of reality.

Jervis's fifth and most serious challenge to the psychology literature of the day was that most theories of behavior "did not account for the ways that highly intelligent people think about problems that are crucial to them. " In some sense this criticism does not transfer well to biological research. Biological influences on thought and behavior may not be apparent to individual agents or reflected in prior beliefs about how they reason. Biological research is likely to help clarify the role of dispositions in ways we could not have explored without recent advances in bio-metrics and statistical analysis. Moreover, decisions concerning conflict likely do engage deep emotions such as anger, fear, and vengeance. Thus, even highly intelligent people may exhibit sensibilities that present themselves as matters for further biological inquiry.

Yet, Jervis's challenge does raise most directly the lurking question of how insights into biological influences and dispositions relate to intelligent thought. It is one thing to know that certain hormones make people more aggressive, but quite another to assert that such hormones are the reason that Adolf Hitler sought territorial expansion or Neville Chamberlain sought appeasement. Of course, findings about the biological bases of aggression are highly suggestive of such links, but connecting those dots straight away is likely overly reductive. Although it is reasonable to conjecture that, lacking a certain physiological/genetic makeup, Hitler would never have sought territorial expansion in the first place, this does not necessarily tell us why Hitler sought territorial expansion. Was his ostensible "reasoning" irrelevant to his decision? Somehow our understanding of biological influences and dispositions must also include space for the influence of more complex conceptual judgments when such judgments clearly play a supporting role as well.

Take, for example, the extensive research done on the hormone oxytocin. Known to be involved in "pair bonding" in mammals, a number of research teams have found that in economic trust experiments, people who exhibited more trusting behavior also had higher levels of oxytocin circulating in their blood.[18] Moreover, in separate trials researchers were able to induce higher levels of trusting behavior in subjects by administering them oxytocin beforehand. The differences were not enormous, but they were significant and reproduced in a number of studies. Many have interpreted these findings as proof that trust is to be explained in terms of a-rational biological forces. Interestingly, many of the behavioral effects of oxytocin (increased risk taking, gregariousness, sociability) are similar to those of

[18] M. Kosfeld, et al. "Oxytocin increases trust in humans" in *Nature*, 2 June, 2005. pp. 673-676.

Zak, "Oxytocin is associated with human trustworthiness". P. Zak, et al. "Oxytocin increases generosity in humans.: *PLoS One*, 2(11) 2007.

alcohol (with the exception of intoxication), and recognizing such influences can obviously have strategic advantages — it is no mystery why casinos serve free drinks. Yet it would be premature to conclude that the behavioral manifestations of elevated levels of oxytocin or ethanol equate to what we commonly mean by "trust."

First, with regard to hypothetical utility of pharmacological manipulation, I would venture to guess that neither of these chemicals would, if administered to rival factions, be successful in securing trust in cases where differences in interest are profound and well known, such as the Israeli-Palestinian conflict or hostilities between Al-Qaeda and the United States. At a deeper level, there is the basic question of how brain chemicals themselves not only drive but also respond to cognitive judgments. We are apt to think of oxytocin in terms of its causal influence on trust rather than as a mediating variable between cognitive judgment and biological affect. However, research has also shown that the *experience of being trusted* apparently raises oxytocin levels on its own. Thus, cognitive judgments appear to retain some influence over components of what otherwise seems a reductionist account of the nature of trust. Much current research is focused on identifying relationships between biology and behavior at a very general level, but for these findings to be of use we will have to explore the details of these relationships with much more nuance and detail. Disentangling the interplay between "mechanistic" biological influences and higher capacities of the human intellect promises to be a very complex enterprise.

I do not wish to downplay the depths to which biological factors influence our attitudes and behaviors. Because we are biological beings, it is of course a truism that our biology matters, and in colloquial terms there are reasons to believe that "strong" biological factors are involved in decisions and behaviors relating to violence and conflict. The simple fact that a high proportion of crime in developed countries (~50% by the estimation of some studies[19]) is committed under the influence of drugs or alcohol is highly suggestive of this, as is the fact that the vast majority of crime worldwide is committed by males between the ages of 15-35.[20] Moreover, attitudes and behaviors that appear unusual or unintelligible seem ripe for biological explanations. However, conceptual judgments also shape human behavior and these are extremely difficult to account for in reductive biological terms.

The ability to conduct genetic association studies, along with an increasing recognition of the degree of human genetic diversity, has resurrected old paradigms in psychology that sought to classify people into various "personality types." Perhaps the most classic construct of this sort, the "authoritarian personality, " was criticized for its conceptual imprecision, which in retrospect seemed a way to pathologize the attitudes of certain ideological positions. Contemporary research in behavioral genomics has access to larger

[19] For example, see this report by the Australian government (http://www.health.gov.au/internet/drugstrategy/publishing.nsf/Content/mono64-l~mono64-l-ch5)

[20] The UK's statistics are representative of many countries' (http://www.statistics.gov.uk/CCI/nugget.asp?ID=1661)

and more precise data sets, although conceptual precision in defining "phenotypes" continues to be a challenge.

It is, *prima facie*, reasonable to ask whether people are biologically disposed to be aggressive or passive, violent or peaceful, risk loving or risk-averse, realist or idealist, sadists or saints. However, it is important to recognize how much conceptual baggage comes with trying to define and measure these "types." Upon scrutiny it is hard to imagine how some of these terms could be meaningfully understood biologically. What counts as aggression or realism will reflect judgments about which there may be substantial disagreements. Also, there is an inherent trade-off between generality and particularity in studying these concepts. From an evolutionary perspective there are reasons we might expect some people to be quicker to anger than others. But is undoubtedly a mistake to treat anger as if it were a simple property that will be manifested in the same or similar ways in all possible contexts. Precisely how such a disposition manifests itself will likely be highly sensitive to social mores, childhood upbringing, legal institutions, and cathartic outlets — not to mention intermediate biological influences from diet or drugs. For such reasons, it is *prima facie* unlikely that we'll find special biological dispositions underlying ever more discrete categories of attitudes/behavior — the anger of Americans after 9-11, the anger of peace activists over the Iraq invasion, the anger of North Carolinians over the decision to relocate Guantanamo detainees to Illinois. Attempting to find a particular biological disposition behind every human behavior resembles the old scholastic mistake of multiply universals, inventing a new generalization for every special case we encounter.

Consider, as illustrative of many of the concerns expressed above, the case of the "ruthlessness gene" reported by *Nature* in April of 2008.[21] Science writer Michael Hopkin authored this news release, entitled "'Ruthlessness gene' discovered: dictatorial behavior may be partly genetic, study suggests," which was accompanied by photos of Adolf Hitler, Robert Mugabe, Saddam Hussein, and Benito Mussolini. It reported the main findings of a then forthcoming article in the journal *Genes, Brains, and Behavior*.[22] According to Hopkin, "The study might help to explain the money-grabbing tendencies of those with a Machiavellian streak — from national dictators down to 'little Hitlers' found in workplaces the world over." Hopkin interprets the experimental protocol of the study- the "dictator game" — as giving participants two basic options: "behave selflessly, or like money-grabbing dictators such as former Zaire President Mobutu, who plundered the mineral wealth of his country to become one of the world's richest men while its citizens suffered in poverty." Indeed the study did employ the "dictator game," but the relationship of this game to dictatorship consists of nothing more than a linguistic coincidence. Hopkins interpretation was profoundly unwarranted. What exactly did the study find?

[21] M. Hopkin, "'Ruthlessness gene' discovered: Dictatorial behaviour may be partly genetic, study suggests" *Nature News*. 4 April, 2008. (http://www.nature.com/news/2008/080404/full/news.2008.738.html)

[22] A. Knafo, et al. "Individual differences in allocation of funds in the dictator game associated with length of the argininevasopressin 1a receptor RS3 promoter region and correlation between RS3 length and hippocampal mRNA" in *Gene, Brains, and Behavior* (7) 2008. pp. 266-275.

Genetic samples were taken from some two hundred student volunteers at the Hebrew University who played a simple economic game. Students were randomly divided into two groups and those in the first group were given 50 shekels (~$14). Each of these students could then decide whether to give away some of this money to a student from the second group with whom they were randomly and anonymously paired through a computer screen. In this exercise, which could more accurately be called the "generosity game," researchers found that those who transferred the most money were more likely to have longer versions of the gene AVPR1a. This gene is related to the hormone vasopressin, which is known to influence mammalian sociability. Students also filled out questionnaires measuring attitudes of "altruism" and "benevolence," which likewise showed some association with the AVPR1a allele. To their credit, the study's authors were much more careful and reserved in the language of their paper, phrasing the differences they found in terms of "altruism" and "benevolence." However, the unwarranted extrapolations drawn by the *Nature News* editor — drawing a line from the less generous participants in this game to mass murders -were profoundly misleading. From the perspective of fundamental biological research this study is, on its merits, genuinely interesting for a number of reasons, but those searching for an explanation of Stalin or Hitler would be well advised to look elsewhere.

We should also note in passing the large amount of current research examining the relationship between "aggression" and the gene encoding monoamine oxidase A (MAOA). MAOA is an enzyme that helps metabolize neurotransmitters, and different versions of the gene are found in the population at large. At least one experimental study has suggested that variations of this gene influence levels of retaliation in response to discrete provocations.[23] A number of longitudinal studies have found associations between shorter MAOA alleles and various measures of "addiction" and "anti-social behavior;" and the prevalence of this allele in the Maori population, where many of these studies first took place, led to its being characterized as the "warrior gene."[24] However, examining the details of these studies suggests that this moniker exaggerates the biological reality. Many studies have failed to find any significant, direct relationship between MAOA and various measures of criminal behavior, violence, and aggression.[25] Rather, this gene has been the poster child for GxE (gene environment interaction) studies. Avshalom Caspi and Terrie Moffitt pioneered this field with a study that found that low MAOA was associated with "anti-social behavior" in people who were abused as children, but showed no effect on those without a

[23] R. McDermott, et al. "Monoamine oxidase A gene (MAOA) predicts behavioral aggression following provocation." in *Proceedings of the National Academy of Sciences* 106(7) 17 February, 2009. (http://www.pnas.org/content/106/7/2118)

[24] R. Lea and G. Chambers, "Monoamine oxidase, addiction, and the 'warrior gene' hypothesis" in *The New Zealand Medical Journal*. 120(1250) 2 March, 2007. (http://www.nzma.org.nz/journal/120-1250/2441/)

[25] J. Buckholtz and A. Meyer-Lindenberg, "MAOA and the neurogenetic architecture of human aggression" in *Trends in Neuroscience* 31(3) 6 February 2008.

history of abuse.[26] Replication studies of this GxE interaction have had mixed results, but some have suggested that low MAOA is associated with *lower* aggression in those who have not been abused (compared with the general population).[27] This may explain why so much variation persists in this allele, if it can grant benefits or liabilities depending on certain environmental triggers (protective in one case, but detrimental in the other). In any case, the title of "warrior gene" is a significant over dramatization of existing results.

To return to the question of elite decision-making and diplomacy, one of the greatest problems with "strong" biological urges or genuine brain illnesses is that they can make individuals impervious to reason, conventionally construed. Much of the IR and security studies literature is premised on a (minimal) rational actor model that understands people as having goals they reason instrumentally to achieve. Indeed, our understanding of human action generally depends on its being intelligible on some level in terms of ends and means, purposes and strategy. It is for this reason that "mad men" at the helm of power are so dangerous in principle, as they can be unpredictable or impervious to negotiation even when it would suit their ostensible interests. Much of the stability of the international world order depends on the use of incentives to structure and align interests. If one's ability to understand and respond to incentives and compelling arguments is compromised by biological urges or an enfeebled mind, this poses a challenge for diplomacy.

Consider Thomas Schelling's rather colorful, but nonetheless tragic, account of Anglo-American dealings with Iran mid-century:

> Recall the trouble we had persuading Mossadegh in the early 1950s that he might do his country irreparable damage if he did not become more reasonable with respect to his country and the Anglo-Iranian Oil Company. Threats did not get through to him very well. He wore pajamas, and, according to reports, he wept. And when British or American diplomats tried to explain what would happen to his country if he continued to be obstinate, and why the West would not bail him out of his difficulties, it was apparently uncertain whether he even comprehended what was being said to him. It must have been a little like trying to persuade a new puppy that you will beat him to death if he wets on the floor. If he cannot hear you, or cannot understand you, or cannot control himself, the threat cannot work and you very likely will not even make it.[28]

---

[26] A.Caspi, T. Moffitt, et al. Role of genotype in the cycle of violence in maltreated children. Science. (297) 2002. pp.851–4. (http://www.sciencemag.org/cgi/content/abstract/297/5582/851)

[27] J. Kim-Cohen, "*MAOA, Maltreatment, and Gene-Environment Interaction Predicting Children's Mental Health: New Evidence and a Meta-Analysis" Molecular Psychiatry. (11) 2006 pp. 903-913*

(http://pn.psychiatryonline.org/content/41/23/26.full)

[28] T. Schelling, *Arms and Influence* (Yale: 2008), p.38 (http://books.google.com/books?id=V25WWXMgte8C) I am grateful to my colleague Eric Lorber for drawing my attention to this passage.

This concern is a valid one, even if the example is extreme. The debacles of that era of US foreign policy continue to have ramifications into the present day. A better appreciation of the "irrationality" of Mossadegh might have led diplomats to deal very different with the situation.

Reflecting on the broad nature of biological influences that can operate on judgment at any given moment may lead to a kind of fatalism regarding our ability to understand or predict the behavior of others. Pascal averred that world history might be different but for the length of Cleopatra's nose. Would Mark Antony have fallen for her and out of favor with Rome otherwise? Hitler forbade anyone to smoke in his presence. Did that make Chamberlain, a smoker, nervous and impatient at Munich? Many historically momentous incidents are ripe for speculation of this sort in hindsight. However, can an understanding of biology meaningfully inform strategy ex ante?

Here I argue that we need to distinguish between different kinds of biological influences. Although it is true that all thinking is dependent on our biology at some level, it is still meaningful to distinguish between: 1) a generally "healthy brain" that can support capacities of consideration and judgment characteristically associated with human rationality and 2) a brain with serious biological deficits, which diminish or destroy capacities crucial for rationality. This idealized distinction can admit of a spectrum of intermediate types and tough cases. However, at the extreme end, biological deficits — and I think here of various brain diseases — have clear, and often predictable, debilitating effects. They call for medical interventions, not arguments. Moreover, advances in neuroscience and genomics are likely to shed a great deal of light on the many ways in which the brain can break down, as well as enable new therapeutic interventions.

At the other end (of "normal" rational capacities), it will still be the case that people are affected by biological dispositions and influences. However, part of becoming a mature human being is learning to be aware of and to deal with such drives and urges. Considerations and judgments of reason must be possible within the gamut of biological forces that weigh on a "healthy" brain, if reason is to be possible at all. And with regard to those ways in which the average person is often "predictably irrational" — loss aversion, wishful thinking, perceptual biases, etc — these are likely to come under increasing scrutiny as the stakes of any decision become higher. Finally, we should recognize that one of the important functions of social institutions is to help order and control biological passions. The story of Ulysses strapped to the mast while sailing past the Sirens is instructive. By understanding our biological weaknesses we can often mitigate their effects when they threaten our deeper or more long-term interests.

Of course there will be many tough cases in the middle, instructive for thinking about what we mean by rationality: the idiot savant capable of mathematical genius but unable to recognize faces, the psychopath with cunning analytic abilities but devoid of empathy. Still, psychopaths and savants are rare, as are those with brain damage and mental illness. Psychopaths can obviously be dangerous, and if your opponent is one that is important to

know. Moreover, one of the most important tasks for political institutions is to keep "mad men" (and women) out of power.

Although it makes sense to look for explanations of particularly crazy or unintelligible behavior at the biological level, it would be a mistake to think that conflict and violence are caused only by biological deviants. In his book *Moral Minds: How Nature Designed Our Universal Sense of Right and Wrong*, the Harvard biologists Marc Hauser, help popularize the notion that normal humans come hardwired with innate moral convictions, which according to Hauser roughly correspond to the ideals of Rawlsian justice.[29] Anyone familiar with history is likely to be incredulous of such a claim, and indeed it has come under sustained critique (e.g. see Jesse Prinz[30]). However, this thesis reflects a certain optimism about human nature, eager to believe that aggressiveness/violence is something rare, which requires explanation via some biological anomaly. Living in the relative tranquility of a rich, western, liberal democracy, it is understandable why someone might mistake the habits of fellow citizens for universal features of human nature. However, those in developing countries that lack extensive institutions to constrain violence are likely to see things differently.

To take one minor example, consider an incident from 2001 in the Nigerian town of Jos. A Christian woman walking home through a commercial district on a Friday afternoon became involved in an argument with a security guard stationed outside of a prominent mosque. The details of the dispute are unclear, but apparently the woman was commanded to take a different route home out of sight of the crowded mosque. The argument turned to shouting and the rumor quickly spread that a Christian woman had been slapped by a Muslim man. Within minutes a street fight erupted. Soon, the town, which had never experienced a riot, was engulfed in bloodshed. In the three days following, over 1000 people were killed in close quarter combat, and dozens of churches and mosques were burned, as previous peaceful neighbors turned against each other in a desperate escalation of violence.[31] The well documented phenomenon of mass violence should caution against the assumption that a minority of biological deviants make up the quarrelsome and contentious.

The biological foundations of violence likely run wide and deep in human nature. They may be more pronounced in certain populations — it is no accident that most of the rioters in Jos were men. However, our capacities for violence clearly engage, and are mediated by, conceptual judgments that are not similarly instinctive — judgments about what

[29] M. Hauser, *Moral Minds: How Nature Designed Our Universal Sense of Right and Wrong*. Abacus: 2008. (http://books.google.com/books?id=pQ1zAAAACAAJ)

[30] Prinz criticizes Hauser's work in three related papers (http://www.unc.edu/~prinz/research.html)

[31] This example is taken from the dissertation research of Alexandra Scacco. (http://www.columbia.edu/~als2110/files/Scacco_Who_Riots.pdf)

constitutes an offense or interest in the first place. Had the woman in Jos been slapped by a mere thief in a botched robbery, the reactions would likely have been very different. Those who work on the biological foundations of behavior are right to call our attention to the place of emotions in human life. Many political theorists have argued this point as well. For example, Harvey Mansfield suggests, "Politics is about what makes you angry, not so much about what you want. Your wants do matter, but mainly because you feel you are entitled to have them satisfied and get angry when they are not."[32] We are, in Mansfield's view, fundamentally "thumotic" creatures, and our political theories, particularly our accounts of human rationality, need to recognize this. However, it is likely a mistake to think our emotions come hardwired. Our biological dispositions towards anger and violence combine to make us thumotic by nature, but their specific exercise is often mediated by concepts that are historically developed and learned, such as the nature of honor.

Thus, in surveying the emerging literature in neuroscience and genomics related to "mind, brain, and behavior" my own suspicion is that the most remarkable discoveries will likely concern ways in which the brain breaks down. Such knowledge promises to enable dramatic new therapeutic options for those afflicted with these conditions. By extension, this knowledge may help us diagnose and understand the deviant behavior of certain elements of society, and perhaps even certain elites. However, for the vast majority — those with "healthy brains" — conventional analysis of ideology, interests, and beliefs is likely to hold the key to the most important decisions and behavior.[33] Granted, even "healthy brains" will be beset with various different biological dispositions, including perceptual biases, emotional liabilities, systematic "irrationalities," but these generally tell only part of the story, which must also be informed by concepts, ideas, purposes. Perhaps research on healthy brains will require us to develop a more subtle language to identify and differentiate the influence of biological forces. It is unlikely, though, that this research will require us to abandon traditional considerations of interests and ideology, power and institutions, etc.

In fact, there are additional reasons to believe that elites will be under particular pressures that guard against dramatic biological irrationalities. The filtering mechanisms through which elites come into power, the high stakes of their decisions, and strong demands of rationalization they face all make it less likely that their decisions will reflect "knee-jerk" reactions. More interesting questions can be raised about the rationality and decisions of democratic masses. Animal spirits may play a greater role here, and a number of interesting theses have been advanced on this front. For example, the diets and lifestyles of wealthy nations tend to lower testosterone (a hormone linked to aggression) across the population, which perhaps plays some role in the (comparative) reluctance of these nations

[32] H. Mansfield, "How to Understand Politics: What the Humanities Can Say to Science" NEH Jefferson Lecture, 2007. (http://www.neh.gov/whoweare/mansfield/HMlecture.html)

[33] Some studies have claimed that ideological beliefs are themselves genetically hardwired, but these suffer from many of Jervis's concerns, as well as other methodological shortcomings.

to go to war — a kind of biological boost to the democratic peace thesis. On another front, some have looked to evolutionary psychology for an explanation of why territorial disputes are much more likely to lead to violent conflict than other disputes.[34] There are good evolutionary reasons that territory might have a natural grip on the human imagination and many provocative analogues of territorial jealousy in the animal kingdom. However, such associations are speculative, and, in any case, the relationship between biology, public opinion, and democracy is a matter for another article.

Although biological discoveries will continue to shed light on the nature of human decision-making across the board, for reasons explored above I expect the most powerful discoveries will mainly apply to issues at the margins of elite decision-making and diplomacy. This assessment relies on a deeper judgment that the reductionist hope of understanding the human mind in terms of its biological components is likely to elude us — or is, at least, a very long way off. It is no secret that biological reduction is appealing to some social scientists who hope to make the study of human behavior completely "scientific," but this aspiration is fraught with well known objections — and its possibility will have to be demonstrated rather than assumed. In the meantime we will continue to have to negotiate the conceptual, and thus historical, dimensions of human beliefs and behavior as we have done in the past, albeit with a greater understanding of distinctly biological influences.

While the contributions that biological research stands to make to our understanding of elite decision-making and diplomacy are, on this estimation, fairly modest, the contributions of biological research to other areas relevant to security and war are likely to be much more profound.

Implications for Domestic Security and Counter Terrorism

Preventing terrorist attacks is one of the most pressing concerns for governments in the post 9-11 era. Technological advances and biological knowledge have combined to provide a number of new tools in this battle. Some of the applications have been obvious, such as the forensic uses of DNA sequencing. Other advances have created new opportunities for terrorists — many pathogens that could serve as biological weapons are now relative easy to synthesize using recombinant DNA. On the whole, however, new technologies are likely to disproportionately benefit those who provide security rather than those to aim to disrupt it.

The strategic advantages of terrorism are well known and the challenges of counter terrorism widely discussed in contemporary security studies. Terrorists are often aided by their ability to blend in to crowds and approach their targets undetected. Various

[34]That they are more likely to lead to conflict has been persuasively argued in the literature, see: J. Vasquez and M. Henehan,. "Territorial Disputes and the Probability of War 1816-1992." *Journal of Peace Research*. 38:2 (March 2001): 123-138. I am indebted to my colleague Sean Zeigler for many stimulating discussions regarding evolutionary psychology and its links to theoretical perspectives in security studies.

surveillance technologies currently help officials search for material components of terrorist attacks- bombs, chemicals, communiqués, etc. However, terrorists have developed sophisticated techniques for concealing these components.

Biological Profiling

Some of the most promising surveillance and detection technologies on the horizon leverage biological knowledge to search directly for the terrorists themselves. These systems rely on various form of "biological profiling" to identify abnormal biological states that could be cause for suspicion. The body, it turns out, reveals many secrets that one might otherwise wish to conceal. As one commentator succinctly explained, "It may be true that hiding emotions is actually harder than hiding a bomb."[35] Humans are adept at reading body language, particularly facial micro-gestures, although our intuitions are often hard to explain or defend. However, there are also objectively measurable bio-correlates of fear, anxiety, stress, etc. Some of the telltale signs are familiar ones — heart rate, eye motions, temperature, breathing — but others involve more sophisticated physiological correlates. Moreover, a remarkable number of biological measurements can be obtained non-invasively by passive biometric sensors.

In their simplest configurations, these technologies are an extension of methods long used by polygraph tests to detect deception. These rely on the premise that conscious deception elicits physiological reactions that stand out when compared to "normal" baseline states of straight-forward honesty. However, this simple detection paradigm is famously open to countermeasures. There are various was to manipulate one's vital signs — through mental exercises, muscle contractions, or even biting one's tongue — that can reliably confound polygraph results. Thus, the use of these tests in courts or for employee screening has been controversial. A National Academy of Science report on "The Polygraph and Lie Detection" issued in 2003 concluded that, when used on naive populations, polygraphs could detect lies significantly better than chance, but they are not accurate enough to justify their use for large scale security screening.[36]

Nevertheless, "better than chance" may be useful odds for targeted screening applications. The United States military has been interested in using polygraph technology in the field to enable quick screening of suspicious persons, for example in the vicinity of a fresh IED. Two years ago a handful of troops in Afghanistan were supplied with polygraph handsets — officially called the "Preliminary Credibility Assessment Screening System"- which employ three biometric sensors that attach to a suspect's hand.[37]

---

[35] A. North, "Step to the Right and Open your Brain: Will Mind Reading Improve Airport Security?" in *Jezebel*. 8 January, 2010. (http://jezebel.com/5443891/step-to-the-right-and-open-your-brain-will-mind+reading-improve-airport-security#comments)

[36] "The Polygraph and Lie Detection" National Academies Press: 2003 (http://www.nap.edu/openbook.php?record_id=10420&page=6)

[37] (http://www.newlaunches.com/archives/us_troops_to_get_portable_lie_detector.php)

A number of companies are currently in the process of bringing related technologies to market. Suspects Detection Systems Ltd. has developed modules that collect and analyze "psycho-physiological" data from persons of interests, meant to identify those who merit further investigation. The company claims its results are highly accurate with a false positive rate of less than 4%.[38] Although these technologies are ostensibly employed for profiling purposes prior to actual investigations of guilt, false positive are a major concern. There are many innocent reasons that someone could display abnormal biological signs. Reliable methods of biological profiling will depend on using multi-factorial assessments that go beyond the simple and common bio-markers of stress.

Another company, WeCU Technologies Ltd., claims its methods can overcome many of the traditional limits of biological profiling: "The system is based on a unique probing method which uses knowledge from the behavioural sciences in combination with advanced biometric sensors. The system is effective for the detection of individuals who are manipulative, calm, do not have guilty knowledge, and are not being deceptive at the time of the detection. At the same time, it eliminates false results..."[39] One of the innovations of their approach is the use of small cues that elicit different autonomic responses from individuals familiar with them. For example, by flashing an obscure terrorist code word on a screen and using optical temperature and heart rate sensors to monitor people walking past, this technology is apparently successful in detecting those with special knowledge of the code word. As our understanding of such autonomic responses increases, along with the sensitivity of biometric scanners, biological profiling will perhaps prove useful a useful tool, making it more difficult for terrorists to blend in.

Mind Reading and Interrogation

The concept of biological profiling raises deeper questions about how the body can reveal things that the conscious mind would like to conceal. Those tasked with interrogation have an obvious interest in leveraging biological knowledge to elicit truthful information from those suspected of criminal activity. In the past, biological knowledge played and small and generally sinister role in interrogation- most conspicuously in service of torture. In more recent decades scientists have explored using various chemicals agents as truth serums. Rather than employing pain to make someone talk against their will, these chemicals aim to break down biological mechanism of inhibition and self-control. Indeed, drugs such as sodium amytal, sodium pentathol, and scopolamine do make people more talkative, although the truthfulness and usefulness of what they said is highly disputed.[40] Although chemically enhanced interrogation is perhaps ethically preferable to traditional torture it suffers from similar sorts of objections. There is also a spectrum of less dramatic ways to

[38] (http://www.suspectdetection.com/solution.html#)

[39] (http://www.epicos.com/epicos/extended/israel/wecu/wecu_home.html)

[40] J. Marks, "Interrogational Neuroimaging in Counterterrorism: A 'No-Brainer' or Human Rights Hazzard?" in the *American Journal of Law and Medicine* 33:2-3 (April 2007).

break down resistance, highlighted in recent debates about "enhanced interrogation techniques," such as sleep deprivation, stress positions, and light control.

The acrimony of these debates helps to explain the considerable interest in "mind reading" technologies, which are fervently being explored by a number of research teams. The great hope is to employ brain imaging technologies to detect lies and guilty knowledge. When US Intelligence Director Dennis Blair recently announced that the government's newly created High-Value Detainee Interrogation Group will conduct "'scientific research' to find better ways of questioning top terrorist suspects" he would not discuss the nature of these research projects.[41] However, the search for a brain imaging lie detector is undoubtedly near the top of the list. A technology able to bypass the intransigence of terrorists and obtain high quality data about what they know would solve many legal and strategic needs.

There are currently at least five different approaches to "mind reading" being explored. One uses electroencephalography to detect signals that are supposedly emitted shortly after a brain recognizes something "familiar" to it, providing what some have called a "brain fingerprint." Another uses laser spectroscopy to look for surface patterns of the brain correlated with deception. Yet another analyzes facial micro-gestures, and there are also experiments examining whether periorbital thermography (measurement of temperatures around the eye) can detect deception.[42] Perhaps the most promising research thus far has come from the use of functional magnetic resonance imaging (fMRI). This technology is able to monitor real-time changes in blood oxygenation levels within the brain based on the differences in their magnetic properties. Because active neurons elicit more oxygen from blood than inactive ones, it is believed that changes in blood oxygenation correspond to localized neuronal activity. Many believe fMRI holds the best chance of providing data detailed enough to discriminate different brain states associated with lying or guilty knowledge.

In 2005, the journal *Nature* ran a news article with the title "Brain imaging ready to detect terrorists, say neuroscientists."[43] It reported the latest round of tests with an fMRI lie detector by a research team at the University of Pennsylvania. The team, lead by psychiatrist Daniel Langleben and neuropsychiatrist Ruben Gur, reported a 99% accuracy rate in its ability to distinguish whether participants in an experiment lied about which cards they drew at the outset of the study. According to Gur, "A lie is always more complicated than the truth...You think a bit more and fMRI picks that up." Although fMRI studies have not reliably found any "lying centers" in the brain, Langleben and others have claimed that the distribution of brain activity looks different when subjects are engaged in

[41] (http://www.breitbart.com/article.php?id=CNG.64f93e3e5ec86eaffb1af7e7d2f5a565.2d1&show_article=1)

[42] M. Greely, "Neuroscience Based Lie Detection: The Need for Regulation" in *Using Imaging to Detect Deception: Scientific and Ethical Questions*. American Academy of Arts and Sciences: 2009.

[43] J. Wild, "Brain imaging read to detect terrorists, say neuroscientists" in *Nature*. 437 (457) 22 September, 2005. (http://www.nature.com/nature/journal/v437/n7058/full/437457a.html)

deception. A company named "No Lie MRI" now uses algorithms derived from the Penn team's research to offer commercial lie detecting services to a wide range of customers.[44] Another company, Cephos, offers similar MRI lie detecting services and lists on its website over 30 scientific articles that support its technology, many published in top, peer-reviewed journals.[45]

The details of many laboratory studies of fMRI lie detection have, however, drawn extensive criticism. First, it is unclear whether providing false information under instruction in a laboratory even counts as lying. More generally, there is a concern that the low stakes and trivial tasks of most research protocols are not good models for investigating the nature of high stakes lies in the real world. Also, although most scientist are acutely aware that their findings are sensitive to specific parameters of a lying task, this caveat is often overlooked by those enthusiastic about fielding this technology. Discriminating a lie from a truth in a forced choice task is very different than detection of deception in more general statements; and guilty knowledge tests, which try to measure some memory/familiarity response to cues, are another challenge altogether. Some critics have also suggested that the most dramatic experimental successes in fMRI lie detection are driven by artifacts that have nothing to do with lying.

For example, in the card experiment used by the Penn research team subjects were presented an envelope with a seven of spades and five of clubs.[46] They were to tell the truth about having one of these cards but lie about the other, and if successful in their lie would receive $20. In the scanner subjects were shown a number of cards in succession (including many control cards from the rest of the deck) and asked to identify only the card(s) they had received. Since subjects would only positively identify that one card which they had chosen to be the truth card, they spend most of their time in the scanner answering "no" to move through the deck, looking for that special card they had chosen as their truth card. Nancy Kanwisher, a prominent neuroscientist at MIT, has suggested that the "neural signature of the supposed 'truth' response is really just the neural signature of a target detection event," which would mean this experiment is not tracking lying at all.[47] Moreover, she argues that the statistical algorithms employed by Langleben and colleagues to boost their detection rates are highly sensitive to the peculiarities of the experimental protocol.

---

[44] (http://noliemri.com/pressNPubs/Publications.htm)

[45] (http://www.cephoscorp.com/lie-detection/index.php#working)

[46]Langleben, D. et al. 2005. Telling truth from lie in individual subjects with fast event-related fMRI. *Human Brain Mapping* 26 (2005): 262–272.

Davatzikos, C. et al. Classifying spatial patterns of brain activity with machine learning methods: Application to lie detection. *Neuroimage* 28 (2005): 663–668.

[47] N. Kanwisher, "The Use of fMRI in Lie Detection: What Has Been Shown and What Has Not" in *Using Imaging to Detect Deception: Scientific and Ethical Questions*. (American Academy of Arts and Sciences: 2009).

Debates about the merits of particular experiments will continue and likely lead to more robust and interesting investigations. However, a serious challenge awaits those who would like to successfully apply any fMRI lie detection technology to terrorists, namely the existence of simple and effective countermeasures. These are summarized by Kanwisher:

> Functional MRI data are useless if the subject is moving more than a few millimeters. Even when we have cooperative subjects trying their best to help us and give us good data, we still throw out one of every five, maybe ten, subjects because they move too much. If they're not motivated to hold still, it will be much worse. This is not just a matter of moving your head— you can completely mess up the imaging data just by moving your tongue in your mouth, or by closing your eyes and not being able to read the questions. Of course, these things will be detectable, so the experimenter would know that the subject was using countermeasures. But there are also countermeasures subjects could use that would not be detectable, like performing mental arithmetic. You can probably activate all of those putative lie regions just by subtracting seven iteratively in your head. [48]

The vulnerability of such interventions along with extensive concerns about the generalizability of laboratory findings inform her ultimately dim view of the usefulness of this technology: "Because the published results are based on paradigms that share none of the properties of real-world lie detection, those data offer no compelling evidence that fMRI will work for lie detection in the real world. No published evidence shows lie detection with fMRI under anything even remotely resembling a real-world situation. Furthermore, it is not obvious how the use of MRI in lie detection could even be tested under anything resembling a real-world situation."[49]

Others, however, see a great deal of promise in the results thus far and expect future innovations can overcome current hurdles to confidently employing mind reading technologies in the investigation of terrorists. I am told a number of studies boasting lower error rates, better protocols, and cross subject regularities await publication. Time will tell if these can overcome the powerful objections of critics, with whom my own sympathies currently rest.[50]

---

[48] Ibid. p. 12.

[49] Ibid.

[50] For further discussions of the promise and limits of using imaging technologies for deception see: D. Langleben, "Detection of Deception with fMRI: Are we there yet?" in *Legal and Criminal Psychology*. 13 (2008). pp. 1-9.; P. Rosenfeld, "'Brain Fingerprinting': A Critical Analysis" in *The Scientific Review of Mental Health Practice*. 4:1 (Spring/Summer 2005).; P. Wolpe, et al. "Emerging Neurotechnologies for Lie-Detection: Promises and Perils" in *American Journal of Bioethics*. 5(2) 2005. pp. 39-49

The quest for an fMRI mind reader is exemplary of the ambitious hopes placed on emerging biotechnologies that some believe can revolutionize the provision of security and justice. On the other hand, this quest has fueled the fears of those who worry both about the dangers posed to privacy if the technology works and the dangers of false convictions if it doesn't. In any case, it is likely that debates about the feasibility of these technologies will overshadow debates about their desirability. While the search for effective lie detectors continues, a number of the biological profiling methods discussed above do appear immediately useful for screening purposes. However, it is important that those who employ them not confuse the probabilistic "red flags" of biological profiling with dispositive evidence of guilt.

Implications for the Conduct of War

Napoleon reportedly remarked that an army travels on its stomach. Indeed, one of the greatest logistical challenges of any military campaign is keeping troops healthy and well fed. However, the fitness of soldiers for work and battle depends on much more than caloric intake. The physiological demands made on soldiers are extensive. This is particularly true in combat situations where, in addition to immediate dangers of enemy fire, soldiers face extraordinary levels of stress and physical exhaustion that can affect performance and have long lasting consequences. Biological research has contributed significantly to our ability to understand, support, and respond to the many physiological needs and liabilities of soldiers.

Optimizing Performance

Professional athletes have long been interested in how science can help enhance their performance. Extensive biological research has aimed at developing training regimens and diets that optimize natural biological capacities, as well as towards identifying performance enhancing drugs. Such knowledge can be of obvious use for improving the fitness, stamina, and mental acuity of troops as well.

Up until the Second World War the daily rations of most European armies included modest portions of alcohol and tobacco, which undoubtedly improved morale. Although these are no longer government issued staples for most troops, simple stimulants such as caffeine and tobacco are used at very high rates by soldiers. The proportion of U.S. military personnel at large who use tobacco is at least 10% higher than the general population, and combat veterans are 50% more likely to use tobacco than soldiers who have not seen combat.[51] Amphetamines and other psycho-stimulants have a long history of combat use too. Some 72 million amphetamine tablets were issued to British troops in the Second World War; similar tablets were available to Special Forces units in Vietnam; and present day US military pilots use amphetamine based "go-pills" to fight fatigue in long term

[51] Combating Tobacco in Military and Veteran Populations, Institute of Medicine Consensus Report: 26 June, 2009. (http://www.iom.edu/Reports/2009/MilitarySmokingCessation.aspx)

missions.[52] In at least one state (Maryland) law enforcement officers can be administered Modafinil (an amphetamine class stimulant) during extended security operations.[53] The benefits of these drugs on cognition and stamina are well documented, although they do have side effects, ranging from neurotoxicity from long term amphetamine abuse to dramatic "crashes" when discontinued.

Some have raised concerns about excessive reliance on performance enhancing drugs in security applications. Shortly after the United States established its military presence in Afghanistan, go-pills taken by a pilot on a 10 hour mission were implicated in his "friendly fire" mistake that resulted in the deaths of four coalition troops.[54] Also, the history of drug research for military applications has a checkered past. The CIA ran a secretive project named MKULTRA from 1953-64 that involved testing drugs such as LSD on unwitting US citizens. Senate hearings in 1977 concluded that drugs were covertly administered to "unwitting subjects in social situations... at all social levels, high and low, native Americans and foreign."[55] Since then the larger biomedical research community has developed extensive protocols to help prevent unethical experimentation. Even with such protocols in place, pharmacological enhancements are likely to raise new and distinct ethical issues.

One of the lurking questions in enhancement research is the degree to which we will encounter inevitable trade-offs. Some have argued we should start from the presumption that evolution has been relatively efficient. If there were simple ways to enhance human biology these should have been selected for in the past. Thus, if evolution has already optimized our biology with regard to the most useful dimensions of human nature, then boosting certain capacities will likely come at the cost of diminishing others. These basic trade-offs may be elementary to our biological constitution: concentration vs. creativity, brawns vs. brains, stamina vs. strength. Perhaps with regard to a panoply of desirable traits, we cannot have our cake and eat it too. Granted, there may be much room for minor improvements, tweaking our capacities, and for repairing genetic abnormalities. However, as far as radical enhancement is concerned, this school of thought suspects that there are

[52] See N. Rasmussen, "America's First Amphetamine Epidemic 1929–1971: A Quantitative and Qualitative Retrospective With Implications for the Present" *in American Journal of Public Health*. 98:6 (June 2008): 947-985. (http://ajph.aphapublications.org/cgi/content/full/98/6/974); R. Cornum, R. et al. "Stimulant Use in Extended Flight Operations" in *Airpower Journal*. (Spring 1997). (http://www.airpower.maxwell.af.mil/airchronicles/apj/apj97/spr97/cornum.html); T. Dormandy, *The Worst of Evils: the fight against pain*. (Yale: 2006), pp. 416-417. (http://books.google.com/books?id=lor1NiZNQ0gC)

[53] The Maryland protocol is described at: (https://www.miemss.org/home/LinkClick.aspx?fileticket=PcFzAVnOA4M%3D&tabid=106&mid=537)

[54] M. Friscolanti, *Friendly Fire: The Untold Story of the U.S. bombing that Killed Four Canadian Soldiers in Afghanistan.* (Wiley: 2005).

[55] *1977 Senate Hearing on MKULTRA*, 3 August, 1977. Accessible html copy at: (http://www.governamerica.com/article_mkultra.html)

few "free lunches" waiting to be discovered. Often there will be a price to be paid for enhancements. Also, it may be the case that certain enhancements may be detrimental to an individual but useful for a society- one could imagine producing idiot savants adept at cracking codes but incapable of sustaining normal human relationships. The price of any enhancement may be worth it, but we will have to decide whether we want to sacrifice some of our capacities to achieve others, and this will raise increasingly difficult ethical questions if these decisions are not based on consent.

Others, however, have argued that such trade-offs are not fundamental to our biology or that they can be overcome with sufficient biological knowledge. They draw attention to the fact that the environments in which humans evolved were characterized by resource constraints that are no longer with us. The selection pressures that optimized our biology in the Pleistocene era produced an organism with features than may be less than desirable today. Moreover, our biological systems may have latent possibilities which were not realized in the past simply because they were optimized within harsher, but outdated constraints. Perhaps the most significant shock to human biology in the last few centuries has been the amount of calories available to the average first world citizen. The immediate effect has been that people have grown much larger (first in height, then in width), but various pathologies have increased as well, such as diabetes, heart disease, and certain cancers.

The incredible advances in medicine over the last century, give many reason to hope that when any pathology is understood well enough, modern science can provides ways to mitigate or resolve it. Perhaps the same will be true of enhancements. As we delve deeper into our understanding of the human organism, we may be able to circumvent the economy of traits that leads to apparent trade-offs, or control these trade-offs with extreme precision. Maybe soldiers of the future can have their cake and eat it too, when it comes to enhancements useful for the field: Designer moods, extended stamina, improved memory and mental clarity, and extraordinary strength. Such enhancements could provide significant strategic advantages, particularly in light of recent discussions of the importance of "force deployment."[56] The ability of soldiers to reason tactically, adapt, and persevere in the field may be just as important as the increasingly high tech weapons they will have at their disposal. Ultimately, the proof will be in the pudding, as it were. However, at some point we will have to confront the question of what qualities should be enhanced and whether the qualities that make a better soldier also make a better citizen and person. In the meantime, there are many other areas where biological research has yielded clear and less controversial benefits for optimal performance. These include technologies that track health, such as the "Mobile Heat Stress Decision Aid" presently being fielded to help American troops avoid heat exhaustion in desert climates, as well as many that enable better hygiene, nutrition, and sleep.[57]

[56] See S. Biddle, *Military Power: Explaining Victory and Defeat in Modern Battle*. (Princeton: 2006).

[57] The significant benefits of the Heat Decision Aid are discussed in the report: W. Santee, et al. "Comparison of USARIEM Heat Strain Decision Aid to Mobile Decision Aid and Standard Army Guidelines for

Selection

Until we possess the ability to pharmacologically enhance or genetically engineer better soldiers, biological knowledge can also be employed to help select soldiers with desirable traits that have measurable physiological manifestations or correlates. This has already been done for some time with regard to medical conditions perceived as liabilities in military service. In addition to serious disabilities and diseases, common conditions such as "flat feet," asthma, and allergies automatically disqualify Americans for military service. Certain military divisions have more restrictive standards on account of their particular missions, such as the vision requirements for pilots. Most of these traditional medical qualifications for service relate to observable qualities — conditions that have noticeable physiological manifestations and are likely to be known to the individuals they affect. However, research has increasingly identified biological markers that correlate with physiological capacities, and these relationships are not immediately obvious or known to individuals. Although such relationships are often probabilistic, they nonetheless provide valuable knowledge. One of the serious questions that will confront those who make personnel decisions and policies in the future will be whether and to what degree biological markers should inform the placement and professional opportunities of soldiers. For some this will likely conjure images from the classic film Gattaca along with concerns about oversold biological determinism. Others however will be quick to point out the undeniable utility of this knowledge.

Consider the findings of a recent study of the biological effects of uncontrollable stress in the military's Survival, Evasion, Resistance and Escape (SERE) training course. Researchers closely monitored the hormones and performance of over 200 students throughout the course, which involves prolonged exposure to high levels of stress.[58] The changes in cortisol (our primary stress hormone) they recorded were some of the highest ever documented in humans. Likewise, testosterone levels showed a dramatic drop, in some cases from normal levels to castration levels within a matter of hours. Moreover, the stress of the course causes significant biological deficits. Many participants experienced high levels of "dissociation" — disruptions in consciousness that alter perceptions of bodily identity and control — and these episodes were correlated with lower levels of performance. Twenty-four hours after the conclusion of the course, the hormones adrenaline and neuropeptide-Y, which the body release in response to stress and whose levels were correlated with better performance, remained depleted in most participants. However, there was a notable exception, namely the subgroup of Special Forces soldiers. Both of these hormones had returned to normal levels in the average SF soldier, and these soldiers had also experienced lower levels of dissociation and better overall performance during the course.

Warm Weather Training" Army Research Institute of Environmental Medicine. (http://www.stormingmedia.us/82/8273/A827384.html)

[58] C.. Morgan, and G. Hazlett, "Assessment of Humans Experiencing Uncontrollable Stress: The SERE Course" in *Special Warfare*. Spring 2000. pp. 6-12.

The authors attributed the extraordinary performance of SF soldiers to two complementary factors: the selection effects of Special Forces training regimens, which weed out individuals who are overly sensitive to stress, as well as "stress inoculation" that occurs as part of training. The study observes, "The end product of the SF pipeline is a soldier who is biologically and psychologically different. These differences all point in the direction of higher stress tolerance and a greater capacity for functioning effectively under high stress."[59] Given the relevance of operational stress to soldiers' cognitive abilities, physical resilience, and immune system there are good reasons to want to promote or select "stress inoculated" individuals. The authors single out nutritional supplementation as one promising way to mitigate the biological effects of stress, but their research also suggests there may be individual genetic differences in the way people deal with stress that could be discovered through simple biological screening processes. If we can predict how well individuals are likely to respond to stress based on particular bio-markers, it is very possible that these will become part of the selection criteria for certain military units.

The way individuals respond to combat situations varies widely. Although many reactions can be strengthened or weakened by training, others have deeper, intransigent sources. Ernst Junger (*Storm of Steel*) found the First World War exhilarating and repeatedly threw himself into no man's land with little fear. Erich Remarque (*All Quiet on the Western Front*) despised the same war, particularly its effects on soldiers. Perhaps an explanation of such difference is to be found at some biological level. As we learn more about individual biological variation, this knowledge is likely to inform new standards of selection for modern soldiers.

Conclusion

We are in many respects fortunate not to live within the warrior culture of the ancient Mediterranean chronicled by Homer, Thucydides, and Livy. We are also privileged to enjoy the benefits of modern science and medicine. However, the ability of Western states to constrain violence and manage passions is indebted to more than mere technological advancement or biological superiority. The genetic endowment of humans has changed fairly little in the past few millennia, and, although changes in diet, exercise, and medicine have had a profound effect on our biology, they are still insufficient to explain variations in human institutions, culture, and history.

Many of the most historically successful strategies for containing violence did not depend on any significant biological insights. The recent book, *Violence and Social Orders,* by North, Wallis, and Weingast convincingly demonstrates this point.[60] Our continued search for ways to provide security and peace needs to remain cognizant of this fact. On the other

[59] Ibid. p.11

[60] D. North, J. Wallis, and B. Weingast, *Violence and Social Order: A Conceptual Framework for Interpreting Recorded Human History*. (Cambridge: 2009).

hand, the biological sciences are developing extraordinary insights into the foundations of human behavior and unprecedented possibilities for medical interventions, all of which would be foolish to ignore. As the quantity of biological research continues to explode- and it will- it's important that those interested in cutting edge priorities within security studies understand the genuine insights of emerging biological knowledge as well as the limits of new research.

Upon examination, much of the hype touting the utility of basic research in neuroscience and genomics appears premature. Genetic explanations of behavior have shed little light on the decisions of those with healthy brains, and neuroscientists are nowhere close to being able to read complex thoughts with a scanner. However, certain aspects of the biological research explored above do promise to make significant contributions towards our ability to establish justice, insure domestic tranquility, provide for the common defense, promote the general welfare, and secure the blessings of liberty — to use the language of desirable social outcomes framed in the US Constitution. However, like all technologies, biological insights can be used for ill in the wrong hands, and indeed many worry that these could make new forms of tyranny possible. This concern runs deeper than standard worries about any arms race. These technologies could be used for more than conventional domination, they might be used to change the very sort of people we are. The specter of biological engineered dystopias, explored so powerfully in contemporary literature and film, raises genuine questions about whether biological discoveries will lead to a Brave New World.

If it is indeed the case that humans are naturally "thumotic," and most biological research supports this classical perspective, then it is unlikely that we can completely secure peace and tranquility without radically changing, or indeed abolishing, human nature as we know it. This is the simple insight that feeds much of the unease with the radical possibilities of biotechnology. Freud's basic argument in *Civilization and Its Discontents*, that civilization will necessarily frustrate many aspects of human nature, raises the question as to whether it would be better to sacrifice aspects of human nature to achieve more stable and lasting social tranquility. The reality, Freud argued, is that it will not be easy to pacify human nature:

> The element of truth behind all this, which people are so ready to disavow, is that men are not gentle creatures who want to be loved, and who at the most can defend themselves if they are attacked; they are, on the contrary, creatures among whose instinctual endowments is to be reckoned a powerful share of aggressiveness. As a result, their neighbor is for them not only a potential helper or sexual object, but also someone who tempts them to satisfy their aggressiveness on him, to exploit his capacity for work without compensation, to use him sexually without his consent, to seize his possessions, to humiliate him, to cause him pain, to torture and to kill him.[61] (68-69)

[61] S. Freud, *Civilization and Its Discontents*. (Norton: 1961). pp. 61-69.

However, from the perspective of the post-Cold War world, concerns about biological dystopias and unmanageable aggression likely appear premature and overwrought. The great achievement of liberal democracies has been the use of institutions to channel *thumos* towards socially beneficial pursuits and to satisfy residual passions through cathartic spectacles of sport, art, and dramatic entertainment. Much violent crime appears readily explained by physiological abnormalities (mental illness), drugs and alcohol, or childhood upbringing. The decisions of elites are fairly well characterized by basic financial and ideological interests, and those in government are often sufficiently constrained by the political process and the democratic sounding board of the popular press. A minimal moral framework emphasizing rights of person/property and prohibiting assault and theft is widely accepted as legitimate.

To those who hope to preserve and extend the relative tranquility of liberal democratic societies, biological research seems to promise knowledge useful for shoring up many desirable aspects of our current civilization. For those afflicted by mental illness or chemical dependencies, biological knowledge promises to remedy these conditions and their effects. For those interested in understanding quirks of human behavior and designing more efficient institutions to deal with them, biological research hopes to provide a fuller account of human psychology. And biotechnology that enhances the performance of troops or the capacities of law enforcement is of one piece with the quest for technological superiority that ensures the hegemony of Western states, and by extension international stability. The only serious concern is whether any given biological research program is actually producing valid and applicable results.

There is much to recommend this view of the generally positive contributions biological research stands to make to the cause of peace and security. Whether the dystopian or Freudian fears prove to be warranted will depend both on the direction of future research and the ability of social scientists and decision makers to evaluate it wisely. Hopefully, rather than providing tools to abolish what is most distinctively human, new frontiers in biological research might help elevate the better angels of our nature.

Essay by Anthony C. Lopez, Brown University

"Evolution, Coalitional Psychology, and War"

Acknowledgements: The author would like to thank Rose McDermott, Leda Cosmides, John Tooby, Andy Delton, Max Krasnow, Aaron Sell and Michael Bang Petersen for their helpful feedback on various concepts developed in this paper. However, the author bears sole responsibility for the thoughts expressed here.

Evolutionary psychology demonstrates that the information-processing structure of the human brain was designed by natural selection in response to evolutionarily recurrent and reproductively significant "adaptive problems" in ancestral environments.[1] Importantly, organisms do not confront one "general" survival or reproductive problem, in response to which selection could favor a simple learning or utility function applied universally across situational contexts. Instead, the challenges an organism confronts in its environment are myriad and unique, such as predator avoidance, food acquisition, and finding a mate.[2] Additionally, engineering principles suggest that a design for solving one problem rarely solves a different problem equally well. For example, the set of decision rules designed by natural selection for regulating interaction among kin would be disastrous if also applied toward prospective mates.[3] These challenges each have unique cost-benefit structures and are informationally distinct, rendering the cross-situational (domain-general) application of a single set of decision rules sub-optimal from the perspective of an evolved organism subject to natural selection.

Success and failure are neither arbitrary nor random for biological systems. An organism that enters the world with domain-*specific* privileged hypotheses and behavior-regulatory mechanisms designed to track the ancestrally recurrent and adaptively relevant structure of the environment in which it evolved will always outperform a domain-general utility-maximizer. Thus, the brain comes "factory equipped" with complex neurocomputational machinery that reflects the diverse landscape of adaptive challenges faced over the course of the organism's evolutionary history.[4]

---

[1] Jerome H. Barkow, Leda Cosmides, and John Tooby, *The Adapted Mind : Evolutionary Psychology and the Generation of Culture* (New York: Oxford University Press, 1992), David M. Buss, *The Handbook of Evolutionary Psychology* (Hoboken, N.J.: John Wiley & Sons, 2005).

[2] Donald Symons, "On the Use and Misuse of Darwinism in the Study of Human Behavior," in *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*, ed. Jerome Barkow, Leda Cosmides, and John Tooby (New York: Oxford University Press, 1992).

[3] D. Lieberman, J. Tooby, and L. Cosmides, "The Architecture of Human Kin Detection," *Nature* 445:7129 (2007)

[4] John Alcock, *Animal Behavior : An Evolutionary Approach*, 1st ed. (Sunderland, Mass.: Sinauer Associates, 1975).

One component of this evolved psychological architecture in humans is the collection of mechanisms designed by natural selection in response to the challenges of group living. The navigation of coalitional dynamics has been a recurrent and reproductively significant component of life for our ancestors, and there is substantial and growing evidence that humans seem to be endowed with a distinct "coalitional psychology."[5] The set of neurocomputational mechanisms that together comprise our evolved coalitional psychology are of great relevance to the study of international politics, and include specialized systems for individual-level and coalitional aggression,[6] status rivalry,[7] threat perception,[8] and leadership.[9]

This paper proceeds by first outlining evolutionary psychology as an approach for investigating the computational logic of behavior-regulatory mechanisms in the brain. The second section will apply these principles toward an understanding of human coalitional psychology.

Evolutionary Psychology

The theoretical core of evolutionary psychology is natural selection, which is a physical process that shapes organisms over time to be able to solve adaptive problems in their environment.[10] In a population of reproducing organisms that possess genetically heritable

[5] Robert Kurzban and Steven Neuberg, "Managing Ingroup and Outgroup Relations," in *The Handbook of Evolutionary Psychology*, ed. David Buss (Hoboken: John Wiley & Sons, 2005), Mark Schaller, Jeffry A. Simpson, and Douglas T. Kenrick, *Evolution and Social Psychology*, Frontiers of Social Psychology (New York, NY: Psychology Press, 2006), John Tooby, Leda Cosmides, and Michael Price, "Cognitive Adaptations for N-Person Exchange: The Evolutionary Roots of Organizational Behavior," *Managerial and Decision Economics* 27 (2006), Joseph P. Forgas, Martie Haselton, and William von Hippel, *Evolution and the Social Mind : Evolutionary Psychology and Social Cognition*, The Sydney Symposium of Social Psychology Series (New York, NY: Psychology Press, 2007).

[6] D. M. Buss and T. Shackelford, "Human Aggression in Evolutionary Psychological Perspective," *Clinical Psychology Review* 17 (1997), Azar Gat, *War in Human Civilization* (Oxford ; New York: Oxford University Press, 2006), Aaron Sell, John Tooby, and Leda Cosmides, "Formidability and the Logic of Human Anger," *Proceedings of the National Academy of Sciences* 106;35 (2010).

[7] E. Ermer, L. Cosmides, and J. Tooby, "Relative Status Regulates Risky Decision Making About Resources in Men: Evidence for the Co-Evolution of Motivation and Cognition," *Evolution and Human Behavior* 29:2 (2008).

[8] John Tooby and Leda Cosmides, "The Logic of Threat," in *Human Behavior and Evolution Society* (Evanston, IL1989).

[9] Mark Van Vugt and Robert Kurzban, "Cogntive and Social Adaptations for Leadership and Followership: Evolutionary Game Theory and Group Dynamics," in *Evolution and the Social Mind: Evolutionary Psychology and Social Cognition*, ed. Joseph P. Forgas, Martie G. Haselton, and William von Hippel (New York: Psychology Press, 2007), Christopher Boehm, *Hierarchy in the Forest : The Evolution of Egalitarian Behavior* (Cambridge, Mass.: Harvard University Press, 1999).

[10] Mark Ridley, *Evolution*, 2nd ed., Oxford Readers (Oxford ; New York: Oxford University Press, 2004), George C. Williams, Adaptation and Natural Selection; a Critique of Some Current Evolutionary

variation, natural selection differentially preserves the genes that code for design features (e.g. color vision, tail-feather length, etc.) that have the on-average effect of enhancing the reproductive success of their bearers relative to alternative designs.[11] Over successive generations, these genes and the design features that they encode will increase in frequency at the expense of alternative genes or "alleles."[12] In other words, genes increase or decrease in frequency as a consequence of their "phenotypic effects" on reproduction.[13] In a blind self-organizing process, design features are maintained and accumulated, which can lead to the establishment of complex adaptations.[14]

An adaptationist perspective is necessary when investigating components of phenotypic design that are reliably developing, species-typical, complex, specialized, and that appear to solve an adaptive problem that has been evolutionarily recurrent in that organism's environment.[15] Once an adaptive problem is identified, we can develop hypotheses about the information-processing structure of a putative mechanism designed in response to this

---

Thought (Princeton, N.J.: Princeton University Press, 1966).

[11] John Maynard Smith, *The Theory of Evolution*, Canto ed. (Cambridge [England] ; New York: Cambridge University Press, 1993).

[12] Sean B. Carroll, *The Making of the Fittest : DNA and the Ultimate Forensic Record of Evolution*, 1st ed. (New York, N.Y.: W.W. Norton & Co., 2006).. This is the major reason why fitness is defined with respect to reproduction, and not survival. Differential reproduction is the process whereby genes change in frequency over generations. A gene that promotes the *survival* of the organism cannot make it into future generations if *reproduction* does not take place. Thus, selection cannot maintain a gene that enhances survivability at the expense of reproductive success. However, it is possible for genes to flourish that enhance reproductive success at the expense of survivability. These are often the product of sexual selection and evolutionary arms races. See Donald Symons, *The Evolution of Human Sexuality* (New York: Oxford University Press, 1979), R. Dawkins and J. R. Krebs, "Arms Races between and within Species," *Proceedings of the Royal Society of London Series B-Biological Sciences* 205:1161 (1979).

[13] Geneticists have found it convenient to distinguish between the "genotype" and the "phenotype." The genotype refers to the collection of genetic material (DNA) in the genome, while the phenotype consists of all the observable and behavioral characteristics of an organism. In short, genotypes, in interaction with the environment, generate phenotypes. In the case where a gene affects the production of a particular trait, that trait is said to be its "phenotypic effect." See Leland Hartwell, *Genetics : From Genes to Genomes*, 3rd ed. (Boston: McGraw-Hill Higher Education, 2008). See also Richard Dawkins, *The Extended Phenotype : The Gene as the Unit of Selection* (Oxford [Oxfordshire] ; San Francisco: Freeman, 1982).

[14] Richard Dawkins, *The Blind Watchmaker*, 1st American ed. (New York: Norton, 1986). Genes may change in frequency and even move to fixation in a population merely as a consequence of genetic drift. However, natural selection is the only physical process that can account for the systematic and *directional* control of gene frequencies in a population, and furthermore, it is the only process that can account for the ordered anti-entropic accumulation of design features over time that results in complex adaptation Mark Ridley, *The Problems of Evolution* (Oxford [Oxfordshire] ; New York: Oxford University Press, 1985).

[15] E. Curio, "Towards a Methodology of Teleonomy," *Experientia* 29:9 (1973), Williams, *Adaptation and Natural Selection; a Critique of Some Current Evolutionary Thought*, John Tooby and Leda Cosmides, "Evolutionary Psychology and the Generation of Culture: Theoretical Considerations," *Ethology and Sociobiology* 10:1-3 (1989).

problem. In other words, we want to know how the mechanism translates input from the environment into adaptively useful output, such as behavior. This investigation is often accomplished in two important ways.

First, a "task analysis" explores the logical features of the adaptive problem itself in order to deduce important or necessary components of mechanism design for solving that problem.[16] For example, evolutionary psychologists recognized that behavior-regulatory machinery undergirding social exchange and collective action could only evolve if it one component of its design included circuitry for the detection and selective exclusion and/or punishment of cheaters and free riders.[17] In this sense, task analysis amounts to establishing the "evolvability criteria" that a mechanism must meet if it is to be favored by selection. In the above example, mechanisms that facilitate cooperation could not evolve and would be quickly outcompeted if cheater detection were not a design component.[18]

Second, it is important to investigate the environment of evolutionary adaptedness (EEA). The EEA represents a statistical composite of the environmental regularities faced by an organism (internally or externally) that is relevant to the adaptive problem in question.[19] Thus, to investigate the design of a putative adaptive mechanism is to ask: what features of an organism's ancestral environment could have been relied upon as cues that would have allowed the organism to detect and solve an adaptive problem? Evolutionary psychologists, therefore, explain the design of extant evolved psychological mechanisms in terms of ancestrally adaptive strategies. The past is not unknowable, and despite the fact that we cannot directly access history, scientists continue to gather an abundance of evidence regarding various aspects of human life in ancestral environments.[20] Task analyses, as well as an evaluation of the EEA, are usefully combined with a variety of additional methods in an effort to identify and map an evolved psychological mechanism.[21]

---

[16] David M. Buss, *Evolutionary Psychology : The New Science of the Mind*, 2nd ed. (Boston: Pearson, 2004).

[17] Leda Cosmides and John Tooby, "Neurocognitive Adaptations Designed for Social Exchange," in *The Handbook of Evolutionary Psychology*, ed. David M. Buss (Hoboken, NJ: Wiley, 2005), M. E. Price, L. Cosmides, and J. Tooby, "Punitive Sentiment as an Anti-Free Rider Psychological Device," *Evolution and Human Behavior* 23, no. 3 (2002).

[18] R. Axelrod and W. D. Hamilton, "The Evolution of Cooperation," *Science* 211:4489 (1981)

[19] John Tooby and Leda Cosmides, "The Psychological Foundations of Culture," in *The Adapted Mind: Evolutionary Psychology and the Generation of Culture*, ed. Jerome Barkow, Leda Cosmides, and John Tooby (New York: Oxford University Press, 1992).

[20] For example, see Robin I. M. Dunbar, "Coevolution of Neocortical Size, Group Size, and Language in Humans," *Behavioral and Brain Sciences* 16:4 (1993), Richard W. Wrangham, *Catching Fire : How Cooking Made Us Human* (New York: Basic Books, 2009).

[21] John Tooby and Irven DeVore, "The Reconstruction of Hominid Behavioral Evolution through Strategic Modeling," in *The Evolution of Human Behavior: Primate Models*, ed. W. G. Kinzey (New York: SUNY Press, 1987).

Because natural selection tends to act over periods of time that are immensely larger than even all of recorded human history, our evolved psychology represents a toolkit designed to produce output that was adaptive in a world that in many respects is much different than the world of today, both quantitatively and qualitatively. This is especially true of the international system. Although humans still gather, compete, and cooperate in political groups, these groups have developed into massive nation-states as a consequence of social arms races and various other socio-historical processes.[22] States are much larger than ancestral coalitions, they are geographically fixed (as opposed to nomadic), and they possess modern weaponry that is increasingly independent of the physical strength of the user. Investigation of the ways in which human coalitional psychology continues to guide and shape behavior even today in international politics must inevitably investigate the ways in which evolved mechanisms for small-scale coalitional behavior interpret and respond to relatively novel modern stimuli.

Coalitional Psychology: An Adaptationist Perspective

Coalitional behavior is qualitatively distinct from individual behavior; the former is not merely the aggregation of the latter. For example, the ancestrally recurrent cost-benefit structure of prospective participation in dyadic interactions is distinct from that of coalitional interactions. In addition, many species that engage in dyadic forms of interaction do not display similar forms of interaction at the coalitional level; although individual-level aggression is zoologically common, *coalitional* aggression is much less so. This suggests that adaptive problems related to coalitional dynamics are distinct from those related to individual-level behavior, and also that coalitional behavior in general seems to require specialized neurocomputational systems designed to process complex multi-individual coordination, tracking, and competition, which relatively few species possess.[23]

In the case of coalitional conflict, it is clear that the necessary ingredient for aggression between coalitions is cooperation and coordination *within* coalitions.[24] That is, war is a fundamentally cooperative endeavor, both requiring and able to elicit unusually high levels of n-person cooperation. In order for a coalition to coordinate its efforts against a rival, its

[22] Robert Wright, *Nonzero : The Logic of Human Destiny*, 1st ed. (New York: Pantheon Books, 2000), Richard D. Alexander, *Darwinism and Human Affairs*, The Jessie and John Danz Lectures (Seattle: University of Washington Press, 1979).

[23] John Tooby and Leda Cosmides, "The Evolution of War and Its Cognitive Foundations," (Institute for Evolutionary Studies, 1988), Frans De Wall and Alexander Harcourt, "Coalitions and Alliances: A History of Ethological Research," in *Coalitions and Alliances in Humans and Other Animals*, ed. Frans De Wall and Alexander Harcourt (New York: Oxford University Press, 1992).

[24] Matt Ridley, *The Origins of Virtue : Human Instincts and the Evolution of Cooperation*, 1st American ed. (New York: Viking, 1997), J. H. Manson and R. W. Wrangham, "Intergroup Aggression in Chimpanzees and Humans," *Current Anthropology* 32:4 (1991).

members must be able to individually and collectively solve adaptive problems related to, for example, labor recruitment, risk-sharing, and free riding. This has led evolutionary psychologists to outline the "risk contract of war," or, the prerequisite psychological structure for the initiation of coalitional violence.[25] The risk contract of war has two broad components: the regulation of an individual's own participation and contributions within the coalition, and the enforcement of the risk contract on other coalition members. I discuss each in turn.[26]

Evolved psychological mechanisms regulating participation in coalitional violence must possess design features that quickly and efficiently track coalitional and individual-level variables that would have ancestrally correlated with success and failure in aggression. Two important variables for such a mechanism to track are individual formidability and relative coalition size. This is because, ancestrally, the most critical factors determining the success of coalitional aggression were relative numbers, physical strength, and the element of surprise.[27] These variables, together with other ecologically linked considerations, would have contributed to a determination of the probability of success, which when high, would have up-regulated individual willingness to participate in coalitional aggression. Such adaptively patterned coalitional behavior has been observed among primates with similar mating and coalitional structures.[28] Recent experiments by evolutionary psychologists have revealed specialized machinery in the human brain designed for assessments of relative strength in individuals, and in these experiments, physical strength itself was a successful predictor of support for aggressive foreign policy.[29] Remarkably, even in a world of massive nation-states, self-assessment cues related to formidability predicted foreign policy preferences, which could not have been predicted *a priori* from a rationalist model of behavior.

---

[25] Tooby and Cosmides, "The Evolution of War and Its Cognitive Foundations."

[26] The following discussion on the "risk contract of war" and related themes largely derives from and expands upon Ibid., combined with preliminary researched conducted to investigate various components of the risk contract and related hypotheses. See Anthony C. Lopez and Rose McDermott, "Offense and Defense in the Adapted Mind" (paper presented at the Princeton Conference on Psychology and Policy Making, Princeton University, February 19-20 2010). See also Anthony C. Lopez, Rose McDermott, and Michael Bang Petersen, "Hypotheses on Evolution: Coalitional Psychology and International Politics," (in prep).

[27] Richard W. Wrangham, "Evolution of Coalitionary Killing," *Yearbook of Physical Anthropology 1999, Vol 42*; Napoleon A. Chagnon, "Life Histories, Blood Revenge, and Warfare in a Tribal Population," *Science* 239:4843 (1988), John Archer, *The Behavioural Biology of Aggression*, Cambridge Studies in Behavioural Biology (Cambridge [England] ; New York: Cambridge University Press, 1988).

[28] Richard W. Wrangham and Dale Peterson, *Demonic Males : Apes and the Origins of Human Violence* (Boston: Houghton Mifflin, 1996), James Silverberg and J. Patrick Gray, *Aggression and Peacefulness in Humans and Other Primates* (New York: Oxford University Press, 1992), Manson and Wrangham, "Intergroup Aggression in Chimpanzees and Humans."

[29] Aaron Sell et al., "Human Adaptations for the Visual Assessment of Strength and Fighting Ability from the Body and Face," *Proc Biol Sci* 276, no. 1656 (2009), Sell, Tooby, and Cosmides, "Formidability and the Logic of Human Anger."

An additional component that would have been adaptively relevant in the ancestral coalitional environment of our ancestors when determining whether to participate in aggression is the expected distribution of benefits from coalitional violence. A mechanism regulating one's participation in coalitional aggression should actively seek input regarding the degree of expected benefit relative to the cost of participation. As mentioned earlier, coalitional aggression is in essence a form of collective action. However, the ancestrally recurrent cost-benefit structure of goals associated with coalitional aggression may vary systematically depending upon the form of the aggression. For example, one important distinction to be made is whether coalitional aggression is offensive or defensive. Is the coalition initiating violence, or responding to violence from another? Is the coalition taking resources and territory, or attempting to hold and deny them to others? Whether coalitional aggression is (or is successfully framed as) offensive or defensive will be an important external cue that specialized mechanisms regulating one's willingness to participate will track. This cue will serve as an important coalitional signal regarding the potential distribution of benefits, and in turn will affect one's willingness to participate in aggression.

For example, it is likely the case that the prospective benefits from successful defense have taken the form of a public good more often than the prospective benefits from successful offense. In defense, repelling an invader confers the benefits of holding territory and resources, maintaining or augmenting coalitional status vis-à-vis potential rival coalitions, and quite simply the removal of a potential threat. These benefits inhere to the group at large, from which individuals cannot be excluded except by removal from the group.[30] Of course, it may be the case in offense, as well, that territory and resources acquired through aggression could be shared by the group at large (especially in the case of non-material benefits, as in defense). However, this was not necessarily always the case; for example, offensive coalitional aggression initiated by many extant hunter-gatherer tribes takes the form of raids that do not always result in the expansion of territory and similar resources that can be generalized to the group at large.[31] Instead, benefits acquired through offensive aggression are more predictably subject to asymmetric privatization among the coalitional participants themselves, not shared among the group at large, or are shared among the kin, allies, and friends of those who participated. In short, defense tends to confer benefits that are public and randomly distributed throughout the group largely irrespective of one's participation, while offense tends confer non-randomly distributed benefits that asymmetrically accrue to participants and their allies.

[30] Ancestrally, small relatively nomadic hunter-gather groups would not have lightly arrived at the decision to forcefully exclude other group members, due to its potentially deleterious effects on coalitional strength.

[31] Wrangham, "Evolution of Coalitionary Killing.", Azar Gat, "The Human Motivational Complex: Evolutionary Theory and the Causes of Hunter-Gatherer Fighting. Part I. Primary Somatic and Reproductive Causes," *Anthropological Quarterly* 73, no. 1 (2000), Steven A. LeBlanc and Katherine E. Register, Constant Battles : The Myth of the Peaceful, Noble Savage, 1st ed. (New York: St. Martin's Press, 2003).

This suggests that on average, and holding other factors constant, individuals in general should expect greater personal benefit from successful defense than offense. Consequently, because expected benefits should have been an important component of one's decision to participate in aggression, it should be the case that individuals are more willing to participate in and sacrifice for defensive rather than offensive aggression. Indeed, "insufficient participation in defense, as expected, does appear to be considered more reprehensible than insufficient enthusiasm for initiating a war."[32] Importantly, as mentioned above, other factors such as individual formidability and personal stake in the aggression should impinge on one's decision to participate and would interact with this framing in significant ways. Additionally, however, it is also important to consider that in humans and other primates, individual and coalitional aggression is often perpetrated by males.[33] To elaborate on this phenomenon, I turn briefly to consider how biologically adapted sex differences may help to explain and predict the extent to which males and females may (or may not) differ in their willingness to participate in coalitional aggression.

In sexually reproducing species such as our own that exhibit two sexual morphs (male/female), it will often be the case that selection pressures (i.e. adaptive problems) faced by one sex may not be the same as those faced by the other sex.[34] Sexual selection is an example of this differential selection pressure, in which, in the competition for mates, the traits favored by selection may not be same for females as it is for males. One theory used to explain when and how this will occur is parental investment theory.[35] Briefly, parental investment theory points out that where one sex bears greater investmen in offspring, over evolutionary time that sex will constitute a limiting (i.e. scarce) resource on the sex that invests less, which will be relegated to compete relatively intensively for access to scarce reproductive resources. Intense intra-sexual competition among the low-investors over access to relatively scarce reproductive resources will establish selection pressures that will favor traits for use in the competition, such as greater size or muscle mass. In humans as with most mammals and primates, and for a variety of physiological and ecological reasons, males have tended to be the sex that invests less, and for whom sexual selection has favored traits that aid in the intra-sexual competition for mates.[36]

---

[32] Tooby and Cosmides, "The Evolution of War and Its Cognitive Foundations," 9.

[33] Martin Daly and Margo Wilson, *Sex, Evolution, and Behavior*, 2nd ed. (Boston: Willard Grant Press, 1983), Silverberg and Gray, *Aggression and Peacefulness in Humans and Other Primates*, Lee Alan Dugatkin, *Cooperation among Animals : An Evolutionary Perspective*, Oxford Series in Ecology and Evolution (New York: Oxford University Press, 1997).

[34] Importantly, I am considering sex differences, not gender differences. Sex is a biologically discrete variable that is defined with respect to gamete size, females being defined as the sex with the larger gamete. Species in which the gametes of the two sexual morphs are equal are referred to as isogamous. See Symons, *The Evolution of Human Sexuality*.

[35] Robert Trivers, "Parental Investment and Sexual Selection," in *Sexual Selection and the Descent of Man*, ed. Bernard Campbell (Chicago: Aldine Publishing, 1972).

[36] D. M. Buss and D. P. Schmitt, "Sexual Strategies Theory - an Evolutionary Perspective on Human Mating," *Psychological Review* 100:2 (1993).

Consequently, a number of experimental, physiological, cross- cultural, and ethnographic studies have confirmed that males are more likely to participate in individual and coalitional violence, and they are more likely the targets of this violence.[37]

Given these dynamics, what sex differences should be predicted in terms of an individual's willingness to participate in coalitional aggression? Again, a prior consideration should be whether the aggression is defensive or offensive, since the recurrent cost-benefit structure faced by each sex over evolutionary time would not have been equivalent in both domains. As mentioned above, selection has favored lower thresholds on the activation of both individual and coalitional aggression in males.[38] Therefore, *ceteris paribus*, males will be more likely to participate in both offensive an defensive coalitional aggression. However, ancestrally there would have been more ways to "support" coalitional aggression beyond the decision to physically join in the fighting. Therefore, it is likely the case, especially in defense due to the public good quality of prospective benefits, that males and females will exhibit no sex differences in their willingness to support defensive aggression through other forms of indirect support. In offense, however, males should exhibit a greater willingness to participate in aggression and perceive greater expected benefits from that participation.[39]

The first component of the risk contract of war discussed above is the regulation of an individual's own level and quality of participation in coalitional aggression. Task analysis combined with consideration of the EEA suggests that evolved psychological mechanisms

[37] Wrangham and Peterson, *Demonic Males : Apes and the Origins of Human Violence*, Martin Daly and Margo Wilson, *Homicide*, Foundations of Human Behavior (New York: A. de Gruyter, 1988), John Archer, "Testosterone and Human Aggression: An Evaluation of the Challenge Hypothesis," *Neuroscience and Biobehavioral Reviews* 30, no. 3 (2006), C. G. Mesquida and N. I. Wiener, "Male Age Composition and Severity of Conflicts," *Politics and the Life Sciences* 18, no. 2 (1999), D. D. P. Johnson et al., "Overconfidence in Wargames: Experimental Evidence on Expectations, Aggression, Gender and Testosterone," *Proceedings of the Royal Society B-Biological Sciences* 273, no. 1600 (2006), J. van der Dennen, "The Origin of War : The Evolution of a Male-Coalitional Reproductive Strategy" (Thesis (PhD), Origin Press, Rijksuniversiteit Groningen, 1995., 1995).

[38] This is a nuanced statement. It is certainly not the case that selection has forced males to be warriors and females to be pacifists by, for example, building aggression systems in males but not in females. Such a misrepresentation belies the fact that 1) mechanisms designed for aggression are present in *both* males and females, but theoretical and empirical evidence suggest that the thresholds that govern the adaptive use of aggression are context dependent and sex dependent, and 2) individual heritable variation exists that may contribute to greater or lesser aggressiveness in both males *and* females. Thus, while great variation in aggression exists within both sexes as a consequence of both genetic and environmental variation, it is nevertheless the case that on average, and regardless of the absolute levels exhibited by each sex, malestend to engage in aggressive violence more than females.

[39] Lest this be misinterpreted as a prediction that males will be willing to engage in offense while females will not, note that this is a prediction about *relative magnitudes*, which could just as effectively be written as: "males should exhibit less disinclination to participate in offensive aggression than females." Therefore, it is a non sequitur, especially given the complexity of the risk contract of war and the plasticity of the psychological mechanisms that regulate it, that the prospect of offensive aggression will invariably trigger male enthusiasm and female pacifism.

regulating participation in coalitional aggression should carefully track variables such as relative numerical superiority, formidability of one's self, one's coalition partners and rivals, and the probability of success. Additionally, such mechanisms should attend to whether the aggression is defensive or offensive, which will activate distinct inferential and motivational systems contributing to a decision to participate. Other ancestrally recurrent and adaptively relevant variables for such machinery to track would include: past history of success in aggression, current trajectory of coalitional size (e.g. has the coalition been increasing or decreasing in size recently?), number of kin present in other coalitions, the ecological profile of the resource sought (e.g. food, territory, or status), etc. The second component of the risk contract of war, to which I now turn, deals with the enforcement of the contract on others.

In general, enforcement of the risk contract can be accomplished in two ways: by the carrot or by the stick. That is, one can reward participants or punish nonparticipants. Additionally, because coalitional aggression is essentially a collective action, the elimination of free riders and the recruitment of sufficient labor are adaptive problems that must be solved if coalitional aggression is to be stable and successful. In short, two problems (free riders & labor recruitment) must be solved, and there are at least two possible solutions (punishment & reward) for each.

A mechanism designed in response to the problem of free riding in collective action could not have depended exclusively on reward as a solution. Free riders pose fitness costs to participants in a collective action precisely because free riders have received a benefit at no cost. Therefore, a mechanism that motivated a participant to reward free riders as an incentive to join the collective action (i.e. to not free ride) would have been quickly eliminated by selection as free riders took advantage of an additional benefit at no cost. Instead, evolutionary psychologists have presented evidence that punitive sentiment (and not reward sentiment) is in part designed specifically to reverse the fitness differentials that exist between free riders and participants in collective action.[40] They find that punitive sentiment is triggered in response to free riders and is predicted by one's willingness to participate. In other words, the greater the cost of participation one incurs, the more one should experience punitive sentiment toward those who free ride, which would have generated the ancestrally adaptive output of reversing the fitness differentials between free riders and participants. This does not mean that reward cannot be used as a separate incentive, but a mechanism evolved in response to this adaptive problem could not have relied upon reward alone.

Successful enforcement of the risk contract of war also requires that sufficient labor be recruited. As mentioned above, relative numerical superiority is often the major factor determining success or failure in coalitional aggression. Therefore, selection should have favored distinct motivational systems designed to recruit labor. Unlike with the problem posed by free riders, reward sentiment as a mechanism for labor recruitment was more likely to be stable. To the extent that the costs of rewarding others do not significantly

[40] Price, Cosmides, and Tooby, "Punitive Sentiment as an Anti-Free Rider Psychological Device."

reduce one's expected gain from coalitional aggression, one should act to reward others who would not otherwise participate.

The above discussion is again qualified depending on whether the aggression is defensive or offensive. For example, it may be the case, particularly in offense, that punitive sentiment serves the function of labor recruitment in addition to its primary function of eliminating fitness differentials between free riders and participants. Indeed, in many instances, even the mere possibility of punishment raises the level of participation in achieving public goods.[41] In offense, however, those who choose not to join the coalitional aggression are not free riders to the extent that the benefit to be gained is not a public good; that is, they do not participate, and they do not receive a benefit. Therefore, punitive sentiment should not be activated toward nonparticipants in offense (because they are not free riders and thus no fitness differential exists) unless labor recruitment is an additional function. The prediction, therefore, is that in defense, punitive sentiment should always be activated toward nonparticipants,[42] but in offense, punitive sentiment should be activated only (or especially) when the mechanism receives input that labor requirements fall short of necessary levels.

The problem of labor recruitment was particularly critical for our hunter-gatherer ancestors, but sometimes too much labor is also a cost. For example, it is likely that evolved labor recruitment mechanisms motivate recruitment thresholds that are distinct depending on whether the coalitional context is offensive or defensive. To the extent that the benefits of offense are asymmetrically privatized, then too many participants in your offensive raid may constitute a check against what you yourself as a raider can loot and keep. This means that offensive campaigns are more subject to diminishing marginal returns per additional unit of labor in a way that defensive campaigns are not. Thus,

while a defense psychology should seek to "maximize" labor in order to ensure success, an offense psychology would seek to "optimize" it at a level that matches the size of the benefit to be obtained. The function of such an outcome would be to balance the probability of success (in which more labor increases the probability of success) against the achievement of maximum per capita returns.

Achieving an optimal level of labor in offensive aggression can be difficult if the distribution of the benefits and risks of aggression are unclear ante bellum. Furthermore, in combination with elements discussed above from the first component of the risk contract of war, a perverse incentive structure is established. Given that the recurrent structure of

[41] E. Fehr and S. Gachter, "Cooperation and Punishment in Public Goods Experiments," *American Economic Review* 90:4 (2000).

[42] There are important exceptions here. Evolutionary psychologists present evidence that the mind distinguishes between intentional and incidental free riding, and that punitive sentiment is triggered especially in response to the former rather than the latter. For example, these tend to be individuals for whom the costs of participation would outweigh any benefits received from the public good. See Leda Cosmides and John Tooby, "Evolutionary Psychology, Moral Heuristics and the Law," in *Heuristics and the Law*, ed. Gerd Gigerenzer and Christoph Engel (Cambridge, MA: MIT Press, 2006).

defensive aggression has tended to confer public goods that are distributed relatively symmetrically throughout the group and are not subject to nonrandom privatization, it follows that the labor recruitment problem will be more easily overcome in defense than in offense. This will be compounded by the psychological tendency of individuals to sacrifice more for what they already have than for what they might gain in the future.[43] Consequently, recruiters who seek to initiate aggression should act to misrepresent offensive action as defensive for the sake of "cheating" the labor recruitment problem, especially where the labor recruitment problem is great and initiators have a significant stake in the outcome of successful aggression. In other words, successful shifting of the coalitional frame by recruiters leads to the activation of motivational systems among potential recruits that makes their participation more likely.

This strategic coalitional "frame-shift" can occur through the conscious manipulation of the coalitional environment by entrepreneurs, or it can be a result of self-deception. The latter possibility is intriguing because it suggests that ancestrally, given the recurrence of situations in which individuals expected particularly significant benefits from offensive aggression but faced acute labor recruitment challenges, selection may have favored motivational circuitry that is designed precisely to manipulate the framing of coalitional aggression for this purpose. And because deception is most effective when the deceiver believes it, self-deception, where successful, may have conferred significant fitness benefits.[44]

Although it can often be difficult in practice to distinguish between offensive and defensive aggression (especially in the murky case of "preventive war"), it is more likely the case that this phenomenological ambiguity is the product of the interaction of motivational systems designed for these types of aggression. In other words, a blurry boundary between offense and defense is the product of the interaction of individuals attempting to resolve and enforce the risk contract of war, rather than evidence for the lack of a psychological distinction between these two domains. Indeed, the strategic manipulation of the coalitional environment and its framing underlie much of what is known as the "security dilemma" in international relations.[45] These dynamics predictably generate coalitional environments in which actions and armaments that are ostensibly defensive can easily be misrepresented by rivals as offensive in nature, generating arms races and spirals of violence at all levels of coalitional association, from tribes to nation-states.[46]

---

[43] D. Kahneman and A. Tversky, "Prospect Theory - Analysis of Decision under Risk," *Econometrica* 47:2 (1979).

[44] Robert Trivers, "The Elements of a Scientific Theory of Self-Deception," *Annals of the New York Academy of Sciences* 907 (April 2000); Christopher C. Byrne and Jeffrey A. Kurland, "Self-Deception in an Evolutionary Game," *Journal of Theoretical Biology* 212:4 (2001).

[45] R. Jervis, "Cooperation under Security Dilemma," *World Politics* 30:2 (1978).

[46] Gat, *War in Human Civilization*.

It may also be the case that where commitments and threats are perceived as interdependent, offensive endeavors are more easily framed as defensive; indeed, this may be the psychological domain in which the concept of preventive war is nurtured. Where a threat to peace anywhere is a threat to peace everywhere, and where a failure to respond to threats in one area is expected to be seen as general weakness that can be exploited in other areas, the choice is reframed as either merely reacting to the inevitably encroaching initiatives of one's enemy or forcing the enemy to respond to one's own initiatives. Such reframing shifts the policy space from offense vs. defense to prevention vs. defense, in which the latter surrenders initiative and the element of surprise to one's adversary, and in which the best defense becomes a strong offense.

This type of logic was, of course, pervasive during the Cold War, as successive leaders of both the United States and the Soviet Union were motivated by the prospect of strategic encirclement by their adversary. The Vietnam conflict serves as a useful example in this regard, in which the "domino theory" predicted that the success of communism there would have been highly infectious to its immediate and regional neighbors, threatening to destabilize the global balance of power itself.[47] Importantly, the degree to which commitments were perceived as interdependent was a major factor in shaping people's perceptions of the intervention as either preventive or purely offensive. Of course it does not necessarily follow that when wars are framed as preventive that it is therefore a consequence of commitments being perceived as interdependent.

What these and other examples suggest is that the framing of aggression and threats in the coalitional environment can be an important component affecting the successful implementation of the risk contract of war, not only in terms of the levels of coalitional participation, but also in terms of the successful enforcement of the risk contract on others. Beyond the risk contract of war, however, there are other important coalitional dynamics that are fundamental to coalitional landscapes such as the ones in which humans have evolved that have shaped behavior-regulatory logic in these domains.

It is a truism that humans are inherently groupish; we spontaneously form groups, identify more readily with those within our group, and act in ways that enhance the position of our own group even (and sometimes especially) if at the expense of other groups.[48] International relations theorists, especially realists, explain in-group preferences at the international level as a consequence of anarchy, under which each state can depend upon only itself for survival, forcing states into mutual suspicion and insecurity. In this environment, states are motivated mostly out of a desire to achieve relative gains, in which a benefit to one state represents a commensurate cost to another.[49] The international

[47] Robert Jervis, *System Effects : Complexity in Political and Social Life* (Princeton, N.J.: Princeton University Press, 1997).

[48] Ridley, *The Origins of Virtue : Human Instincts and the Evolution of Cooperation*, Henry Tajfel and John C. Turner, "The Social Identity Theory of Intergroup Behavior," in *Psychology of Intergroup Relations*, ed. Stephen Worchel and William G Austin (Chicago: Nelson Hall, 1986).

[49] Kenneth Neal Waltz, *Theory of International Politics*, Addison-Wesley Series in Political Science

system is not only plagued by uncertainty, realists argue, but it is also constrained by the zero-sum game theoretic structure of state interactions.

The debate has been largely conditionalized, in which it has been observed that, on matters of "low politics," for example, states may be able to focus instead on absolute gains, in which states may accept (perhaps only in the short-run) a relative loss for the sake of an absolute gain, as in the case of minor trade agreements and environmental protocols.[50] Importantly, however, one should consider that the preference for absolute or relative gains is likely generated by an evolved motivational system designed to navigate inter-coalitional dynamics. Not all coalitional interactions are the same, and to the extent that stable differences exist between coalitional contexts, and where fitness gains are achieved by attending to these differences, selection should have favored contextually dependent preference structures.

For example, a straightforward prediction would be that mechanisms designed to regulate relative/absolute gains preferences in coalitional interactions would privilege relative gains in adversarial contexts but absolute gains in cooperative contexts. A couple of recent experiments by evolutionary psychologists provide some support for this prediction. First, Ybarra and colleagues show that in competitive contexts, individuals have an incentive to be unpredictable and "difficult to read" in order to avoid allowing one's adversary to use this information to one's detriment.[51] In contrast, in cooperative contexts, cooperation is best achieved by being relatively more transparent in order to facilitate coordination and exchange. In short, competitive contexts generate strategies that minimize the possibility of out-group gains, while cooperative contexts generate strategies that leave one vulnerable to out-group gains (through transparency) so that one may maximize absolute gains. An interesting recent example is one in which Iran, to the collective puzzlement of Western countries, inexplicably relocated what appeared to be its entire stockpile of low-enriched nuclear fuel to a single location above ground. Some analysts suggested that this could have the paradoxical effect of restraining Israel and others with an interest in preemptively striking these facilities.[52] In short, adversaries gain (or at least seek to minimize out-group gains) by being unpredictable, which would otherwise be a cost in cooperative coalitional contexts.

(Reading, Mass.: Addison-Wesley Pub. Co., 1979), J. M. Grieco, "Anarchy and the Limits of Cooperation - a Realist Critique of the Newest Liberal Institutionalism," *International Organization* 42:3 (1988).

[50] Robert O. Keohane and Joseph S. Nye, *Power and Interdependence : World Politics in Transition* (Boston: Little, Brown, 1977), David A. Baldwin, *Neorealism and Neoliberalism : The Contemporary Debate*, New Directions in World Politics (New York: Columbia University Press, 1993).

[51] Oscar Ybarra et al., "The Social Prediction Dynamic: A Legacy of Cognition and Mixed Motives," in *Evolution and the Social Mind: Evolutionary Psychology and Social Cognition*, ed. Joseph P. Forgas, Martie G. Haselton, and William von Hippel (New York: Psychology Press, 2007).

[52] David E. Sanger, "Another Puzzle in Iran after Nuclear Fuel Is Moved," *The New York Times* 2010.

A second study, by Wagner and his colleagues, showed that testosterone levels are higher among males during inter-coalitional competition than during intra-coalitional competition.[53] These results suggest that, to the extent that testosterone is correlated with dominance activity (both in humans and other primates), the suppression of these endocrine pathways during intra-coalitional competition functions to dilute potentially destabilizing in-group status challenges, which would otherwise be beneficial during competitive inter-coalitional contexts.

Thus, two dimensions may matter. First, is the coalitional context cooperative or competitive? Second, is the context intra- or inter-coalitional? These contextual cues may interact in important ways, and the significance of these findings is that the preference for absolute or relative gains may be conditional upon contextual cues that are moderated by specialized endocrine pathways. Internationally, many types of associations exist which affect the constitution of coalitional cues. Broadly, we may distinguish between "coalitions" and "alliances," in which the former are relatively loose and remain united merely in response to shared threat, while the latter maintain themselves even in the absence of threat.[54] For example, the western Allies (despite the label "allies") during World War II would be a useful example of a coalition, established in response to the shared threat posed by Germany and the Axis powers. Notwithstanding coordination on most major military matters, distrust and mutual suspicion was pervasive among the Allies; Stalin continually worried that the Allies would establish a separate peace with Germany, and for the most part, Allied suspicions of Soviet spying were often accurate. Indeed, Stalin's vast and penetrating spy network in part allowed him to know about the U.S. atomic bomb even before Truman.[55]

This is a perfect example of a coalition whose internal dynamic is plagued by competitive rivalries. Although the domain of interaction was broadly intra-coalitional (as the Americans, British, and Soviets were united against shared threats), it was also competitive, as each sought to move in the present with an eye toward relative positioning

---

[53] J. D. Wagner, M. V. Flinn, and B. G. England, "Hormonal Response to Competition among Male Coalitions," *Evolution and Human Behavior* 23:6 (2002).

[54] This is a standard distinction drawn by primatologists. See A. H. Harcourt and F. B. M. de Waal, *Coalitions and Alliances in Humans and Other Animals*, Oxford Science Publications (Oxford [England] ; New York: Oxford University Press, 1992). Importantly, the distinction should not be seen as

dichotomous, but as continuous. Up until now I have used "coalition" broadly to refer to group behavior in general, and in the context of "coalitional psychology" the term encompasses both types while recognizing that not all coalitions are structurally equivalent.

[55] John Lewis Gaddis, *We Now Know : Rethinking Cold War History* (Oxford: Oxford University Press, 1997), Geoffrey Roberts, *Stalin's Wars : From World War to Cold War, 1939-1953* (New Haven [Conn.]; London: Yale University Press, 2006). Of course, this is also partly due to the fact that Truman remained relatively isolated from most matters while Roosevelt was president. See Wilson D. Miscamble, *From* Roosevelt to Truman : Potsdam, Hiroshima, and the Cold War (Cambridge ; New York: Cambridge University Press, 2007).

in the future, once the threat was removed. Thus, the cooperation-eroding effect of relative gains renders these types of coalitions fundamentally unstable. In contrast, the transatlantic association between the United States and Britain serves as a good example of a true alliance, in which coalitional cooperation over time has shifted the frame of context from coalition to alliance.

Although it is possible to distinguish among types of coalitional environments and their cues, and to use these recurrent structures to explain and predict the operation of behavior-regulatory mechanisms in these domains, the analysis remains somewhat static. Additionally, therefore, once we begin to more fully map the structure of these domains and the putative psychological mechanisms that may exist for each of them, we must begin to consider questions such as: what is the process by which coalitional contexts change over time? How does an association of states move from coalition to alliance, and how do alliances come undone? Ultimately, of course, these are more complex questions, because they involve the interaction of evolved psychological mechanisms with changing socio-cultural environments.

For example, the analysis above suggests, *inter alia*, that movement along the coalition-alliance spectrum necessarily involves a frame-shift in which two coalitions become tied to each other's well being in ways that go beyond what is necessary for the elimination of a particular threat. Two coalitional identities that are united by shared threat are moored only to a contingent feature of the environment that is not constant. In other words, and from a game theoretic perspective, each player (coalition) knows that the game will inevitably end, and each has relatively similar expectations about when the game will end. In these dynamics, game theorists employ the familiar backward induction logic to arrive at the necessary conclusion that defection is the optimal strategy throughout. Thus, cooperation is the exception to the norm of defection and a political expediency for the sake of threat removal. A coalition of states may be able at times to achieve absolute gains at the cost of relative losses (e.g. one state gains 10 but another gains 15), but an overriding emphasis on relative gains, muted only by the severity of external threat, will restrict the parameters of cooperation within that coalition. Building shared interests that are not moored to contingent features of the environment and that are relatively constant is an important first step if coalitions are to transition into alliances. Future research along these lines is important.

Importantly, therefore, all states are not natural enemies merely by virtue of the fact that anarchy exists. From nation-states to hunter-gatherer groups, coalitional interactions vary greatly in their character, and cooperation is not always explained merely by the presence of a shared threat, but by the character and history of the relationship. As social organisms, our brains are designed to strongly track and actively scan the coalitional environment for ancestrally recurrent and reliable cues, such as the history of interaction, which would have allowed the organism to infer intentionality and generate outcomes that would have been adaptive in these environments.[56] Additionally, humans are coalitional entrepreneurs,

[56] Forgas, Haselton, and Hippel, *Evolution and the Social Mind : Evolutionary Psychology and Social Cognition*, A. M. Leslie, O. Friedman, and T. P. German, "Core Mechanisms in 'Theory of Mind'," *Trends in*

designed to take advantage of these features to affect dynamic change in coalitional landscapes.

Conclusion

Evolutionary psychology offers a framework that is useful for bridging the gap between "deep time" selection pressures faced by our hominid ancestors and manifest behavior during the developmental life cycle of the organism. Natural selection does not cause behavior directly; it is not the homunculus in the black box, dictating day-to-day instructions on what to think and how to behave. Instead, natural selection builds and maintains mechanisms that had the effect, over evolutionary time, of reliably generating adaptive outcomes in the context of the ancestrally recurrent environment of the organism. Selection builds psychological adaptations, and the product of these adaptations is behavior. Thus, to understand behavior, it is necessary to understand the proximate mechanisms that give rise to behavior, as well as the evolutionary pressures that favored the particular design of these mechanisms.

Consequently, by combining an understanding of how natural selection builds adaptations with an understanding of the EEA and rigorous task analysis, it is possible to develop and test hypotheses about the information-processing structure of evolved psychological mechanisms in the human brain. Based on the discussion above, we see that selection will often favor behavior-regulatory logic that reflects conditional (or "facultative") strategies for engaging in various forms of coalitional behavior contingent upon the presence of adaptively relevant contextual cues.

It is important to avoid certain fallacies that may arise in the process of such an analysis. For example, a common non sequitur is the assertion that, because selection favored adaptations that had the on-average effect of maximizing reproductive success in ancestral environments, humans must therefore be constantly and consciously striving to maximize their number of offspring. However, it is sufficient for selection to instantiate a desire for sweets, a fear of predators, and a yearning for safety, in order to accomplish goals that would have enhanced reproductive success relative to alternative strategies over evolutionary time. Adaptations are not truth-maximizers; that is, natural selection does not discriminate among design features on the basis of their effects on philosophical understanding. Instead, design features are selected on the basis of their effects on reproductive success. We love our parents more than strangers because they are dear to us, and this behavior had the effect, on average, of enhancing reproductive success relative to alternative strategies. In short, "nature selects for outcomes."[57]

Cognitive Sciences 8, no. 12 (2004), Tooby, Cosmides, and Price, "Cognitive Adaptations for N-Person Exchange: The Evolutionary Roots of Organizational Behavior."

[57] D. S. Lehrman, "Semantic and Conceptual Issues in the Nature-Nurture Problem," in *Development and Evolution of Behavior*, ed. L. R. Aronson and E. Tobach (San Francisco: W. H. Freeman & Company,1970), 36.

An important final reminder is that design features are selected because of the fitness enhancing effects that they produced in ancestral environments. This bears repeating because the modern world, especially in the realm of international politics, is in many ways drastically different from the world in which most if not all of our psychological adaptations were built. Natural selection is an immensely slow process relative to our otherwise limited time horizons as humans. By evolutionary standards, the emergence of agriculture, chiefdoms, city-states and the industrial revolution have occurred in the blink of an eye relative to our much longer evolutionary history as a species. Therefore, in addition to the analysis outlined above, evolutionary social scientists must give serious consideration to the ways in which our evolved mechanisms interpret and respond to modern evolutionarily novel stimuli. All of these factors together enable scholars to gain a better understanding of the political world. In the end, evolutionary analysis suggests that humans possess specialized psychological machinery that enables coalitional entrepreneurship and contributes to the marvelous complexity of human political behavior.

Essay by Rose McDermott, Brown University and Peter K. Hatemi, University of Iowa

"Some Considerations on the Potential Impact of Hormones on Aggression"

One of the biological factors that can influence behavior is endocrinology. Hormones can exert an influence on strategic decision-making in general and on the dynamics involved in leadership and followership in particular. Although hormones alone will not necessarily prove decision in any given interaction of interest, they can certainly influence the propensity to engage in particular actions over others. Thus, they can emerge as a variable worthy of potential interest in exploring the occurrence of impulsive aggression and other expressions that can affect international outcomes.

A wide variety of hormones operate to influence human behavior in a myriad of ways. Many of these are familiar to those who read the popular science press. The public is probably most familiar with serotonin because of the common use of serotonin specific reuptake blockers (SSRIs) in the treatment of depression. Other hormones which have been implicated in large-scale studies include estrogen, whose effects have been studied extensively in the Women's Health Initiative to explore its relationship to breast cancer, heart disease and other health outcomes (http://www.nhlbi.nih.gov/whi/). Of particular interest to those concerned with behaviors relevant to international relations is testosterone, because of its involvement in precipitating responses to challenge.

In work on sex differences in aggression, one of the authors has examined the influence of testosterone on unprovoked attack in the context of a simulated war game.[1] In this series of experiments, testosterone was clearly associated with the propensity to launch a first strike attack within the context of a crisis situation. Although testosterone alone could not explain differences in aggression within either men or women, the differences in hormonal levels did correlate with the differences in aggression between sexes. Not surprisingly, because a negative relationship existed between testosterone and age, older men proved less aggressive than younger men. However, interestingly, older women manifested much greater levels of aggression than younger woman. It is possible that such differences resulted from lower levels of estrogen, leading to a different hormonal balance between estrogen and testosterone over time. It does not appear entirely accidental that all the women leaders thrown out as examples of aggressive women (Golda Mier, Margaret Thatcher) were post-menopausal at the height of their power.

Exploring the possibility that men who had higher testosterone simply proved more efficacious and thus were merely responding to a historical base rate of success in conflict when engaging in aggressive action, we analyzed the victory rate of such subjects. Contrary to expectations, men who fought and lost had higher initial testosterone than those who did not fight.

[1] For relevant work, see: http://www.psych.ucsb.edu/research/cep/McDermott/McDermott.html.

Work by Dominic Johnson, Richard Wrangham and others have suggested a potential evolutionary advantage to account for what might otherwise appear to be a losing biological strategy in which testosterone precipitates conflicts that are likely to be lost. [2] Johnson suggests that positive illusions tell part of the story underpinning the phenomenon of overconfidence.[3] These so-called positive illusions constitute a series of cognitive and motivated biases which combine a troika of characteristics which include self-aggrandizement, an illusion of control over events, and a sense of invulnerability to risk. These tendencies can easily manifest at group, organizational and societal levels, exacerbating rather than ameliorating the propensity to respond to threat with aggression. Why would such a strategy prove successful over time in human evolutionary history? Such a strategy succeeded precisely because it confers advantages to those who possess high testosterone through self-fulfilling prophecies in health, creativity, and performance in the face of obstacles. These skills and abilities instilled adaptive advantages led to selection pressures encouraging positive illusions in the human evolutionary past .[4]

In work examining how military incompetence (i.e., wanting to attack when you are likely to lose) might prove adaptive, Richard Wrangham argued that overconfidence and optimism might have proved advantageous in the evolutionary past because it increased combat performance by hardening resolve or bluffing an opponent.[5] In other words, prior to the onset of the militarized threshold for combat, when automatic weapons leveled the playing field somewhat by providing a compensatory basis of power independent of physical strength, sheer numbers would have proved decisive, along with a few strategic elements like surprise, in determining victory. Under such conditions, observers who might otherwise sit on the fence might be enticed to fight if they believed one side was likely to prove victorious, because then the combatant could share in the spoils of victory. Anyone charismatic enough to recruit such labor then, by definition, would prove more likely to win precisely because he could bring more fighters into the fray. Further, anyone who could convince an opponent that his victory was inevitable, and that the challenger would be vanquished regardless, might get potential opponents to back down prior to actual combat. A strategy where such a leader need not bluff, which would allow for the possibility of behavioral leakage (i.e., what a poker player would call a 'tell'), because he believed his own deceit would become most likely to prevail. Even if such a strategy worked only a small percentage of the time, the prevalence of such a propensity would have been preserved into potential generations to a much greater degree than alternative strategies, not only because such actors would have been much more likely to survive, but

[2] Richard Wrangham, "Is Military Incompetence Adaptive? "*Evolution and Human Behavior*, 20:1 (1999):3-17.

[3] Dominic Johnson, *Overconfidence and War*. (Cambridge: Harvard University Press, 2004).

[4] Lionel Tiger, *Optimism: The Biology of Hope*. (New York: Simon and Schuster, 2004). Robert Trivers, *The Elements of Scientific Theory of Self-Deception*. (New York Academy of Sciences, 2000).

[5] Trivers, 2000. Richard Wrangham "Evolution of Coalitionary Killing,"*Yearbook of Physical Anthropology* 42 (1999):1–30.

also because victors would have been disproportionately likely to obtain reproductive access, often as part of the spoils of war. Because war was so common over the course of human history, the neurocomputational frequencies of even such low probability events would have ensured that factors which successful recruited labor and bluffed opponents into submission, like testosterone, would have been preserved in the population.

As a result of such suppositions, we tested whether positive illusions were indeed more likely to be triggered under conditions of threat in men with high levels of testosterone. And, indeed, in our experiment we found that men with high testosterone were more likely to rank themselves as more aggressive, competitive and hostile, as well as more intelligent and skillful. Moreover, they were more likely to rate their opponent as less skillful and intelligent. Significantly, their assessment of their own assets drove their behavior more than their evaluation of their challenger. Finally, confidence was preserved in the face of defeat. High testosterone men who lost their games did not adjust their subjective self-raking downwards as much, while those who won significantly adjusted their self-rankings upwards. By way of comparison, female subjects showed exactly the opposite propensity in self-raking in response to external feedback.

The implications of such work for international relations are as obvious as they are myriad. In particular, biological factors may easily affect a given individual's leadership profile. How do we know how people are going to make decision in real time? It can be crucial to have a developmental history on such individuals so that observers can factor in the forces which helped shape and formulate their abilities as well as their blind spots. And biological and hormonal factors can influence these outcomes in significant ways. Testosterone represents only one part of an omnipresent biological and hormonal bath that infuses leaders' actions and is not normally factored into our understanding of an individual's capabilities.

These elements may help in predicting performance under conditions of stress. For example, such factors might be included in measures which screen which individuals might be best suited for particular kinds of jobs in the military; some people may find a better fit actually doing the work of nation-building, establishing infrastructure, providing security, and winning hearts and minds, while others may remain more effective in more traditional search and destroy kinds of missions. These screening mechanisms may also help predict those individuals who would remain more vulnerable to post-traumatic stress as a result of combat, or more susceptible to suicide during the course of post-deployment transition. In addition, biological factors might be factored into promotion structures in the military, for instance, because they can exert decisive impact on a whole range of strategic and tactical behaviors and proclivities. How much of a particular androgen gets dumped into a leader's bloodstream in a given crisis may affect their decision-making in critical ways which can mean the difference between victory or annihilation.

For example, compare General George Patton versus General Douglas MacArthur. Patton reacted explosively and immediately in the face of personal and professional provocation. He got himself into political trouble repeatedly for everything from slapping a soldier suffering from what was then called battle fatigue, to defying orders to overtake his

personal rival General Bernard Montgomery in taking over Palermo. Montgomery may have been on the same side as the Americans in the war, but Patton nonetheless considered him a rival for personal glory. However, his personal charisma also resulted in one of the most amazing troop movements in history, when he was able to disengage his entire Third Army from combat, move over 100 miles in the dead of winter in 48 hours to re-engage the Germans and provide support for the besieged and surrounded Easy Company of the 101st Airborne during the Battle of Bastogne during the German Christmas counter-offensive in December, 1944. Ironically, members of Easy Company maintain that they never asked for, or needed, this relief. On the other hand, MacArthur, in taking on President Harry Truman over the issue of crossing the Yalu river during the Korean war, never erupted or blew up. Rather, he made a strategic decision to refuse to listen to the president, and he paid the price with his job. However, he did not get visibly angry, he just refused orders. Such individual differences in behavioral tendencies can exert a decisive difference in both tactical and strategic decision making and are worth considering in screening individuals for promotion and identifying potential leaders as well as those likely to collapse under pressure. [6]

In this way, we suggest that further empirical exploration of the various functions and effects of particular hormones, including but not limited to testosterone, may help illuminate important aspects of leadership and, perhaps, followership as well. In this way, such investigations may provide further insight into the nature of the individual variance which helps define the ineluctable aspects of charisma, and the influence, power and control that encourages one person to follow another.

[6] Carlo D'Este, *Patton: A Genius for War* (New York Harper Pereniel, 1996). *Stephen Ambrose, Band of Brothers* (New York: Simon & Schuster, 2001). William Manchester, *American Caeser* (New York: Back Bay Books, 2008). Richard Rovere and Arthur Schlesinger, Jr., *General MacArthur and President Truman: The Struggle for Control of American Foreign Policy* (New York: Transaction Publishers, 1997).

Essay by Michael Bang Petersen, Aarhus University

"Towards a folk psychology of security: Insights from evolutionary psychology"

Issues of security are far from novel. For all we know, war in the sense of between-group aggression has been with our evolutionary lineage for an extended period of time. War is ubiquitous across all current human societies[1]; the fossil record from the Middle Paleolithic show signs of weapon-inflicted trauma and, hence, con-specific aggression[2]; and organized between-group aggression has frequently been observed among non-human primates, most notably our closest relative, the chimpanzee.[3] If this last observation is taken as evidence that already the latest common ancestor between humans and chimpanzees engaged in warfare, this would imply that war has been with the human lineage for between 5 and 6 million years.[4] For perhaps as long as several millions of years, the reproductive success of our ancestors has, in other words, been influenced by getting killed, injured or raped in war.

Given the evolutionary persistence of war and the massive reproductive costs involved, it would be surprising, to put it mildly, if the course of evolution had not left any mark on how ordinary people spontaneously reason about matters of group-security. In this short paper, I will argue that theorizing about war as an evolutionary challenge indeed provides an important step in understanding the folk psychology of security.[5] Most importantly, I will bring attention to a particular insight from evolutionary psychology: that our psychology carries the imprint of the environment in which it evolved. In essence, our default expectation should be that modern citizens think of national security issues as if

[1] Azar Gat, "The Causes of War in Natural and Historical Evolution", in *Human Morality and Sociality: Evolutionary and Comparative Perspetives*, ed., Henrik Høgh-Olesen, (New York: Palgrave Macmillan, 2010) 160-190.

[2] Marilyn Keyes Roper, "A Survey of the Evidence for Intrahuman Killing in the Pleistocene", *Current Anthropology*, 10:4 (October 1969): 427-459. Phillip L. Walker, "A Bioarchaeological Perspective on the History of Violence," *Annual Review of Anthropology*, 30 (2001): 573-596.

[3] Christophe Boesch, "Patterns of Chimpanzee's Intergroup Violence", in *Human Morality and Sociality: Evolutionary and Comparative Perspetives*, ed., Henrik Høgh-Olesen, New York: Palgrave Macmillan, 2010, 132-159.

[4] Richard Wrangham, "The Evolution of Coalitional Killing", *Yearbook of Physical Anthropology* 42 (1999: 1-30.

[5] See also, e.g., Dominich Johnson, *Overconfidence and War* (Cambridge, MA: Harvard University Press, 2004). Raphael D. Sagarin and Terence Taylor, eds., *Natural Security: A Darwinian Approach to a Dangerous World* (Berkeley and Los Angeles, CA: University of California Press, 2008). John Tooby and Leda Cosmides, "The Evolution of War and its Cognitive Foundations," *Institute for Evolutionary Studies Technical Report #88-1 (1988).*

they occurred in the small-scale groups of our Pleistocene ancestors.[6] This expectation is supported by current evidence.

Evolution and behavior: Psychological mechanisms as links

Natural selection operates on adaptive problems, i.e. problems that affect the reproductive success of organisms. Obviously, war would have constituted an adaptive problem in this sense (and still does).[7] To understand how natural selection could have shaped human behavior in the face of war, it is important to understand what it is that natural selection actually selects for. Basically, natural selection selects for genes that propagate themselves more successfully than their rivals. The question, then, is what genes do. The short answer is that they build the physiology (body) and psychology (brain) of the organism. What they don't directly do is to build behavior. Behavior is the direct product of psychological mechanisms in interacting with environmental input, not genes.[8] While this evolutionary distinction between behavior and psychology might seem unimportant at first (what are psychological mechanisms for, if not to produce behavior?), it is actually one of the most essential contributions of evolutionary psychology – the dominant approach in linking evolutionary biology and the social sciences. One reason is that it clarifies how the structure of ancestral environments continues to shape modern behavior.

Let us say that a population faces an adaptive problem that requires some kind of behavior to solve. This would set up a selection pressure that selected for psychological mechanisms that are required to do two things.[9] First, scan the environment for cues that disclose a particular adaptive problem and, in the case multiple solutions to the problem exist, scan for cues that provide information as to which particular solution would be the most adaptive given the specific circumstances. Second, activate motivational circuitry that would prompt the organism to engage in the behavior that would solve the particular problem. In this respect, it is important to note that a psychological mechanism cannot just figure out for itself whether it should trigger or what output it should deliver. To function, many of the mind's psychological mechanisms need to be automated algorithms that each are *preset* to search for a particular list of cues and, upon detection of these, automatically activate a particular behavioral motivation.[10]

---

[6] See Michael Bang Petersen, "Public Opinion and Evolved Heuristics," *Journal of Cognition and Culture* 9: 3 (October 2009): 367-389.

[7] John Tooby and Leda Cosmides, "The Evolution of War and its Cognitive Foundations," *Institute for Evolutionary Studies Technical Report #88-1 (1988).*

[8] John Tooby and Leda Cosmides, "The Psychological Foundations of Culture" in *The Adapted mind: Evolutionary psychology and the Generation of Culture,* eds., Jerome Barkow, Leda Cosmides and John Tooby, (New York: Oxford University Press, 1992): 19-136.

[9] John Tooby and Leda Cosmides, ibid.

[10] Steven Pinker, *How the Mind Works* (London: Penguin Books, 1997).

How does natural selection design such a list of cues? In short, selection favors psychological mechanisms that scan for cues that are statistically correlated with the existence of an adaptive problem in the exact environment in which the mechanism evolves. For example, ancestrally the degree of kinship between an older and a younger child would have been correlated with the degree to which the older child had observed his or her mother breast-feed the younger. A younger child that is breast-fed by ones mother is most likely a sibling. As demonstrated by detailed experimental studies by Lieberman et al., modern humans actually do estimate kinship based on this and similar cues and use it to regulate, for example, their level of altruism towards younger siblings.[11] Importantly, observations of breast-feeding predict altruism better than explicit knowledge about the degree of kinship. In this way, the structure of ancestral environments – where breast-feeding was the only available feeding option and, hence, a reliable cue to kinship – reveals itself in modern behavior.

Understanding which cues our folk psychology of security is sensitive to requires us to understand the environment in which this folk psychology evolved. For all we know, this environment is the environment of ancestral hunter/gatherer groups on the East African Savannah.[12] In this environment the lineage that eventually became Homo sapiens evolved over millions of years. Just 50,000 years ago, our ancestors left the Savannah and populated the rest of the earth. And just 10,000 years ago did we slowly abandon the hunter/gatherer-lifestyle to become sedentary farmers. Natural selection is a slow process and the current consensus suggests that we cannot expect selection to have had the time to build complex psychological adaptations that are designed for this evolutionary novel way of life.[13]

Warfare as an adaptive problem

The goal of the preceding paragraphs was to provide some of the underlying rationale for a simple but important point: The folk psychology of security (and of many other social problems for that matter) should carry the imprint of the conditions of ancestral hunter/gatherer-societies. In this respect, one particular condition is notable. While modern nation states are extremely large, ancestral groups were small-scale. The anthropological record suggests that ancestral hunter/gatherer-bands were comprised by

[11] Debra Lieberman, John Tooby and Leda Cosmides, "The Architecture of Human Kin Detection," *Nature, 44 (2007):* 727-731.

[12] See, e.g., Robert Boyd and Joan B. Silk. *How Humans Evolved* 3rd edition, (New York & London: W. W. Norton & Company, 2003).

[13] John Tooby and Leda Cosmides, "The Psychological Foundations of Culture," in *The Adapted mind: Evolutionary psychology and the Generation of Culture,* eds., Jerome Barkow, Leda Cosmides and John Tooby, (New York: Oxford University Press, 1992), 19-136.

around 30 individuals.[14] This suggests, first, that the cues to which our evolved psychology of security should be sensitive to are cues that would inhere in small-scale social interaction. Second, it suggests that warfare would in fact have constituted a massive adaptive problem. In this section, I deal with this second implication, and in the final section I return to the first implication by way of a specific example.

If a small closely knit group attacks or is attacked by another group, everybody in the group is affected, either because they directly partake in the aggression (and, hence, risk being killed or maimed) or because their kin, mates, or cooperative partners do so. Hence, although some pay the costs more directly, everybody pays some costs. In reverse, everybody can reap (some of) the potential benefits from attacks in terms of security from would-be aggressors and increased control over natural resources. Other benefits are more directly tied to being in actual combat such as increased social status from heroic acts[15] and increased reproductive opportunities by "stealing and raping woman"[16] (let me be clear, the term benefits is here used in the evolutionary neutral sense of increased inclusive fitness, that is, more reproductive success). While these latter points have important consequences for the design of our psychology of security,[17] the conclusion remains that warfare is the evolutionary business of everybody. That is, the reproductive success of all individuals (whether in a positive or negative direction) would have been affected by decisions about whether to engage in group-based aggression or not. In short, warfare has constituted an adaptive problem.

Given this, natural selection should have furnished the human mind with psychological mechanisms designed to decide on whether to use aggression to solve between-group tensions and, hence, estimate the costs and benefits associated with each choice.[18] Given the automated nature of these mechanisms, they should be aroused whenever cues are available that mimic evolutionary recurrent cues to the existence of group conflict.[19] To the

[14] Robert L. Kelly, *The Foraging Spectrum: Diversity in Hunter-Gatherer Lifeways* (Washington: Smithsonian Institution Press, 1995). Frank W. Marlowe, "Hunter-Gatherers and Human Evolution", *Evolutionary Anthropology* 14 (2005): 54-67.

[15] Napoleon A. Chagnon, "Life Histories, Blood Revenge, and Warfare in a Tribal Population," *Science* 239: 4843 (1988): 985-992.

[16] Azar Gat, "The Causes of War in Natural and Historical Evolution", in *Human Morality and Sociality: Evolutionary and Comparative Perspetives*, ed., Henrik Høgh-Olesen, New York: Palgrave Macmillan, 2010, 164.

[17] See Anthony Lopez, this roundtable.

[18] John Tooby and Leda Cosmides, "The Evolution of War and its Cognitive Foundations," *Institute for Evolutionary Studies Technical Report, #88-1 (1988).*

[19] For an extended discussion about the fit between modern cues and evolved mechanisms, see Dan Sperber, *Explaining Culture: A Naturalistic Approach* (Oxford: Blackwell Publishing, 1996). For a discussion focusing on politics, see Michael Bang Petersen, "Public Opinion and Evolved Heuristics," *Journal of Cognition and Culture* 9:3 (October 2009): 367-389.

extent national identities are represented as groups, international conflict would be one obvious context in which such cues are present. Upon activation, the cues used to make the necessary estimations to govern choice would be cues relevant in the small-scale setting of our Pleistocene ancestors. If these mechanisms are indeed activated in the context of modern security issues, the implication would, in other words, be that modern citizens reason about these issues as if they occurred in small-scale settings.[20]

Large-scale warfare as if it occurred in a small-scale setting: Physical strength and modern security

The above arguments entail that we can build testable hypotheses about the structure of the folk psychology of security by considering which cues could be important regulators of security-related decisions in ancestral small-scale hunter/gatherer bands. In this section, I will provide a compelling example. By adopting the here specified approach, recent studies have predicted and demonstrated that the physical strength of the self and others influences how modern citizens reason in the face of international conflict.

In every culture, males are more prone to engage in group aggression than females.[21] From an evolutionary perspective, this is not surprising. In a time with limited long-range weapons, the strength of an individual would be an important factor in regulating the costs and benefits of engaging in physical aggression. Strong people would simply more often return home victorious. Sex differences in aggression are, in part, explainable from this observation.[22] Hence, males have on average 61 % more muscle mass than females[23] and, hence, would be less at risk in aggressive encounters. Yet, physical strength does not only vary between sexes – also within the male sex we find significant variations in strength. As argued in a recent study by Sell, Cosmides & Tooby, this variation should also influence the adaptiveness of aggression as a strategy in solving disputes.[24] From an evolutionary perspective, it would be more adaptive for physically strong males to engage in aggression because they are able to impose greater costs on their enemies and, hence, prevail more often in combat. Importantly, this argument is not only applicable to individual aggression

[20] Michael Bang Petersen, "Public Opinion and Evolved Heuristics", ibid.

[21] Richard Wrangham and Dale Peterson, *Demonic Males: Apes And The Origins Of Human Violence* (London: Bloomsbury, 1997).

[22] Sexual selection is another and more fundamental factor; see e.g., Azar Gat, "The Causes of War in Natural and Historical Evolution", in *Human Morality and Sociality: Evolutionary and Comparative Perspetives*, ed., Henrik Høgh-Olesen, (New York: Palgrave Macmillan, 2010): 160-190.

[23] William D. Lassek and Steven J. C. Gaulin, "Costs and benefits of fat-free muscle mass in men: relationship to mating success, dietary requirements, and native immunity," *Evolution and Human Behavior* 30:5 (September 2009): 322-328.

[24] Aaron Sell, John Tooby and Leda Cosmides, "Formidability and the Logic of Human Anger", *Proceedings of the National Academy of Sciences, vol. 106 (*2009*),* 15073-15078.

but also to group aggression. Ancestral hunter/gatherer bands would most likely not contain more than a dozen adult males and, hence, the fighting ability of each and every individual male would have influenced the probability that the group as a whole prevailed. Given this, it would be more adaptive for strong than weak males to engage not only in individual-level aggression but also in between-group aggression.

As argued by Sell et al., this creates the expectation that evolution has selected for psychological mechanisms that gauge the physical strength of the individual and from this and other cues activate appropriate motivational circuitry in the face of group conflict. In essence, physical strength should positively predict the motivation to use aggression and violence to solve such conflicts. This effect should hold across all decision-making contexts that would arouse the underlying evolved psychology. As argued, one such context would be international conflict between nation states. Hence, Sell et al. predicts that the physical strength of males positively influences their support of using aggression in solving international disputes. This prediction is supported in two separate studies with non-trivial effect sizes between .15 and .31. As also predicted, the relationship does not hold for females who ancestrally would have engaged in physical aggression to a lesser extent.

Because the small-scale nature of ancestral coalitions entails that the fighting ability of every participant would have influenced the success of the coalition, our folk psychology of security should not only attend to our own strength but also to the strength of those we associate with. In particular, in times of between-group aggression it would be adaptive for people to rally around physically strong individuals. Importantly – and in contrast to the preceding argument – this would be adaptive for *both* males and females. Males as well as females benefit from protection from formidable allies. Hence, to the extent evolved psychological mechanisms influence how modern individuals reason about national security issues, this would imply that individuals of both sexes, for example, prefer physically strong leaders in times of war. A recent study by Little, Buriss, Jones & Roberts provides compelling support for this prediction.[25] Little et al. investigated the effect of the facial masculinity of political candidates on vote choice. Importantly for the present argument, the degree of masculine facial traits in males is one cue to their physical strength.[26] In addition, Little et al. investigated the effect of contextual information on vote choice; specifically, whether subjects favored different candidates in times of war and in times of peace. Importantly, they found that during times of war, subjects strongly favored more masculine candidates than during peace time. In line with the evolutionary perspective, this relationship existed for both males and females.

Conclusion

[25] Anthony Little, Robert Burriss, Benedict Jones amd S. Craig Roberts, "Facial Appearance Affects Voting Decisions," *Evolution and Human Behavior* 28: 1 (2007): 18-27.

[26] Aaron Sell, Leda Cosmides, John Tooby, Daniel Sznycer, Christopher Von Rueden and Michael Gurven, "Human Adaptations for the Visual Assessment of Strength and Fighting Ability from the Body and Face," *Proceedings of the Royal Society London (Biological Sciences) 276 (2008): 575-584.*

As argued by Sell et al., "it would be delusional in the modern world to think that your personal strength determines – or even influences – how effective your nation's military will be in war."[27] In a similar way, it would be delusional to think that the strength of the president or a senator would influence how effective the military would be. Yet, both personal strength and cues to the strength of political candidates are assessed in the context of security. Seemingly, modern individuals reason about security issues as if they occurred in the setting of small-scale groups. In these settings, the physical strength of the individual members of the group would indeed influence the probability of success in combat.

It is in the ancestral environment of small hunter/gatherer-bands that our psychology acquired its design. In this environment, how individuals reasoned about group-based aggression would have affected their reproductive success and there is every reason to expect that the human psychology contains dedicated psychological mechanisms for reasoning about security. But because evolution selects for cue-sensitive psychological mechanisms rather than behavior per se, this psychology is expected to be sensitive to cues relevant in small-scale settings rather than factors relevant to the evolutionarily novel phenomenon of large-scale warfare. If we want to understand how modern individuals reason about security, we should, in other words, consider which cues were relevant in small-scale ancestral war and from this derive testable hypotheses on the factors governing modern citizens' intuitions.

Given the differences between ancestral and modern environments, there is no guarantee that our intuitions on security are adaptive today. At the same time, however, it its expectable that their deep psychological underpinnings make them hard to overwrite – even, perhaps, for the political leaders who eventually decide on whether states go to war or not. This quandary is probably the most compelling reason for dissecting the evolved psychology operating behind modern security intuitions.

[27] Aaron Sell, John Tooby and Leda Cosmides, "Formidability and the Logic of Human Anger," *Proceedings of the National Academy of Sciences 106 (*2009*):* 15077.

Essay by Jonathan Renshon, Harvard University

"Leadership Differences: What We Don't (Yet) Know About National Security Decision-Making."

The study of judgment and decision-making is in many ways a growth industry. Across a diverse group of disciplines such as neurobiology, economics, psychology and philosophy, there exists a growing interest in the science of decision analysis. Political science, and international relations in particular, has a large and well-regarded strand of research that applies the general approach of behavioral decision research to questions in the field of political science.[1] Much of that work is underpinned by theories and research agendas (e.g. prospect theory, attitude theory, etc.) borrowed from other disciplines in which experimental design is the most prevalent research paradigm. As a result, much of the work which informs current perspectives in political psychology is based upon results obtained using experimental methods and so-called "convenience samples" (often undergraduates).

It is a long-standing and coming common criticism of such research to complain that such results lack external validity because they so often rely on the judgments of teenagers. As early as 1946, McNemar observed that "the existing science of human behavior is largely the science of sophomores.[2]" The situation has not changed a great deal in the ensuing years.[3] Yet, the question of external validity is surely relative. If our interest is in public opinion or consumer spending choices, or our purpose is to establish some evidential basis for a new theory (a "plausibility probe"), then samples of undergraduate students might be a perfectly acceptable population.[4] However, whether such samples are appropriate for extrapolating to high-level national security decision-makers is another matter entirely.

In fact, the use of experimental studies to draw inferences in the domain of international security poses several very specific challenges. There are at least three critical reasons to

[1] For notable examples, see H. C. Kelman, *International Behavior: A Social-Psychological Analysis* (Holt, Rinehart & Winston of Canada Ltd, 1965); R. Jervis, *Perception and Misperception in International Politics* (Princeton: Princeton University Press, 1976); R. Jervis, "Deterrence and Perception," *International Security* 7 (1982): 3-30; J. S. Levy, "Prospect Theory and International Relations: Theoretical Applications and Analytical Problems," *Political Psychology* 13 (1992): 283-310; R. C. Snyder, H. W. Bruck, B. M. Sapin, V. Hudson, D. H. Chollet and J. M. Goldgeier, *Foreign Policy Decision-Making (Revisited)* (New York: Palgrave Macmillan, 2002); V. M. Hudson, "Foreign Policy Analysis: Actor-Specific Theory and the Ground of International Relations," *Foreign Policy Analysis* 1 (2005): 1-30.

[2] Q. McNemar, "Opinion-Attitude Methodology," *Psychological Bulletin* 43 (1946): 333.

[3] M. E. Gordon, L. A. Slade and N. Schmitt, "The 'Science of the Sophomore' Revisited: From Conjecture to Empiricism," *The Academy of Management Review* 11 (1986): 191-207.

[4] For a broader statement of this argument, see D. G. Mook, "In Defense of External Invalidity," *American Psychologist* 38 (1983): 379-387.

worry that experimental research has given us a false sense of security in our study of international conflict. First, traditional pools of subjects are likely to differ from most political leaders on key demographic dimensions (e.g. age, gender, political beliefs) that are almost certain to affect the translation of results from college campuses to the Oval Office. Second, there are potentially huge selection effects that impact who actually *becomes* a high-level political leader. Finally, institutional pressures or socialization into well-defined roles and mindsets may lead to differences in the way that leaders from a given organization make decisions (relative to the general population). This brief essay explores how these issues impact the manner in which we can and should draw lessons for international security from experimental research, as well as suggesting possible avenues for future research to compensate for these concerns.[5]

Selection Effects

Not everyone aspires to or can become a high-level leader. Powerful selection effects impact who becomes a leader in the first place. The intuition behind this problem is as follows: Imagine for a moment that there were no situational or institutional pressures which made decision-making in White House (or 10 Downing Street or the Presidential Palace) different than decision-making in a lab. Imagine as well that there were no important demographic differences between our subjects and real-world leaders. If students from a high-profile university were our subjects (call them population *A*), we could have a reasonable expectation that some subset of them will end up being leaders that influence national security policy (sub-population *B*, denoted as $B \subseteq A$). We might find that 80% of these subjects were risk-averse in their choices. Yet, for subjects from population A to satisfy us, we would have to make the somewhat incredible jump in logic to believe that high-level political leaders were selected randomly from this broader population. However, there are powerful reasons to believe that this is not the case. And if sub-population *B* is not drawn randomly from the broader population (*A*), we have no way of knowing how to interpret the implications of our findings for group *B*.

This matters because there is every reason to believe that the ways in which leaders differ from the general population may be important in determining their behaviors and decisions in national security situations. As an example, consider the argument of Post, who has argued that the ranks of the political elite are filled with "successful narcissists.[6]" In a more recent work, McIntyre et al. found that individuals who scored high on

[5] This essay is far from the first to note the potential challenges to external validity that result from traditional subject pools. However, it is as far as I know the only work to point out the specific problems posed by the application of such methods to security studies. For more general treatments of experimental methodology in political science, see D. R. Kinder and T. R. Palfrey, "On Behalf of an Experimental Political Science," *Experimental foundations of political science* (1993): 1-42; R. McDermott, "Experimental Methods in Political Science," *Annual Review of Political Science* 5 (2002): 31-61.

[6] J. M. Post, "Current Concepts of the Narcissistic Personality: Implications for Political Psychology," *Political Psychology* 14 (1993): 99.

narcissism scales were 10 times more likely than other individuals to launch attacks in a simulated war-game.[7]

In fact, there are likely to be two different types of selection effects at work in producing leaders who impact decisions in the domain of international security. The first is *self-selection*. Individuals who choose to pursue a career in either politics or the national security bureaucracy may differ from the general population on any number of key characteristics (and from each other as well!). Moreover, something about those characteristics may be related to the decision to run for office or apply for a job with the CIA (for instance, it is easy to imagine that individuals high in extraversion or self-confidence might be more likely to seek elected office). The second type of selection effects are akin to the concept of "selection pressures" in evolutionary biology. That is, certain characteristics will be advantageous in particular political or bureaucratic contexts. As a result, individuals with those characteristics will have a higher likelihood of succeeding and moving on in their careers than those without. Combined, the selection effects are likely to impact both who decides to seek office in the first place, as well as who ends up succeeding. At each of these two levels of selection, certain behavioral tendencies or personality characteristics might become more or less prevalent at the group-level.

There are several reasons why this may pose a problem for the interpretation of experimental results that use traditional subject pools. Consider the notion of risk. A great deal depends on how risk acceptant leaders are in national security decision-making. To take one well-known example, had Nikita Khrushchev been less risk-acceptant, he would have been far less likely to deploy nuclear weapons in Cuba. Political scientists differ in the assumptions they make on this matter. Many formal models of international relations, and most IR theorists, assume a world in which decision-makers are risk-neutral or risk-averse.[8] Political psychologists often counter that such preferences are not stable, but rather that leaders are risk-averse in the domain of gains and risk-acceptant in the domain of losses, as described by prospect theory.[9]

Furthermore, a growing body of research has argued for the influence of personality characteristics in affecting how individuals make risky choices. Kowert and Hermann, for instance, found that subjects who were low on anxiety and deliberation measures were risk-insensitive; that is, they paid less attention to problem framing, and took risks

[7] M. H. McIntyre, E. S. Barrett, R. McDermott, D. D. P. Johnson, J. Cowden and S. P. Rosen, "Finger Length Ratio (2d: 4d) and Sex Differences in Aggression During a Simulated War Game," *Personality and Individual Differences* 42 (2007): 755-764.

[8] For a notable example, see J. D. Fearon, "Rationalist Explanations for War," *International Organization* 49 (1995): 379-414.

[9] D. Kahneman and A. Tversky, "Prospect Theory: An Analysis of Decision under Risk," *Econometrica* 47 (1979): 263-291; see also J.S. Levy, "Applications of Prospect Theory To Political Science," *Synthese* 135 (2003): 215-241; R. McDermott, "Prospect Theory in Political Science: Gains and Losses from the First Decade," *Political Psychology* 25 (2004): 289-312.

regardless of the whether or not they faced a loss.[10] Research on the personality characteristics associated with risky decision-making is ongoing, indicating that the question is far from settled.[11]

In addition to the complexity[12] generated by our incomplete understanding of risk preferences in general, we must add to the picture that selection effects are likely to affect the overall levels of risk acceptance in the population of political leaders or national security decision-makers. Consider as an illustrative example the hazards that potential future dictators face as they try to attain and consolidate political power. Attempting to take control of a government through a coup d'état is often punished with the swift application of the death penalty (treason is a capital crime even in many liberal democratic polities). Thus, even at this first decision point (whether or not to attempt a coup), only individuals with high levels of risk-acceptance (or risk insensitivity) are likely to persevere.[13]

One could make a similar case for leaders of democratic polities who choose to run for office. In fact, whether and how democratic leaders differ from the general population is a classic research question in the field of American Politics, often grouped under the terms "elite/leadership recruitment." Interest in this dates back at least as far as Harold Lasswell, who argued that individuals motivated solely by the pursuit of power may be too rigid to ever attain political power.[14] Winning high-level political office is so unlikely as to be

[10] In contrast, subjects high on deliberation and anxiety measures were more aware of risk and more likely to either avoid it entirely (if they scored particularly high on anxiety) or behave in a manner predicted by prospect theory (if they scored high on conscientiousness). P. A. Kowert and M. G. Hermann, "Who Takes Risks? Daring and Caution in Foreign Policy Making," *The Journal of Conflict Resolution* 41 (1997): 623.

[11] See also M. Lauriola and I. P. Levin, "Personality Traits and Risky Decision-Making in a Controlled Experimental Task: An Exploratory Study," *Personality and Individual Differences* 31 (2001): 215-226; I. P. Levin, G. J. Gaeth, J. Schreiber and M. Lauriola, "A New Look at Framing Effects: Distribution of Effect Sizes, Individual Differences, and Independence of Types of Effects," *Organizational Behavior and Human Decision Processes* 88 (2002): 411-429; E. Soane and N. Chmiel, "Are Risk Preferences Consistent? The Influence of Decision Domain and Personality," *Personality and Individual Differences* 38 (2005): 1781-1791.

[12] The summary of risk preferences above is abbreviated and as a result, incomplete. Many other perspectives on risky decision-making have been advanced, including in the burgeoning field of emotion research. See J. S. Lerner and D. Keltner, "Fear, Anger, and Risk," *Journal of Personality and Social Psychology* 81 (2001): 146-159.

[13] There are additional pressures pushing in the same direction once these leaders gain power. As Goemans has argued (and found support for), leaders of so-called "mixed regimes" are likely to face severe punishment (potentially execution) from their populace if they lose wars because their regimes are not repressive enough to have de-fanged all potentially threatening opposition leaders. As a result, such leaders face powerful adverse incentives that incline them toward escalation and continued fighting, even in a losing effort. H. E. Goemans, "Fighting for Survival: The Fate of Leaders and the Duration of War," *Journal of Conflict Resolution* 44 (2000): 555-579.

[14] See also R. E. Lane, *Political Life: Why People Get Involved in Politics* (Free Press, 1959); R. P. Browning and H. Jacob, "Power Motivation and the Political Personality," *Public Opinion Quarterly* 28 (1964): 75-90

roughly the statistical equivalent of winning the lottery. From the very beginning, the odds are set highly unfavorable, the barriers to entry extremely high, and the penalty for losing often quite public. Further, many politicians (obvious examples include Richard Nixon and Bill Clinton) have experienced quite humiliating defeats which must have served to emphasize to them the costs of continuing to pursue high political office. If this were true, then almost by definition we would expect political leaders to be in the long tail of the distribution with respect to risk-acceptance.[15]

Demographic Matching

Setting aside the issue of selection effects into leadership positions, there are additional considerations that are worth exploring. Imagine now that we have those same two groups (large student population *A*, small subset of that population, *B,* that goes on to become a national-security decision-maker or attain political office). If *B* is selected randomly from *A* (which it is not, but this is just a thought experiment), then we might think that we should have more confidence in our ability to make inferences about *B* from results that utilize the population *A.* However, there are often important demographic differences between the leaders who make national security decisions and the students that comprise subject populations.

These demographic differences can critically affect judgment and decision-making. Consider age, one of the variables most likely to differ between leader populations and traditional subjects. Broadly speaking, subject populations tend to be relatively young, while leaders tend to be much older: the average age of a United States president upon taking office has been roughly 54 years old, more than 30 years older than the average subject in a "convenience sample" of undergraduates. Even for un-elected officials, it takes a considerable amount of time for one's career to advance to the stage at which they might wield sizeable influence over policy matters.

There are a host of reasons to wonder whether such vast differences will lead to difference behavior. As an example, consider the role of the hormone testosterone, whose levels vary significantly with age. Testosterone increases around puberty, peaks in 20's (for men), and declines slowly and predictably thereafter. For women, menopause causes an increase in the production of testosterone such that at middle age, men and women reach similar levels of the hormone.[16] This matters for the study of international security because testosterone may have important implications for aggression, status-seeking and dominance behavior (this link is considered all but certain for primates, though it is still controversial in human beings; see Archer 1991; Mazur and Booth 1998; Book, Starzyk et al. 2001). McDermott et al. found that older women (who typically have higher

[15] I thank Rod Kramer for this insight.

[16] M. Horowitz, R. McDermott and A. C. Stam, "Leader Age, Regime Type, and Violent International Relations," *Journal of Conflict Resolution* 49 (2005): 661-685.

testosterone levels than younger women) were more likely than younger women to make unprovoked attacks in a simulated crisis game.[17]

Institutional Pressures

In addition to selection effects (which determine who pursues and who is successful in politics) and key demographic differences (which separate the average national security decision-maker from the average subject), institutional pressures may affect how leaders make decisions once they attain positions of power. What I term "institutional pressures" are any external or group pressures that change or otherwise affect the choices, behavior or beliefs of individuals (the size of the group may be a small as a elite coterie of presidential advisors or as large as a large government bureaucracy).

These pressures have been studied in a multitude of ways over the years. The political socialization sub-field, for instance, has examined how and when key political beliefs form.[18] While much of the early work in this area was devoted to early (pre-adult) developmental stages, some of it also explored how political leaders developed their beliefs once in office.[19] More recent work in the constructivist vein of international relations has focused on socialization of political elites into the international community of states.[20] A related research focus has been the study of bureaucratic politics as summed up in the aphorism "where you stand depends upon where you sit." In this literature, it is argued that the different responsibilities, protocols and interests that come bundled with a given job or title influence how the individual sees and responds to the set of problems at hand.[21]

Other research that has dealt with this subject focuses specifically on group decision-making. Indicative of this is the research focused on the "risky shift" phenomenon, which described the tendency of groups to make riskier decisions than the members made

[17] R. McDermott, D. Johnson, J. Cowden and S. Rosen, "Testosterone and Aggression in a Simulated Crisis Game," *The ANNALS of the American Academy of Political and Social Science* 614 (2007): 15-33.

[18] The literature on political socialization is voluminous. For a recent review, see V. Sapiro, "Not Your Parent's Political Socialization: Introduction for a New Generation," *Annual Review of Political Science* 7 (2004): 1-23.

[19] E.g. A. Kornberg and N. Thomas, "The Political Socialization of National Legislative Elites in the United States and Canada," *The Journal of Politics* (1965): 761-775; J. L. Sullivan, P. Walsh, M. Shamir, D. G. Barnum and J. L. Gibson, "Why Politicians Are More Tolerant: Selective Recruitment and Socialization among Political Elites in Britain, Israel, New Zealand and the United States," *British Journal of Political Science* 23 (1993): 51-76.

[20] E.g. A. I. Johnston, *Social States: China in International Institutions, 1980-2000* (Princeton: Princeton University Press, 2008).

[21] G. T. Allison and M. H. Halperin, "Bureaucratic Politics: A Paradigm and Some Policy Implications," *World Politics: A Quarterly Journal of International Relations* (1972): 40-79; R. J. Art, "Bureaucratic Politics and American Foreign Policy: A Critique," *Policy Sciences* 4 (1973): 467-490.

individually.[22] It was soon discovered that "cautious shifts" could also be induced, leading the more robust theory of group polarization: the observation that initial tendencies of individual group members are strengthened and exaggerated by group discussion and decision-making.[23] Related research has focused on "groupthink," or the tendency for excessive consensus-seeking behavior among small, coherent groups.[24]

It seems clear that in some cases, these types of institutional pressures are likely to affect the judgment and decision-making of key actors in ways that might have relevance for international security. One way that it does so is through decision structures that encourage accountability for judgments and decisions. While not all types of accountability necessarily improve decision-making, there is good evidence that some biases can be attenuated by the right structure.[25] For instance, the tendency to escalate commitment to a losing venture (sunk costs bias) is attenuated by "pre-decisional accountability" (this refers to a type of accountability in which subjects know before the decision task that they will be asked to justify their choices).[26] Research (and theory) that fails to take this into account is likely to either over or under-estimate the effects of this important bias if the bureaucratic and institutional context is not properly taken into account.

Think for example of the commonly made argument that U.S. military culture discourages risk-taking.[27] A useful illustration of this is the experience of the U.S. Navy's Pacific submarine fleet in World War II. Technology in the 1930s was such that submarines were very much at the mercy of ships if discovered; once detected, a sub had only a one-in-seven chance of avoiding a depth charge that could cause irreparable harm. As a result, Navy culture prior to WWII had inculcated a highly conservative doctrine with respect to

[22] N. Kogan and M. A. Wallach, "Risky-Shift Phenomenon in Small Decision-Making Groups: A Test of the Information-Exchange Hypothesis," *Journal of Experimental Social Psychology* 3 (1967): 75-84.

[23] D. G. Myers and H. Lamm, "The Group Polarization Phenomenon," *Psychological Bulletin* 83 (1976): 602-627.

[24] I. L. Janis, *Groupthink* (Boston: Houghton Mifflin, 1982); J. K. Esser, "Alive and Well after 25 Years: A Review of Groupthink Research," *Organizational Behavior and Human Decision Processes* 73 (1998): 116-141.

[25] J.S. Lerner and P.E. Tetlock, "Accounting for the Effects of Accountability," *Psychological Bulletin* 125 (1999): 255-275.

[26] I. Simonson and P. Nye, "The Effect of Accountability on Susceptibility to Decision Errors," *Organizational Behavior and Human Decision Processes* 51(1992): 416-446. As with risk preferences, the picture is reasonably complex. While pre-decision accountability attenuates the tendency to escalate commitment and focus on sunk costs, *post*-decisional accountability amplifies this bias.

[27] For recent examples of this argument, see P. E. Bierly and J. C. Spender, "Culture and High Reliability Organizations: The Case of the Nuclear Submarine," *Journal of Management* 21 (1995): 639-656; E. Dorn, H. D. Graves, W. F. Ulmer, J. J. Collins and T. O. Jacobs, *American Military Culture in the Twenty-First Century: A Report of the CSIS International Security Program* (Washington, DC: Center for Strategic & International Studies, 2000).

submarines; they were meant to stayed submerged as long as possible, avoid the use of periscopes (to search for enemy ships) and fire on sonar information alone.

Dovetailing with this, those who rose through the ranks to become commanders of submarines were highly cautious men. The training, strategy and culture that had been drilled into the commanders for years prior to the war worked, although perhaps too well. Although there were many sighting of the ships that the subs were meant to attack, very few were actually destroyed. Immediately upon positive sightings, most commanders would immediately submerge, effectively nullifying any chance they had of a successful attack. In other words, a combination of selection effects (what *type* of commander was given command of submarines pre-WWII) and organizational culture and doctrine combined to create a submarine force that was entirely ineffective, even at destroying unarmed merchant ships. In an effort to increase the efficiency of the submarine force, Admiral James Fife replaced fully one-third of the submarine commanders with younger men. The effect of this was twofold; the younger men were naturally more risk seeking, but had also been promoted late enough to avoid training in the risk-averse culture of the 1930's. The results of this demographic shift were immediately clear: the younger, more daring commanders immediately started to inflict considerable damage on Japanese ships.[28]

Moving Forward

Given the issues discussed above, how can we reach a greater understanding of the psychology (and neurobiology) of national security decision-making? There are several actions that would aid us in this effort. First, we obviously must take greater care in extrapolating from experimental studies to the real world of international security. Psychological research can shed light on outcomes of interest in international relations, but political scientists who make use of laboratory studies must at least note for their readers the caveats involved in extrapolating from the controlled conditions of a laboratory to a subject pool and domain that is entirely different.

Second, it would help in future experiments to use subjects that more closely resemble the population of real-world leaders on general demographic characteristics. Age, for instance, is a critical variable that has many important ancillary implications (e.g. time horizons, hormone levels, etc.). While plausibility probes are defensible with the convenience samples usually available to researchers, greater efforts should be made to also match subjects on demographics so that the groups look more similar on key dimension to real-world leaders.

Third, to the extent that we believe socially defined "roles" impact decision-making, normal citizens might be inducted into the role of a political leader. While of course it is not possible to use an induction that requires years of socialization into a leadership role, it is

[28] This story is borrowed from S. P. Rosen, *Winning the Next War: Innovation and the Modern Military* (NY: Cornell University Press, 1994), chapter 5.

almost certainly not necessary. If even weak, laboratory manipulations were able to induce differences in subjects primed to "act like a leader" then this would provide compelling evidence of the importance of socialization and roles.

Last and most important, we must continue to expand the use of "unusual subject pools" in experimental research. In recent years, we have witnessed a positive trend as more and more studies (though still an extremely small number in absolute terms) have focused on replicating or extending findings with unusual subject populations. The results have been mixed. In some cases, experimental work intended to replicate an original finding in a different sample population has yielded similar results. For instance, Glaser et al. found that professional traders were just as likely (even more in some circumstances) to exhibit biased overconfidence.[29] Other experiments have verified this finding that professionals are at least as likely as students and the general population to evince overconfidence in forecasting and decision-making, or that professional economists are just as susceptible to framing effects as college students.[30]

In other cases, such as cross-cultural work on decision and judgmental biases, findings from different populations have forced researchers to modify and refine existing models of judgmental biases. The tendency to over-attribute responsibility to disposition and neglect contextual factors was once thought to be so widespread that the moniker "*Fundamental* Attribution Error" seemed to accurately describe the phenomenon.[31] However, much recent work has found that this type of attribution error may only predominate in individualist cultures; collectivist cultures (such as India, China and Japan) seem to prefer situational explanations for behavior.[32]

---

[29] M. Glaser, M. Weber and T. Langer, "Overconfidence of Professionals and Lay Men: Individual Differences within and between Tasks?" *SSRN eLibrary* (2005).

[30] For a small sample of these studies, see H. R. Arkes, R. L. Wortmann, P. D. Saville and A. R. Harkness, "Hindsight Bias among Physicians Weighing the Likelihood of Diagnoses," *Journal of Applied Psychology* 66 (1981): 252-254; T. Ehrbeck and R. Waldmann, "Why Are Professional Forecasters Biased? Agency Versus Behavioral Explanations," *The Quarterly Journal of Economics* 111 (1996): 21-40; G. Torngren and H. Montgomery, "Worse Than Chance? Performance and Confidence among Professionals and Laypeople in the Stock Market," *Journal of Behavioral Finance* 5 (2004): 148-153; E. Fatas, T. Neugebauer and P. Tamborero, "How Politicians Make Decisions: A Political Choice Experiment," *Journal of Economics* 92 (2007): 167-196.

[31] L. Ross, "The intuitive psychologist and his shortcomings: distortions in the attribution process," in L. Berkowitz (ed.) *Advances in experimental social psychology* (New York: Academic Press, 1977), 173-220.

[32] H. R. Markus and S. Kitayama, "Culture and the Self: Implications for Cognition, Emotion, and Motivation," *Psychological review* 98 (1991): 224-253; M. W. Morris and K. Peng, "Culture and Cause: American and Chinese Attributions for Social and Physical Events," *Journal of Personality and Social Psychology* 67 (1994): 949-971; F. Lee, M. Hallahan and T. Herzog, "Explaining Real-Life Events: How Culture and Domain Shape Attributions," *Personality and Social Psychology Bulletin* 22 (1996): 732-741.

However, not all findings can be replicated with different subject populations. In particular, there appear to be some potentially important differences between students and laypeople as compared to political officials and military personnel. Mintz et al. conducted an experiment in which a foreign policy-based scenario was given to a sample of undergraduates and military commanders from the National Defense University (NDU).[33] Several major differences emerged. Military officers chose to "do nothing" only 8% of the time, compared to 35% for students. Students also accessed considerably more information than officers before making a decision and were far more likely to employ "maximizing" decision strategies than officers (who were more likely to employ "satisficing" strategies).

While the Mintz et al. study was the only experiment we are aware of to use military officers as subjects, other research efforts in the past decade or so have gradually begun to recruit more "elite" subjects and have found significant differences between those samples and the standard student or laypeople pools. Fehr and List, for example, found that chief executive officers (CEOs) were both more trusting and more trustworthy than students in experimental settings.[34] Alatas et al. found that Indonesian public servants exhibited different patterns of beliefs and tolerance for corruption than Indonesian students.[35]

Most recently, researchers at the Harvard Decision Science laboratory (http://decisionlab.harvard.edu/) have initiated a multi-year study of leadership decision-making. The subjects in this research are taken from the Senior Executive Fellow (SEF) program at the Harvard Kennedy School. Participants in this program are high-ranking government employees and military personnel. They included members of every branch of the U.S. armed forces as well as representatives from FEMA, Department of Energy Department of Defense, Department of Education, Department of State, as well as several foreign governments. In one preliminary result, Lerner, Inbar et al. compared the SEFs to control subjects using the Adult Decision-Making Competence index, which measures performance on a variety of tasks relevant to real-world decision-making.[36] They found that the leadership sample showed "significant bias" on a number of behavioral tasks (resistance to framing, consistency in risk perceptions and resistance to sunk costs), but lower levels of bias *relative* to control subjects.

---

[33] A. Mintz, S. B. Redd and A. Vedlitz, "Can We Generalize from Student Experiments to the Real World in Political Science, Military Affairs, and International Relations?," *Journal of Conflict Resolution* 50 (2006): 757-776.

[34] Ernst Fehr and John A. List, "The Hidden Costs and Returns of Incentives-Trust and Trustworthiness among CEOs," *Journal of the European Economic Association* 2 (2004): 743-771.

[35] V. Alatas, L. Cameron, A. Chaudhuri, N. Erkal and L. Gangadharan, "Subject Pool Effects in a Corruption Experiment: A Comparison of Indonesian Public Servants and Indonesian Students," *Experimental Economics* 12 (2009): 113-132.

[36] W. B. de Bruin, A. M. Parker and B. Fischhoff, "Individual Differences in Adult Decision-Making Competence," *Journal of Personality and Social Psychology* 92 (2007): 938-956.

The application of behavioral decision research to questions of interest in security studies is a natural and important cross-disciplinary endeavor. Research conducted at this juncture can have a meaningful impact on both how we understand key decisions of the past, as well as how we organize our political institutions and train young leaders in the future. In order to have this effect, however, we must be attentive to the particular challenges of studying national security decisions in the highly artificial context of the laboratory. These challenges as described in this brief essay are not insurmountable, and it is my hope that some of the suggestions found in these pages will provide some small amount of guidance for future research.

Essay by Brad Verhulst, Stony Brook University

"Towards a Biological Understanding of National Identification."

Categorizing people based on whether they are similar or different from one's self is an innate behavior that motivates the identification with one group rather than another.[1] This process is rooted in fundamental differences between the way people innately perceive and categorize objects. The more similar objects are to each other, the more likely people will group the objects into the same category. The basic drive to organize the world into discrete categories extends beyond simple objects to people and social groups, and generalizes across increasingly significant differences. In fact, young children, who have not completely learned the culturally dominant categorization schemes, automatically categorize along important biological dimensions like age and race.[2] The distinction between racial or linguistic categories begins to blur, however, as the groups get larger and begins to include less prototypical group members. Considering modern states are very rarely comprised of a single ethnic, racial or linguistic group, making natural group delineations impossible, national identification can be viewed as a relatively high order type of categorization. Nevertheless, strong group attachments to large abstract groups are still rampant, as is substantiated by patriotic and nationalistic sentiments.

It is important to qualify this statement, however, as within every society smaller groups exists that vie for distinctiveness.[3] People simultaneously identify with multiple groups, often in a hierarchical fashion, with the strongest attachments given to groups that are most relevant to an individual's identity, like inherent familial ties, and weaker though non-trivial attachments to larger, more diffuse groups, like the acquired ties to one's country.[4] One interpretation of this observation is that the strongest groups that people identify with are the most biologically grounded, while attachment to more socially constructed groups is socialized, albeit at a very young age. Therefore, it appears that the basic process of identification with members of one's biological family, which is inherent in the human condition, can be employed to enhance identification with groups that lack any biological connections. Understanding this basic identification processes, with roots in biologically driven social attachments, therefore, plays an integral role in understanding of group conflicts and attitudes toward other groups, such as those between states.

---

[1] John C Turner et al, *Rediscovering the Social Group: Self-Categorization Theory* (Oxford: Basil Blackwell, 1987).

[2] L.A. Hirschfeld, Do children have a theory of race? *Cognition* 54:2 (1995): 209-252.

[3] J. Sidanius, S. Levin, and F. Pratto, "Consensual social dominance orientation and its correlates within the hierarchical structure of American society," *International Journal of Intercultural Relations* 20:3-4 (1996): 385-408.

[4] L. Huddy, "From Social to Political Identity: A Critical Evaluation of Social Identity Theory," *Political Psychology* 22:1 (2001), 136.

Since groups form naturally, it is very difficult to account for all of the possible factors that lead to conflict among groups. In order to combat this difficulty, researchers create groups within controlled conditions that allow for measurable comparisons. In such situations, groups and group loyalty is extremely easy to induce, even if groups are created by random selection.[5] Further, these fabricated groups behave as if they were naturally occurring groups.[6] Despite this randomized component of group formation, group membership still drives individuals' behavior leading them to be biased in favor of other in-group members and antagonistic towards out-group members.[7] Even when people have no prior contact with members of the in-group or the out-group, nor have any expectation of future contact, individuals still exhibit a strong preference for in-group members over outsiders.

In reality, social groups, whether biological or social, are differentiated along legitimate lines of distinctions, not aesthetic preferences or random selection. Family, ethnicity, religion, nationality, language or countless other criteria provide people with ample sources of biological and social categories to divide their worlds. Extrapolating from experimentally created groupS to naturally occurring groups, where membership is personally meaningful and the consequences of membership are more severe, identification and categorization are likely to be even more apparent and have an even greater influence over the behavior of members.[8] Importantly, the effects observed in the laboratory hold true in actuality where self-relevant groups amplify the importance of the social identity. Competition between social groups often leads to the devaluation of the out-group and the increased desire for further differentiation. What is overwhelmingly clear is that the mere existence of an identifiable out-group increases the desire to distinguish between groups and aids in the reciprocal definition of the in-group.[9] As groups strive to differentiate themselves from each other, the out-groups become the enemy, reinforcing in-group cohesion.

Two observations from the preceding discussion can be elaborated on and, to a limited extent, examined for plausibility in the foreign policy domain. First, social identity theory suggests that this categorization process happens outside of conscious awareness,

---

[5] M. Billig & H. Tajfel, "Social Categorization and Similarity in Intergroup Behavior," *European Journal of Social Psychology* 3 (1973): 27-52.

[6] M. Sherif & C.W. Sherif, *Groups in Harmony and Tension: An Integration Studies on Intergroup Relations* (New York: Octagon Books, 1953). H. Tajfel, "Interindividual Behavior and Intergroup Behavior" in Tajfel, ed., *Differentiation between Social Groups: Studies in the Social Psychology of Intergroup Relations* (London: Academic Press Inc., 1978), 32.

[7] Sherif & Sherif, *Groups in Harmony and Tension*.

[8] D.K. Gupta, *Path to Collective Madness: A Study in Social Order and Political Pathology* (Westport: Praeger, 2001), 104.

[9] Ibid.

suggesting that individuals automatically differentiate themselves from others, perceive the world in terms of distinct groups, and facilitate the identification with one group and differentiation from another. If true, group attachment should not be mediated by conscious thought. I will present evidence for this in the next section. Second, if group attachment and behaviors that protect the group truly have a biological component, there should be some heritable component to these traits. Accordingly, these traits are too important for the maintenance of the group to be trusted to social transmission between generations. I will explore this hypothesis in the third section.

Towards a neuronal understanding of attitudes and preferences

The claims of social identity theory rest on the assumption that the cognitive processes involved in social categorization are automatic, however the supporting evidence rarely explores this automatic component. The theoretical model of cognition most political scientists rely on to understand the automatic activation of concepts in memory is the associationist model of cognition. [10] Naturally, the associationist model of cognition is an oversimplification of neuronal processes, but the metaphorical clarity that underlies the theory makes it accessible to a wide audience. The basic metaphor is that concepts in memory are associated with other related concepts with the assumption that the links in memory are analogous to the synaptic connections between neurons: the more related the concepts, the stronger the association.

This assumption is consistent with behavioral evidence from cognitive psychology demonstrating that more accessible concepts are retrieved more quickly from long-term memory. Implicit attitudes measures assess the length of time it takes to retrieve, comprehend and evaluate a concept, capitalizing on the fact that closer associations between the concepts take less time to process. When a person is presented with one word (say sparrow) it is easier for them to retrieve related concepts from memory (like bird, feathers or nest).[11] As such, when a person consciously or unconsciously perceives a stimulus, the stimulus automatically activates the concept itself as well as spreading activation to its linked associations. To test the strength of the connection between concepts, one can simply present (or prime) people with an initial stimulus followed by another stimulus (the target) that may or may not be associated with it in memory. The

[10] J.R. Anderson, *The Architecture of Cognition* (Cambridge: Harvard University Press, 1983). R.H. Fazio, D. M. Sanbonmatsu, M.C. Powell, & F.R. Kardes, "On the Automatic Activation of Attitudes," *Journal of Personality and Social Psychology* 50 (1986): 229-238. This is a very brief outline of the associationist model that glosses over the major assumptions and ignores the niceties of the theory. If readers would like a more detailed description of the theory they should consult Anderson and A. Collins & E. Loftus, "A spreading-activation theory of semantic processing," *Psychological Review* 82 (1975): 407–428. A. Collins & M.R. Quillian, "Retrieval time from semantic memory," *Journal of Verbal Learning and Verbal Behavior* 8 (1969): 240–247. A.W. Staats & C.K. Staats, "Attitudes established by classical conditioning," *Journal of Abnormal Psychology* 57:1 (1958): 37-40.

[11] Collins and Quillian, "Retrieval Time"; J.H. Neely, "Semantic Priming and Retrieval from Lexical Memory: Roles of Inhibitionless Spreading Activation and Limited-Capacity Attention," *Journal of Experimental Psychology: General* 106:3 (1977): 226-254.

more closely the concepts are related in memory, the easier (and therefore faster) it is to respond to the target stimulus. The assumption is that faster responses are made possible by denser neuronal connections.

So how can this theoretical model be applied to automatic attitudes toward other groups? Prior research has demonstrated that at the implicit level there is an innate preference for the in-group over the out-group, consistent with the expectations derived from social identity theory. Research using the Implicit Association Task (IAT)[12] has demonstrated that automatic preferences across a wide variety of different groupings, like the classic implicit racial attitudes, compatriots over foreigners, or simply people from one's on racial group over other racial groups.[13] In a conceptual replication using a sequential priming task instead of the IAT, in-group preferences activated simple positive and negative words, implying that the in-group is perceived as inherently good while the out-group is perceived as inherently bad at the preconscious level.[14]

Two specific results deserve special mention. First, when people are primed with in-group pronouns like "we," "us," or "our", they respond to positive trait target words more quickly and negative target traits words more slowly.[15] By contrast, when people are primed with out-group pronouns like "them," "they," or "theirs," the opposite pattern of results was found: people respond faster to negative relative to positive trait words when primed with out-group pronouns. It is important to mention that the out-group results were weaker than the in-group results, which is consistent with the other findings suggesting in-group favoritism and out-group derogation are relatively distinct and the primary mechanism in social identity is the maintenance of a positive evaluation of the in-group.[16] These findings support the associationist concept of an automatic (neural) connection between the in-

[12] To explore the IAT visit *http://www.yale.edu/implicit/*

[13] A.G Greenwald, D.E. McGhee & J.L.K. Schwartz, "Measuring individual differences in implicit cognition: The implicit association test," *Journal of Personality and Social Psychology* 74:6 (1998): 1464-1480. J. De Houwer, "A structural and process analysis of the Implicit Association Test" *Journal of Experimental Social Psychology* 37 (2001): 443–451. B.A. Nosek, "Moderators of the Relationship between Implicit and Explicit Evaluation," *Journal of Experimental Psychology, General* 134:4 (2005): 565–584.

[14] C. W. Perdue, J.E. Dovidio, M.B. Gurtman & R.B. Tyler, "'Us' and 'them': Social categorization and the process of intergroup bias," *Journal of Personality and Social Psychology* 59 (1990): 475-486. I. Burdien, M. Lodge, & C. Taber, "Implicity Identifications in Political Information Processing: An experimental test of the Hot Identifications Hypothesis," (2005) Unpublished Manuscript.

[15] Ibid. The Positive trait words in the Purdue et al paper are helpful, clever, tolerant, observant, skillful, competent, obedient, persuasive, inquisitive, careful, thrifty, systematic, sentimental, courteous, studious, entertaining, logical, and practical. The negative trait words are disagreeable, prejudiced, conforming, clumsy, sarcastic, possessive, wasteful, inconsistent, impolite, touchy, gullible, irresponsible, forgetful, indecisive, envious, stubborn, sloppy, and irritable.

[16] M.B. Brewer, "In-group bias in the minimal inter-group situation: A cognitive motivational analysis," *Psychological Bulletin* 86 (1979): 307–324.

group and positivity, and a weaker, though still present, association between the out-group and negativity.

This automatic connection can be pushed even further. When in-group pronouns are repeatedly paired with nonsense syllables, thus creating an association or neural connection between the concepts, the nonsense syllables (xeh. yof, laj, giw, wuh, or qug) paired with in-group words are evaluated much more positively than the same nonsense syllables paired with out-group syllables.[17] Thus, the evaluative component of the in- or out-group is transferred to these random strings of letters even in the absence of any initial inherent meaning of the letters. One would expect that if the letters formed real words with real meanings, people would form associations between positive concepts and in-group pronouns, or negative concepts and out-group pronouns faster than the reverse. Thus it is easier to convince people that "we are good and they are bad" than "we are bad and they are good." More importantly, these connection can be created with minimal, if any, conscious attention.

The application to foreign policy or diplomatic studies from this point is a very small step, which is where the behavior of political elites is the most clear. Elites drive the definition of who belongs to which group. Political and national leaders routinely reinforce these associations by categorizing the in-group by words like good, valiant, victims, humans, while the out-group is categorized bad, evil, oppressors, and sub-humans.[18] These words are not neutral, and this non-neutrality makes the associations self-reinforcing, easier to create, and more stable over time. These euphemisms help individuals differentiate between social categories by creating easily understood groups that serve as the basis for their social environment by building on natural cognitive processes. Notably, the way groups are defined influences the perception of groups and group boundaries.

Implicit measures, as persuasive as they are, cannot provide the final word on the biological nature of group attachments. As with any measure there are drawbacks that cast doubt on the validity of the findings. The IAT in particular is plagued with criticisms that the measure confounds personal attitudes and preferences with culturally based stereotypes. For instance, breaking with the inherent preference for the in-group that social identity theory would predict, with the IAT African-Americans are typically found to have a weak preference for European over African American stimuli (pictures, names).

This finding strongly cautions the use of implicit measures as indicators of attitudes, but does not necessarily invalidate the theory as it applies to the biological nature of group attachments. Individuals embedded within a dominant culture are repeatedly exposed to cultural stereotypes and these cultural stereotypes create associations between constructs

[17] Purdue et al. "'Us' and 'them'".

[18] Gupta, *Path to Collective Madness.*

in memory.[19] These culturally based associations are present in everyone's responses.[20] For example, in the United States African-Americans, as with all other racial group, are highly aware of the cultural stereotypes that entail generally negative and violent traits of African-American characters in the mainstream media. This cultural artifact simultaneously decreases the impact of in-group preference for African-Americans while heightening it for non-African-Americans, highlighting an integral limiting condition on the biological underpinnings of attitudes. Specifically, culturally reinforced associations can alter the strength of the biologically driven or innate preferences that people hold.

Even though this automatic component of social categorization suggests a neurological, and hence biological, foundation, the development of this automatic component can easily be explained by the complex interaction between an individual and his environment. Specifically, the social categories that exist within any society are repeatedly reinforced through social interactions, which very quickly become habitual. Accordingly, automatic associations between social constructs can develop over repeated exposure to consistent patterns of behavior. That said, profound importance of groups for human interaction suggests something more fundamental than pure social learning. To gain more traction on this issue, I now turn to some recent research on the genetic and environmental influences on military and protection attitudes.

The importance of genetic factors in military and defense attitudes

Genes provide further support for role of biology in the development and maintenance of group related attitudes, especially attitudes toward punishment and the military. The protection of the group has enormous implications for the maintenance of positive social identities. However as with implicit attitudes, focusing on the contribution of genes to our understanding of attitudes also stresses the importance of the environmental constraints within which genes operate. This interplay between genes and the environment suggests a complex relationship where different attitudinal dimensions vary in the importance of additive genetic variance. In other words, some attitudes are more influenced by genetic sources of variance while other attitudes are more influenced by environmental sources of variance.

Based on this research using the classic twin design to partition variance between additive genetic, shared environmental and unique environmental variance components, an interesting pattern emerges that juxtaposes the classic social and economic attitude dimensions with military and protection attitudes. Namely, social and economic attitudes appear to have a strong common environmental component, which suggests some degree

[19] M.R. Banaji, "Implicit attitudes can be measured," in H. L. Roediger, J. S. Nairne, I. Neath, & A. Surprenant eds., *The nature of remembering: Essays in honor of Robert G. Crowder* (Washington: American Psychological Association, 2001), 117–150.

[20] R.H. Fazio, & M.A. Olsen, "Implicit Measures in Social Cognition Research: Their Meaning and Use," *Annual Review of Psychology* 54 (2003): 297–327.

of socialization whereas military attitudes lack this common environmental component.[21] From a social identity perspective, this makes perfect sense: people are motivated to behave in ways that protect the in-group and derogate the out-group. In the prior section I argued that social identities rely on automatic cognitive processes that are activated when people encounter members of different groups. Although learning may alter the neurological structure to some extent, the automaticity of this process suggests that it is rooted in a more basic biological process. If group based attitudes are truly based in biological processes, it would expected that a large portion of the variance in the attitude would be accounted for by the additive genetic variance component.

This is exactly what the results look like for the military-type attitudes. When looking at the pattern of results that emerges from the individual item analysis conducted by Alford, Funk and Hibbing, reproduced in Table 1, a very interesting pattern of results emerges.[22] Because Alford, Funk and Hibbing use the Falkner formulas[23] to calculate the variance components associated with genetic and environmental sources of variance, no standard errors or confidence bounds are provided, making formal hypothesis testing impossible. Thus, to interpret the effects, we are forced to rely purely on the relative size of the estimates when making inferences. To make any conclusions, we simply compare the sizes of the variance components for the specific attitudes with the size of the estimate for the average variance components across the 28 items presented in the paper.

Several key observations pop out of the estimates presented in Table 1. First, consistent with the extension of social identity theory, for every individual attitude there is a sizeable additive genetic component, even if this component does not account for the majority of the variance in the attitude. For the military-type attitudes, the additive genetic component is approximately the same magnitude as the general 28 item composite index. Further, this additive genetic variance component is, in all cases, larger than the shared environmental (C) variance component.

---

[21] Verhulst, Hatemi and Martin, "The nature of the relationship between personality traits and political attitudes," *Personality and Individual Differences* (2010). J.R. Alford, C.L. Funk, and J.R. Hibbing, "Are Political Orientations Genetically Transmitted?" *American Political Science Review* 99 (2005): 153-167.

[22] Alford, Funk and Hibbing, "Are Political Orientations Genetically Transmitted?"

[23] The Falkner formulas calculate the additive genetic (a^2), shared environmental (c^2), and unique environmental (e^2) variance. To compute the additive genetic variance one would simply double the differences between the correlations between monozygotic (MZ) twins and dizygotic (DZ) twins, summarized by the equation $a^2 = 2(r_{MZ} - r_{DZ})$. Further, the common environmental variance can be calculated using the formula $c^2 = 2\, r_{DZ} - r_{MZ}$, while the unique environment variance can be calculated by the formula $e^2 = 1 - r_{MZ}$. As this way of retrieving heritability estimates does not take into consideration uncertainty in the estimate of the correlation, uncertainty in the variance components is ignored, and thus standard errors or other methods of hypothesis testing simply cannot be conducted. For a summary see Alford, Funk & Hibbing, or for a more complete discussion see Jinks & Fulker, "Comparison of the biometrical genetical, MAVA, and classical approaches to the analysis of the human behavior," *Psychological Bulletin* 73:5 (1970): 311-349, or Plomin, DeFries , McClearn, & McGuffin, *Behavior Genetics: A Primer*, 4th edition (W.H. Freeman & Co., 2001).

More interestingly, the shared environmental component seems to capture a trivial amount of variance in the specific attitudes, suggesting the dominance of the biological component of the attitudes over the socialized component. The shared environmental variance shared between the twins' accounts for systematic attempts at socialization, within family similarity in environment, and common social background. Thus, if there was a concerted effort to teach people the "correct" attitude, this component would absorb the majority of the variance. Because this is clearly not the case, it is necessary to conclude that these attitudes do not seem to be influenced by common environmental factors; however, it is difficult to draw strong conclusions without knowledge about the variability around the estimate of the variance components. Central to the current argument, the specific attitude shared environment variance is less than the shared environment for the general ideology scale.

Finally, the unique environmental variance component captures the majority of the variance in every attitude. This is not overly surprising given that the unique environment (E) is the accumulation of unique, random, or unshared environmental influence which also includes error. This suggests that political attitudes are strongly influenced by the idiosyncratic features that make up a person's life. Thus, these military or defense related attitudes seem to decompose into additive genetic and unique environmental factors.

Verhulst, Hatemi & Eaves conducted a confirmatory factor analysis to retrieve factor scores for social, economic and military ideology dimensions with the same items, with the attitudes from the Alford, Funk and Hibbing paper presented in Table 1 comprising the military factor.[24] The univariate variance components results are presented in Table 2.[25] What is evident is that when the attitudes are aggregated into a single military factor, the results replicated very strongly. In fact, for both males and females this military dimension does not have a statistically reliable common environment effect while for both the economic and social ideology dimensions, the shared environment variance component is highly significant.

Verhulst, Hatemi and Martin (2010) further extend the robustness of these effects using a sample of Australian twins.[26] As can be seen in Table 3, Punishment attitudes have a relatively small shared environment component in males while in females the shared environmental component in females is decidedly not significant. Again, with a different set of twins, a different set of items comprising the same underlying attitudinal scale, in a different political climate, the basic result of punishment attitudes being driven by a strong additive genetic component and a variably significant shared environmental component

[24] B. Verhulst, P.K. Hatemi, & L. Eaves, "Personality Traits and Political Ideologies" (submitted).

[25] For more information on variance components modeling in the classic twin design see S.E. Medland and P.K. Hatemi, "Political Science, Biometric Theory and Twin Studies: A Methodological Introduction," *Political Analysis,* 17:2 (2008): 191-214.

[26] Verhulst, Hatemi and Martin, "The nature of the relationship between personality traits and political attitudes".

underscore the relative importance of biological factor to environmental factors for defense or military attitudes.

Interestingly, in contrast with the punishment attitudes, the out-group factor in the Australian analysis has a significant shared environment component suggesting some role for concerted socialization. Therefore, consistent with most lay theories of attitudes, social learning plays a key role in the formation of attitudes. This result is highly consistent with the observation that groups are in part socially defined and as such require some sort of socialization when learning group boundaries. However, when examining the point estimates and confidence intervals on the shared environment components of out-group attitudes and the general ideology factor, there is a significantly less variance captured by the shared environment of out-group attitudes.

Combined these genetics findings support a biological component of attitudes that are relevant to social identities. Not only is there routinely a strong additive genetic component to the military attitude items and higher order factors, this additive genetic factor is more consequential than the shared environmental factor.

Conclusion

Looking at evidence across disparate literatures a common finding emerges: attitudes toward out-groups appear to have a biological component. Evidence based on the associationist model of cognition suggests group related constructs are clearly driven by non-conscious evaluations, suggesting some sort of neurological basis for in-group and out-group attitudes. A similar conclusion is reached when examining the research on political genetics. Military attitudes have a very strong additive genetic component, also suggesting some sort of biological motivation to protect the larger group. Although the literatures do not speak directly to each other, the common finding reinforces the robustness of biological underpinnings of group related attitudes.

It is important to note however that the environmental influences can have a profound impact on the attitudes that people form and maintain. With reference to the automatic activation of group related attitudes, it is extremely difficult to disentangle whether repeatedly thinking about the positive aspects of the in-group and the negative aspects of the out-group lead to the formation of automatic associations favoring the in-group or whether neurological connections predispose automatic in-group favoritism. Relatedly, it is possible that people are genetically inclined to select into environments that promote the endorsement of attitudes.

Table 1: Variance components for specific attitudes and the general ideology scale from Alford Funk & Hibbing (2005)

	a^2 (Additive Genetic)	c^2 (Shared Environment)	e^2 (Unique Environment)
The Draft	0.38	0.02	0.59
Military Drill	0.29	0.09	0.62
Nuclear Power	0.26	0.16	0.57
General Ideology Scale	0.32	0.16	0.53

Note: Respondents were presented with the specific phrases in the table leaving the interpretation of the response up to the respondent. The response options were "yes" "?" and "no". Although the meaning of the individual items may seem unclear each item is clearly related to underlying military attitudes. With respect to the "nuclear power" item, it is important to keep in mind that this data was collected in the 1988 when the concept of "nuclear power" was related to the Cold War and nuclear proliferation.

Table 2: Variance Components Analyses for Ideological Dimensions taken from Verhulst, Hatemi & Eaves (95% confidence intervals are in parentheses)

	Male			Female		
	a^2	c^2	e^2	a^2	c^2	e^2
Social	.352 (.21, .50)	.232 (.10, .36)	.417 (.38, .46)	.320 (.24, .41)	.363 (.28, .44)	.317 (.30, .34)
Economic	.322 (.17, .48)	.228 (.09, .36)	.450 (.41, .50)	.401 (.30, .51)	.167 (.07, .26)	.432 (.40, .46)
Military	.443 (.27, .52)	*.031 (.00, .18)*	.526 (.48, .58)	.302 (.18, .42)	*.082 (.00, .19)*	.616 (.58, .65)

Note: Estimates in italics are not significant.

Table 3: Estimated Variance Components for Ideology Dimensions For Austrailian Twins taken from Verhulst, Hatemi & Martin (2010)

	Males			Females		
	a^2	c^2	e^2	a^2	c^2	e^2
Religious Attitudes	.151 (.00, .32)	.435 (.28, .57)	.415 (.37, .46)	.226 (.12, .34)	.393 (.29, .49)	.381 (.35, .41)
Sex Attitudes	.271 (.11, .45)	.316 (.15, .46)	.413 (.37, .46)	0.212 (.11, .32)	.443 (.34, .53)	.346 (.32, .37)
Out-Group Attitudes	.268 (.11, .44)	.336 (.18,.47)	.395 (.35, .44)	.311 (.19, .44)	.244 (.13, .35)	.445 (.41, .48)
Punishment Attitudes	.285 (.11, .47)	.277 (.10, .43)	.438 (.39, .61)	.491 (.36, .61)	*.089 (.00, .21)*	.420 (.39, .45)
General Ideology	.212 (.06, .37)	.408 (.29, .54)	.380 (.35, .42)	.244 (.15, .31)	.420 (.34, .51)	.335 (.31, .36)

Note: Estimates in italics are not significant. 95% confidence intervals are in parentheses.