Workshop
Evolution and Social Behavior

UCLA The Center for Governance, April 20, 2001.

Report by Paul J. Zak

The Gruter Institute conference "Evolution and Social Behavior" was held on April 20, 2001. Cosponsored by UCLA&rsquos Center for Governance, the conference featured six papers that examined the evolutionary foundations of civil society. Conference directors Jack Hirshleifer (UCLA) and Paul J. Zak (Claremont Graduate University) gathered a diverse set of scholars from the natural and social sciences to examine this topic.

After welcoming comments from Margaret Gruter and the conference directors, the day opened with Professor Bill McKelvey (UCLA, Management) presenting "Social Order-Creation Science: Bénard, Darwin, Swenson, and Emergence from What?" In this paper, McKelvey asks why human societies display social order rather than disorder. Drawing on the new discipline of complexity science, McKelvey offers ten premises for the emergence of social order through the interactions of autonomous, heterogeneous agents.

The second paper, "Strong Reciprocity and Human Sociality: Empirical Evidence and Evolutionary Models," by Professor Herb Gintis (University of Massachusetts, Amherst, Economics) offered an overview of a generation of biological and economic mechanisms that produce cooperative behavior among unrelated individuals. Gintis offered a number of fascinating examples of institutional arrangements that reliably produce reciprocal cooperation. Gintis also briefly mentioned results from his forthcoming edited volume "Cooperation, Reciprocity, and Punishment in Small-Scale Societies" which tests these arrangements in fifteen primitive societies, often with surprising differences found vis-à-vis behaviors in developed countries.

UCLA Professor of Anthropology Rob Boyd followed Gintis. Boyd presented "Group Beneficial Norms Can Spread Rapidly in a Structured Population," a mathematical model of group norms dynamics. He shows that when successful social norms are imitated, evolutionary selection on norms leads to rapid cultural change until a stable equilibrium state is reached. Indeed, Boyd argues that group selection plays a much greater role at the level of societies than does individual selection.

After a break for a catered lunch in the atrium of UCLA&rsquos Bradley International Hall, UCLA Professor of Political Science, Susanne Lohmann (who graciously helped coordinate the event), presented her provocative paper "Do People Have a Taste For Doing Good, or Do They Have a Taste for Punishing Others for Not Doing Good, Which is Why They Do Good?" In this computational evolutionary model of interacting individuals, Lohmann offers an explanation for the high degree of internecine punishment observed in laboratory experiments of cooperation. She asks if a preference for punishment can sustain the high degree of cooperation seen in most human societies. The model demonstrates that evolutionary selection favors a taste for punishment. Then, she examines how cultural evolution has led most modern societies to seek to

inculcate children to "turn the other cheek" — at least as a first attempt to sustain cooperation — rather than punish others.

The penultimate paper, "Ecological Rationality: How Our Evolved Neurocognitive Mechanisms Outperform Traditional Rational Methods" was presented by Professor John Tooby (UCSB, Anthropology), one of the founders of the field of evolutionary psychology. Discussing his joint work with Leda Cosmides, Tooby proposed a number of evolutionary reasons for experimentally observed deviations from "rationality" (e.g. errors in determining probabilities). He argued that these "mistakes" occur because in the environment of evolutionary adaptedness (EEA) where our neural mechanisms were formed, the problems early humans faced were quite different than those of today. He offered copious evidence showing that when problems posed to subjects are framed in a context consistent with conditions in the EEA, subjects overwhelmingly make the correct "rational" decisions.

Professor Cort Pedersen (University of North Carolina, Chapel Hill, Psychiatry) presented the conference final paper "How Love Evolved From Sex and Gave Birth to Intelligence." In this paper (excerpted from a book he is writing), Pedersen presents an evolutionary account of neuro-active hormones associated with reproduction. Animal and human studies demonstrate that these hormones are part of an evolved system of emotional attachment that is the foundation for pro-social behaviors in humans. Pedersen further argues that, driven by sexual selection, the drive for emotional attachment led to the advanced cognitive abilities that separate humans from other animals, unifying the emotions and intelligence cleaved by Descartes.

The conference ended with a festive dinner in Westwood, attended by Margaret Gruter, the conference presenters, and special guests. A subset of the conference papers will be published in a forthcoming special issue of the Journal of Bioeconomics edited by Zak and Hirshleifer.

Research Report ~ The Neurobiological Basis for Trust

by Paul. J. Zak

Human beings exhibit an enormous amount of cooperative behavior. We give out credit card numbers over the internet or telephone, we seldom have trouble deciding which car should proceed first at a four-way stop—indeed almost all drivers do in fact stop at stop signs, and we properly anticipate that (most) others will continue to follow this pattern. These trusting behaviors are easily understood as conventions that reduce the costs (economic, time, and cognitive) of interacting with others.

Humans are social beings because, presumably, there was a survival advantage to cooperation. The British social philosopher John Stuart Mill wrote in 1848 that "The advantage to mankind of being able to trust one another, penetrates into every crevice and cranny of human life: the economical is perhaps the smallest part of it, yet even this is incalculable.'' Nevertheless, in recent survey data, those who agreed that "most people can be trusted" varied from five percent of the population in Peru, to 66 percent in Norway. If John Stuart Mill is correct, the lack of trust in Peru has enormous costs in the myriad social interactions of daily life, from shopping for

groceries at the local mercado, to the quality of governance, to marriage and procreation, to the prospects for successful economic development.

Extending W.D. Hamilton's theory of kin selection, I and my co-author, Stephen Knack of the World Bank, developed a formal theory of trust that includes the various effects of legal structures, the level and distribution of income, and the heterogeneity of the population ("Trust and Growth," to appear in The Economic Journal April, 2001). Statistical tests of the formal model's predictions verify that the factors we identify are fundamental to determining the observed level of trust (observed trust is measurable; one's innate predilection to trust others or be trustworthy is not measurable). Indeed, our model explains 70% of the variation in trust across the 43 countries for which trust data exist. This is an extraordinarily high degree of explained variation for a cross-country study. Our study also demonstrates that the primary way that different legal structures impact economic development is not directly, but by affecting the level of trust. Further, we show that countries with very low trust will not develop at all. Low trust countries typically have weak legal institutions, high income inequality, and a high degree of social heterogeneity.

Even though the Zak & Knack trust model works well on average, it produces some substantial over- and under-predictions on a country-by-country basis. Two extreme examples, given country-specific attributes, are that the model predicts that trust in Norway should be 50% when it is actually 66%; on the other end of the spectrum, the model predicts that trust in Peru should be 18% when it is actually 5%. In order to improve the model's overall predictive ability, I have recently begun a research program to characterize biological and environmental effects that are related to differences in observed trust.

The approach I am taking draws from a recent literature in neuroendocrinology that examines the hormones that promote "affiliation." Affiliation broadly denotes pro-social behaviors, typically among mammals. Such behaviors include grooming, nuzzling, and cooperating to procure food. A seminal study in this literature is the examination of pro-social behavior among prairie voles done by Winslow and colleagues (*Nature*, 1993). Winslow et al showed that a hormone called oxytocin is higher when prairie voles exhibit social behaviors; this finding has been confirmed in a large number of animal studies (Carter, et al, 1997, The Integrative Neurobiology of Affiliation New York Academy of Sciences).

Conventional endocrinological research in humans associates the hormone oxytocin with uterine contractions during childbirth and with milk expulsion during breastfeeding. Both male and female humans produce oxytocin (which also appears to act as a neurotransmitter), and psychologists have found that oxytocin levels in humans spike up and remain high for a period of time after a woman gives birth, when a man holds his newborn child for the first time, and during orgasm in men and women. Anthropologist Helen Fisher, has called oxytocin the "love drug" (Anatomy of Love: A Natural History of Mating, Marriage, and Why We Stray, Fawcett, 1995).

I am currently seeking to apply these endocrinological findings to explain trusting behavior by humans. This is being done in two ways. First, with support from the Fletcher-Jones Foundation and the Claremont Institute for Economic Policy Studies, I am spearheading a preliminary international data collection of factors that promote the release of oxytocin. Because

international data on oxytocin are unavailable, our data collection is focusing on factors that raise estrogen (or lower testosterone). Because of oxytocin's relationship to reproduction, factors that raise estrogen also raise oxytocin. Conversely, factors that raise testosterone and vasopressin tend to reduce oxytocin. Items that raise oxytocin levels include a variety of foods (phytoestrogens are plant-derived compounds that raise estrogen, e.g. soybeans and cabbage), the consumption of pollutants that have estrogen-like biological activity (e.g. the pesticide DDT), and a variety of social factors, especially those associated with children, social contact, and sexual activity.

My preliminary statistical analysis shows that breastfeeding (+), phytoestrogen consumption (+), the mortality rate (-), the proportion of young people (+), sexual frequency (+), telephone usage (+), an unstable socio-political environment (-), ambient temperature (+), and rates of ovarian cancer (+, which is related to elevated estrogen) are all associated with trust. Most of these factors are statistically significantly related to trust even after controlling for the social, political, and economic factors identified in the Zak & Knack model. My current work is refining this data to further explore this relationship.

The second strand of this research will examine individuals in the laboratory and will commence in 2001. Professors Vernon Smith and Kevin McCabe of the Economic Science Laboratory at the University of Arizona have developed a trust game in which players can signal that they are trusting if they want to share a larger payoff (the payoff is given if, and only if, the cooperative signal is reciprocated). They are currently examining the different brain structures involved when playing this game using functional magnetic imaging (fMRI). Their initial findings show that the choice to cooperate uses a different part of the brain (Brodman's area 8) than choosing to defect, and that the former is associated with forecasting what others will do ("mind reading"). The neuroendocrinological research suggests that this difference in brain activity may be mediated by variations in hormone levels affecting the limbic system, especially oxytocin, and a competing hormone that is related to stressful situations, cortisol. I am currently designing a protocol to collect saliva samples from individuals playing trust games in the laboratory to examine their hormone levels. A pre-play survey will correlate differences in hormone levels with recent events in players' lives, including food intake, prior social behaviors, time with children, etc., and these will then be matched to the fMRI findings.

The ultimate goal of this research is to provide a complete picture of the biological mechanisms that engender trusting behavior. The brushstrokes of this picture are composed of hormones, neurotransmitters, cortical activity, and the intake of environmental compounds. The Gruter Institute and the Center for Governance at UCLA will further explore this topic by sponsoring a conference to be held at UCLA on April 20, 2001 (see www.gruter institute.org for information). An understanding of the neurobiological basis for trust will provide a firm platform for the design of legal institutions to take advantage of the human predilection for trust. Indeed, such an understanding, as John Stuart Mill recognized, is the foundation of civil society.