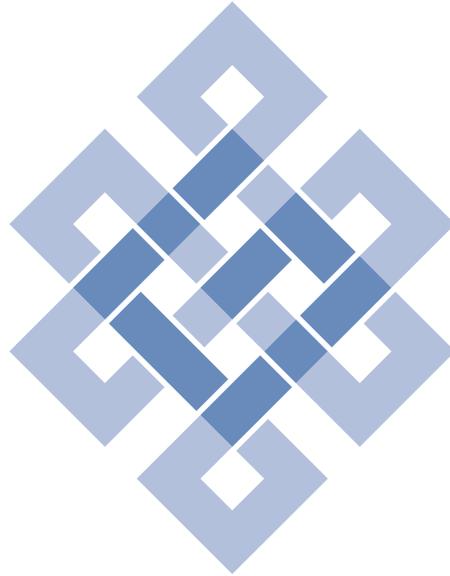


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GARRISON INSTITUTE REPORT

THE SOCIAL BRAIN AND THE DIFFUSION OF PRO-SOCIAL BEHAVIOR

**Background Paper for the Garrison Institute
Climate, Mind, and Behavior Program**

**John Gowdy, Department of Economics,
Rensselaer Polytechnic Institute**

January 29, 2011

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TABLE OF CONTENTS

Abstract.....	i
About the Garrison Institute.....	i
I. Introduction: Bridging the Gap Between Biology and Social Science.....	1
II. Neuroscience Has Confirmed the Existence of the Social Brain.....	4
III. Behavior, Culture and Institutions: The Need for New Models of Human Motivation.....	7
1. The Nature of Money.....	8
2. The Social Self and Natural Selection.....	11
3. Group Intelligence.....	13
IV. Framing and Behavioral Change.....	14
V. Homeostasis and Individual, Social and Environmental Sustainability.....	18
VI. Conclusion: Toward a New Framework for Climate Policies.....	20
References.....	22
Addendum: The White Underclass as a Key Reference Group.....	27

ABSTRACT

As society considers how to motivate humans to address the challenges of climate change, increasing attention is turning to biological insights into human behavior, an inquiry that is starting to supplant the economic paradigm of the “rational actor” (a model individual who instinctively profit maximizes and optimizes behavior). Current research in human behavior and neuroscience is confirming what critics of standard economic theory have long argued: humans are uniquely social mammals whose behavior deviates significantly from “rationality” because of social norms and evolutionary wiring. This runs counter to the biological analogy to the survival of the fittest metaphor frequently used to justify the assumptions of the standard economic model. Many of these insights have yet to penetrate the policy world, but growing understanding may help shape more effective policy approaches to changing individual behavior and informing the regulatory process for climate change.

ABOUT THE GARRISON INSTITUTE

Founded in 2003, the Garrison Institute is a non-profit, non-sectarian organization exploring the intersection of contemplation and engaged action in the world.

Our mission is to apply the transformative power of contemplation to today’s pressing social and environmental problems, helping build a more compassionate, resilient future.

We envision and work to build a future in which contemplative ideas and approaches are increasingly mainstream, and are applied at scale to create the conditions for positive, systemic social and environmental change.

I. INTRODUCTION: BRIDGING THE GAP BETWEEN BIOLOGY AND SOCIAL SCIENCE

The Legacy of Social Darwinism

Much of economics today continues to reflect the ethic of evolution as “survival of the fittest,” the gladiatorial view of natural selection articulated by early followers of Darwin such as Thomas Huxley:

From the point of view of the moralist the animal world is about on a level of a gladiator’s show. The creatures are fairly well treated, and set to fight - whereby the strongest, the swiftest, and the cunningest live to fight another day. The spectator has no need to turn his thumbs down, as no quarter is given. (Huxley 1888, 161)

The most egregious abuses of Darwin’s theory of natural selection (so-called Social Darwinism) are found not in biology but in political scientists like Herbert Spencer who coined the term “survival of the fittest.” The term seemed to be a good metaphor to describe the world of the emerging industrial economy of the 1800s and it paved the way for social Darwinism and a reactionary defense of the existing social order. This school of thought continued in late 19th century economics, where the survival of the fittest metaphor was used to justify the privilege of the well-to-do and to argue against public policies helping the less fortunate. In this view, who is rich and who is poor is a natural outcome of the struggle for survival. Helping those who are less fit is a violation of the laws of nature. The Yale economist William Graham Sumner wrote:

Almost all legislative effort to prevent vice is really protective of vice, because all such legislation saves the vicious man from the penalty of his vice. Nature’s remedies against vice are terrible. She removes the victims without pity. A drunkard in the gutter is just where he ought to be, according to the fitness and tendency of things. (Sumner 1883)

Sumner was one of the first to cast social Darwinism in economic terms. To give money to the poor was to divert it from productive investment

Capital, however, as we have seen, is the force by which civilization is maintained and carried on...Every bit of capital which is given to a shiftless and inefficient member of society, who makes no return for it, is diverted from a reproductive use; but if it was put into reproductive use, it would have to be granted in wages to an efficient and productive laborer. Hence the real sufferer by that kind of benevolence which

consists in an expenditure of capital to protect the good-for-nothing is the industrious laborer. (Sumner 1883)

One hundred years later, the remnants of this idea are found in the economics profession. In the 1970s, economists jumped on the sociobiology bandwagon for biological arguments for the superiority of market capitalism. In an article in *Business Week* in 1978 titled “A Genetic Defense of the Free Market” the economist Jack Hirshleifer specifically used a biological (genetic) argument to justify the prevailing economic theory of human nature:

Sociobiology means that individuals cannot be molded to fit into socialist societies such as the Soviet Union without a tremendous loss of efficiency.

Bioeconomics says that government programs that force individuals to be less competitive and selfish than they are genetically programmed to be are preordained to fail.

In the standard economic model, human behavior is individual, not social, reflecting the view that the greatest good comes from perfectly rational individuals expressing their preferences through “dollar votes” in unfettered markets. Milton Friedman’s classic article on economic methodology (Friedman 1954) states a natural law that the fittest (most efficient) firms prosper and the unfit ones fall behind. Many economists still push the idea that helping the “unfit” is a “moral hazard”, a violation of the laws of nature and therefore harmful to the social good. Given this intellectual history of abuse of biological theories it is no wonder that certain areas of social science have such an aversion to biology.

The irony today is that mounting scientific evidence from the fields of biology, neuroscience, and behavioral science is confirming what the critics of mainstream economics have argued for decades. The prejudice against biological explanations of human behavior still haunts social science today and stands as a barrier to developing realistic theories of human decision making and effective social policies that reflect that humans are uniquely social animals that thrive in a complex system of cooperation, competition, and evolved social norms.

Contemporary Biology and the Social Brain

A main point of this background paper is that modern neuroscience has refuted strict biological determinism and confirmed the uniqueness of human sociality. Human behavior is a result of complex interactions between biological inheritance, social conditioning, and random events. Understanding the neurobiology of social behavior is still in its infancy but neuroscience and behavioral experiments are proving key insights that can be used to improve individual and social well-being.

A growing body of evidence indicates that humans are unique among mammals in their degree of sociality (Siegel 2007, Wexler 2006, Wilson 2007, Woodburn and Allman 2009). Far from leading to genetic determinism, modern behavioral science, neuroscience, and evolutionary theory has shown that human behavior is a combination of genetic, developmental and cultural factors. Neither of these can be understood in isolation. The behavioral sciences can help us understand these links and this understanding can give insights into behavioral adjustments and thus policy formulation to manage social transitions including the transition to sustainability. Cultural variation has added another dimension to the ability of humans to adapt to changing environmental conditions.

Evidence suggests that cultural adaptation gave humans a unique advantage in adapting to climate transitions over the past several million years. The ability to adapt customs and technology to changing conditions allowed humans (used here to mean the genus *Homo*) to more quickly adapt to a changing food resource base compared to other animals that depended on more purely genetic adaptation. For example, Richerson and Boyd (2005) argue that culture and complex brains were an evolutionary advantage for humans during the extreme climate volatility of past ice age transitions. The ability to use culture as an adaption mechanism creates another source of variety—in addition to genes—upon which natural selection can work. The ability of humans to adapt culturally-conditioned behavior to changing conditions is perhaps the critical factor in successfully managing environmental transitions.

The emerging view of human nature from behavioral psychology and neuroscience is in sharp contrast to the assumptions embodied in the standard rational actor model underlying much of contemporary economic theory. In fact, it seems to be the case that the rational actor model is a better description of non-human members of the animal kingdom than it is of human behavior. It is a model of a simple mind performing simple tasks. The rational actor model strips away the essential features of human behavior that make our species unique.

II. NEUROSCIENCE HAS CONFIRMED THE EXISTENCE OF THE SOCIAL BRAIN

Many mammals are highly social animals with a variety of behavioral attributes that evolved to facilitate social interaction, but humans seem to be unique in their degree of sociability. Two related features of the human brain are particularly important to human sociality and to gene-culture coevolution: *brain plasticity* and the existence of *Von Economo neurons*.

Neurons are a type of cell that processes information and transmits it to and from the brain by electrical and chemical signaling. A remarkable finding from neuroscience is that most of the neurons in the human brain develop after birth and the way they are configured depends critically on how a child is socialized. It is another way that variability can be introduced into evolutionary mix. Wexler (2006, 3) writes about the evolutionary advantages of brain plasticity:

There is an evolutionary advantage for life forms that reproduce sexually because mixing of genetic material from parents produces variety in their offspring. Thus, different individuals have different characteristics, which increases the likelihood that some members of the group will be able to function and reproduce even when the environment in which the group lives changes. In an analogous manner, the distinctive postnatal shaping of each individual's brain function through interaction with other people, and through his or her own mix of sensory inputs, creates an endless variety of individuals with different functional characteristics. This broadens the range of adaptive and problem-solving capabilities well beyond the variability achieved by sexual reproduction.

A related insight is also important for successful societal transitions. Humans alter the environment that shapes culture and brain development to an unprecedented degree.

These human alterations in the shared social environment include physical structures, laws and other codes of behavior, food and clothes, spoken and written language, and music and other arts...It is this ability to shape the environment that in turn shapes our brains that has allowed human adaptability and capability to develop at a much faster rate than is possible through alteration of the genetic code itself (Wexler 2006, 3).

Evolutionary biologists call the ability of species to shape their environments *niche construction* (Laland, Odling-Smee and Myles 2010). For example, animals build nests and construct burrows. Niche construction due to cultural

processes can be much more potent and more rapid than non-cultural (gene-based) processes. Most of the world's population (although certainly not all) live in a material environment almost entirely created by humans. Very little of our well-being comes directly from the natural world (although ultimately, of course, it all does). We have also adapted technologically, socially, and perhaps even neurologically in ways that shield us from the negative effects of our activities on the earth's life support systems. This is called *counteractive niche construction* (Laland, Odling-Smee and Myles 2010). An example is bees using collected water to cool their hives. Humans have used technology and the built environment to live in habitats from the arctic to inhospitable deserts. The ability of humans to buffer themselves from environmental change makes it difficult to get public support to correct human-induced negative impacts like climate change and biodiversity loss. For most people rapid environmental change is something in the distant future affecting people in distant lands, not them. But the good news is that the same skills that gave humans an unrivaled ability to adapt to new situations and meet new challenges. The importance of post-natal brain development in humans means that we have the innate ability to change our attitudes and ways of living both to reduce our pressure on the environment and to adapt to the inevitable changes we have set in motion.

Another remarkable finding from neuroscience is the presence in the human brain of *Von Economo* or spindle neurons that apparently evolved to enable people to make rapid decisions in social context. Sherwood, Subiaul, and Zadwinski (2008, 433) write:

Based on the location, neurochemistry, and morphological characteristics of Von Economo neurons, it has been hypothesized that they transmit rapid outputs to subcortical regions (Allman et al. 2005). It is interesting that these specialized projection neuron types have been identified in cortical areas that are positioned at the interface between emotional and cognitive processing. Given their characteristics, it has been speculated that Von Economo neurons are designed for quick signaling of an appropriate response in the context of social ambiguity (Allman et al. 2005). Enhancements of this ability would be particularly important in the context of fission-fusion communities, such as those of panids and possibly the LCA [last common ancestor], with complex networks of social interactions and potential uncertainties at reunions.

Allman et al. (2005, 370) argue that these neurons help humans to adjust quickly to rapidly changing social situations:

We hypothesize that the VENs and associated circuitry enable us to reduce complex social and cultural dimensions of decision-making into a single dimension that facilitates the rapid execution of decisions. Other animals are not encumbered by such elaborate social and cultural contingencies to their decision-making and thus do not require such a

system for rapid intuitive choice.

Von Economo neurons are also found (in much smaller numbers) in great apes and whales and dolphins, other highly intelligent species with complex social systems. In humans, most of these neurons are formed *after birth* and develop according to environmental influences, again pointing to the blurred line between heredity and socialization. The latest neurological evidence suggests that human behavior is uniquely social and that critical neuro patterns of intimacy and trust must be established during infancy to condition the brain for social bonding and empathy, as well as learning and cultural transmission through childhood and adulthood. Although most neurons are formed within a few years after birth there is evidence that the human brain can and does modify itself throughout life in response to environmental conditioning. Understanding the social basis of human cognitive development is key to comprehending the nature of decision making (and the importance of reference groups, for example). And both are critical to formulating successful pro-social and environmental policies and to gaining public acceptance of these policies.

Neuroscience, because of its grounding in human biological and social evolution, has the potential to provide a solid, science-based framework to help understand the regularities of human behavior within highly evolved social systems. This may help to inform us about how the transition to sustainability might take shape as we struggle to make it through the climate disruptions, population pressures and resource bottlenecks of the 21st century. Neuroscience can help us understand the *ultimate* causes of human behavior (evolution through natural selection) as opposed to *proximate* causes (particular learned cultural practices).

III. BEHAVIOR, CULTURE AND INSTITUTIONS: THE NEED FOR NEW MODELS OF HUMAN MOTIVATION

Economics, as it has evolved over the past 150 years, has generalized from stylized assumptions about the preferences of isolated individuals motivated by money and changes in the relative prices of consumer goods. But evidence from behavioral neuroscience calls these assumptions into question. This section explains the tensions between the assumptions of mainstream economics and growing insights from behavioral science and neuroscience. It is important to understand the neoclassical economic model because it still dominates the public policy debate. Whether or not we agree with the model we always confronted with its assumptions and policy implications. For example, it is this model that underlies arguments for pricing biodiversity and for market-based tools like carbon trading to mitigate climate change.

It is now widely recognized that the most serious shortcoming of the standard economic model—the mathematical formulation is called the Dynamic Stochastic General Equilibrium (DSGE) model—is that it must assume that human behavior is self-regarding. The mathematical constraints of the model dictate that decisions of one individual cannot be influenced by the behavior of others. Without the assumption of independent (self-regarding) preferences the whole mathematical edifice of the DSGE model comes crashing down like a house of cards (Gowdy 2010), and with it many if not most of the tools of contemporary economics (marginal analysis, constrained optimization techniques) and policy recommendations (privatization, more trade).

There is, of course, a long history of dissent within the economics profession with respect to the DSGE model. Thorsten Veblen's description of rational economic man made over 100 years ago still rings true today:

The hedonistic conception of man is that of a lightning calculator of pleasures and pains who oscillates like a homogeneous globule of desire of happiness under the impulse of stimuli that shift him about the area, but leave him intact. He has neither antecedent nor consequent. He is an isolated definitive human datum, in stable equilibrium except for the buffets of the impinging forces that displace him in one direction or another. Self-imposed in elemental space, he spins symmetrically about his own spiritual axis until the parallelogram of forces bears down upon him, whereupon he follows the line of the resultant. When the force of the impact is spent, he comes to rest, a self-contained globule of desire as before. Spiritually, the hedonistic man is not a prime mover. He is not the seat of a process of living, except in the sense that he is subject to a series of permutations enforced upon him by circumstances external and alien to him. (Veblen 1898)

It might be a monumental task to replace the DSGE model with realistic assumption about human behavior but it's not as if we're starting from scratch. A more recent, and already influential, critique of characterizing humans as "self-contained globules of desire" was made by Nobel laureate George Akerlof in his 2007 Presidential address to the American Economic Association (Akerlof 2008). Akerlof called for a redirection of current economic theory starting again with Keynes and identifying the "norms" that determine human behavior. Akerlof's address has been compared to Milton Friedman's presidential address in 1968 that set a new course toward "Chicago School" economics in the 1970s and 1980s. Louis Uchitelle, writing in the New York Times, observed: "His speech as the outgoing president is an attempt to set economics on a new path, a path that departs from the theoretical foundations of modern macroeconomic models by including social norms of behavior into the theoretical structures." This was written before the financial collapse of 2008 which seemed to be the final nail in the coffin for DSGE economics. But see John Quiggin's (2010) book *Zombie Economics* for an excellent analysis of the resilience of the neoliberal model in spite of a mountain of evidence refuting it.

Insights from behavioral science and neuroscience are beginning to change the perspective of traditional economics in fundamental ways.

THE NATURE OF MONEY

New findings about how money affects decision making may provides insights to issues ranging from economic growth to understanding the nature of incentives. In the standard view of economics embodied in DSGE models, money is considered to be a tool to facilitate economic exchange. In these models there is no essential difference between a barter economy and a money economy with respect to economic outcomes. Money has no effect on the real (disregarding inflation) economy. In economic jargon money is "neutral" in the long run. Debate has raged among economists as to whether or not there exists a "money illusion" that may introduce a time lag between changes in the money supply and perceptions of the effect of such a change on purchasing power. But generally, most economists subscribe to a tool theory of money and they attach no particular explanatory power to money itself (Lea and Webley 2006).

By contrast, findings from neuroscience and behavioral economics indicate that money itself has some profound effects on how people feel and act in a variety of market and non-market situations (Cassidy 2006, Knutson et al. 2001, McClure et al. 2004, Spreckelmeyer et al. 2009, Vohs et al. 2006). These findings have helped assess some long-standing controversies in economics (for example, there is a money illusion), and they also point to new research

agendas. Among the problems of interest are the following:

1. Is money not only a tool but also a drug? Economists consider money to be a tool, serving the purposes of (1) a medium of exchange, (2) a store of value and (3) a unit of account. In this view, we only need to understand the economic job that money does. Recent work by psychologists suggests that money may also be a kind of drug desirable in its own right. Lea and Webley (2006) present a strong case for the money as a drug theory. People seem to discount money differently than goods, money can apparently be a substitute for social interactions in some cases, and the presence of money can reduce social behavior including altruism. What are the implications of these findings for economic theory and policy? According to Lea and Webley (2006, 164), a drug is some substance that “acts in the same way as a body chemical and is therefore able to intrude upon the normal functioning of the nervous system.” If money acts as a drug, then it may have the same effect on the brain as a natural motivator but may not have the same benefits. Many examples in the biological world illustrate these “unnatural” motivators. Lea and Webley (2006, 164) write:

[C]ardboard disks elicited sexual pursuit in Grayling butterflies, a striped knitting needle elicited begging in herring gull chicks, and an Easter egg elicited brooding in graylag geese...Although it is to the Grayling’s evolutionary advantage to court a female Grayling, the butterfly gains nothing in fitness terms by pursuing a cardboard disk...In all cases that have been investigated, the artificial sign stimuli discovered by the ethologists have the same reinforcing or incentive effects as the natural stimuli they mimic. They therefore constitute a kind of functionalist motivator.

This is not to suggest that money plays no positive role to individuals in our society. It is a tool that allows us to obtain life’s necessities. It is also important as a status symbol and even in attracting desirable mates. It may be that money acts a signal to potential mates that its possessor is a fit prospect, much like a successful hunter in earlier societies (Smith 2004). But other experiments suggest that money is much more profound and intrusive in human societies than a mere proxy for biological fitness.

Experiments suggest that the mere mention of money may make people more individualistic and less social. A recent experiment by Vohs, Mead and Goode (2006) found that the mere mention of “money” had a negative effect on sociality. In one experiment one group of people were first given reminders of “money” and another group was given a “non-money” reminder. Participants were asked to unscramble jumbled words to make phrases. In the money group the phrases involved some concept of money, like “a high-paying salary is important.” In the control group the phrases were neutral, like “it is cold outside”. This reinforced thinking in terms of money in the experimental group but not the control group. The groups were then subjected to nine experiments

designed to test the effects of exposure to money on “self-sufficiency” and helpful behavior. In one experiment subjects were given \$2 in quarters which they were told was left over from an earlier experiment. At the end of the word scrambling game they were offered the chance to put money in a box to denote to needy students. Those exposed to reminders of money gave substantially less to the charity. In another experiment subjects reminded of money were less likely to ask for help in performing a complicated task. In another test, subjects were asked to sit at desks and fill out a questionnaire. Some desks faced a poster with a picture of money, and others faced a poster showing flowers or a seascape. They were then asked to choose between a reward characterized as a “group” or “individual” activity, for example, individual cooking lessons versus a dinner for four. Those exposed to the money poster were more likely to pick individual activities.

The reasons for this behavior are unclear. It may mean that possessing money gives people more control over their own lives, making them less dependent on the charity of others. Or there may be something deeper going on. There may be biological as well as social reasons why people are so attracted to money. Knutson et al. (2001) used fMRI imaging to look at what goes on in people’s brains when they deal with money. They found that offers of the opportunity to make money activated regions of the midbrain called the *nucleus accumbens* associated with addiction, fear, insecurity, and selfish behaviors. This may explain why money rarely provides the sense of wellbeing that is associated with close human relationships.

Money and monetary exchanges also have deep social meaning. A large literature exists on the anthropology and sociology of money (Lea et al. 1987, chapter 12, Mauss 1925, Simmel 1900). This literature confirms that a money economy is fundamentally different than an exchange economy (Bohannon, P. 1959). It is well-known that monetary incentives can “crowd out” pro-social behaviors. The classic case is blood donations. When people are paid to donate blood, contributions drop sharply (Titmuss 1971). Private incentives can crowd out public incentives (Frey 1997) and private incentives in the form of higher prices can also reinforce social status (Ng 1987). Another study confirming the social nature of monetary rewards was conducted by Fliessbach et al. (2009). Brain scans were used to monitor the brain activity of two male players receiving a substantial monetary reward (from 30 to 120 euros) for correctly estimating the number of dots on a computer screen. As expected the ventral striatum (a part of the brain associated with reward) was activated when the participants received a monetary payment for a good guess. Surprisingly, the reward system was substantially more active when participants were told that the other player was unsuccessful. Similar experiments (Spreckelmeyer et al. 2009) suggest that although both men and women are motivated by anticipation of both monetary and social rewards, women are more responsive to social rewards than are men.

2. What is the evolutionary basis for “money as a drug?” Animal survival

depends on responding to positive and negative environmental signals. If money activates parts of the brain responsible for emotions like fear and reward it must have some evolutionary basis. But money is a very recent invention in human history—at most about 3,000 years old. Modern uses of money go back only a few hundred years. Can neuroscience identify brain structures involved in evaluating money incentives? Can this be a guide to understanding the role money plays in view of human evolutionary history? What does money “buy”? How does the evolution of money from coin to paper to numbers on a computer affect consumer behavior?

3. Money and Trust- Evidence is also accumulating that neurological pathways are involved in “trust” games involving monetary rewards. In sequential social dilemma games such as the ultimatum game and centipede game an area in the midbrain called the striatum is activated when people punish those considered to act unfairly (Fehr, Fischbacher and Kosfeld 2005). Punishing others for violating social norms is a rewarding experience. Several studies have identified the role played by the neuropeptide oxytocin in trusting behavior. In one experiment (Kosfeld et al. 2005) two groups of subjects played a social dilemma game involving trust in exchanging money. One group was given oxytocin through a nasal spray and one group was given a placebo. The percentage of people exhibiting maximal trusting behavior was significantly higher in the oxytocin group (45 percent) than in the group receiving the placebo (21 percent). Commenting on the results of these and similar experiments Fehr, Fischbacher, and Kosfeld (2005, 350) write:

Such studies enable us to go beyond the prevailing “as if” approaches in economics by uncovering the neural mechanisms behind individual decisions. In the long term, it may well be that neuroeconomic insights fundamentally change the current “preferences and beliefs” approach that prevails in economics.

THE SOCIAL SELF AND NATURAL SELECTION

Wexler’s (2007) insight that the distinctive postnatal shaping of the human brain through interaction with other people creates an endless variety of individuals with different functional characteristics has enormous implications for social policy. The range of adaptive capabilities of humans is enormous but they are also shaped by basic Darwinian selection processes—variation, selection, and retention. Humans have a “social self” unique to their particular reference group. The attitudes in different reference groups are “selected” to conform to the norms of a particular group. A distinction can be made between behavior that evolved for its survival characteristics—possibly loss aversion for example—and behavior selected to conform to social norms (although this is not to deny that such behavior may have something to do with physical

survival).

1. Individual rationality – The rational actor model of standard economics in some ways focuses on the logic of survival. Its self-referential assumptions of non-satiation (more is preferred to less), perfect assessments of risk, that sunk costs should be ignored, etc., can be traced to survival characteristics in non-human animals. Risk aversion, for example, has an obviously survival advantage for animals who frequently find themselves in dangerous and uncertain situations. This may be why a number of behavioral researchers have observed that “lower animals” are more rational than humans (Arkes and Ayton 1997).

2. Sociality adds another layer to adaptation possibilities – To the extent that culture has solved the problem of individual survival, society creates values over and above purely biological survival rules. As Boyd and Richerson (1992) point out, the existence of social sanctions can lead to the cultural selection of almost any type of behavior imaginable. Cultural variation has a survival advantage in that human societies can quickly adapt to new environmental situations as in the case of technological adaptation to changing environmental conditions during the Pleistocene (Richerson and Boyd 2005).

3. Mismatch Theory - Evolved social customs can also be a hindrance to adapting to environment change as in the case of the Moai culture of Easter Island. Easter Islanders completely deforested their island by cutting down trees to use as skids to move the large stone heads for which Easter Island is famous. When the environmental impact of deforestation began to severely affect their lives, the solution was to build even bigger statues to appease the Gods and in the process cut down more trees. An area of biological research called “mismatch theory” is potentially of great use in the study of social change. An evolutionary trait that was adaptive in an earlier environment may become maladaptive as environmental or social conditions change.

The question also arises as to which behavior patterns are universal and which are culturally specific. Some parts of human social behavior are apparently universal. For example, all humans (from New Guinea tribesmen to Americans according to Wexler) have the same distinct expressions for emotion like fear, disgust or happiness. Children born deaf use the same vocal expression of emotions as do hearing children (Wexler 2007, 33). On the other hand, cultural differences in social and perhaps even neural development are apparent at an early age. Bosch and Sebastián-Gallés (1997) found that 4 months old infants could recognize the difference even between two similar languages (Catalan versus Spanish).

The above discussion makes it clear that the standard rational actor models strips away everything that characterizes the uniqueness of the human species. Even our closest relatives, chimpanzees, act like rational economic men, and not like human beings. Jensen, Call, and Tomasello (2007, 107 Summarize

the findings of an ultimatum game experiment with chimpanzees:

Traditional models of economic decision-making assume that people are self-interested rational maximizers. Empirical research has demonstrated, however, that people will take into account the interests of others and are sensitive to norms of cooperation and fairness. In one of the most robust tests of this finding, the ultimatum game, individuals will reject a proposed division of a monetary windfall, at a cost to themselves, if they perceive it as unfair. Here we show that in an ultimatum game, humans' closest living relatives, chimpanzees (*Pan troglodytes*), are rational maximizers and are not sensitive to fairness. These results support the hypothesis that other regarding preferences and aversion to inequitable outcomes, which play key roles in human social organization, distinguish us from our closest living relatives.

GROUP INTELLIGENCE

From the discussion above about brain plasticity and Von Economo neurons it seems clear that the human brain is specifically designed for social interaction and the extended parent child relationship ensures this rich capacity for intimacy, trust and cooperation is developed. But does this have an evolutionary advantage? The strongest evidence that it does comes from the group selection discussion in evolutionary biology (Sober and Wilson 1998). Group selection refers to a process of natural selection that favors traits that increase the fitness of one group relative to other groups (Wilson, 1997). Every member of the group depends on a common characteristic not isolated in a single individual. Such behavior is the result of Darwinian "selection" but not selection rooted solely in the characteristics of individuals (Richerson and Boyd, 2005, Von den Bergh and Gowdy 2010). Group selection depends on *other-regarding interaction* among individuals, and is thus incompatible with isolated, self-referential interaction between cultural and genetic transmission. In social animals, natural selection is more likely to favor pro-social behavior than the selfish gene model would predict. Henrich (2004) notes that a purely genetic approach cannot explain the degree of pro-social behavior observed in humans. He suggests that a co-evolutionary process between cultural and genetic transmission is at work. Using a group selection perspective we can pose a scientific explanation for the cooperation and fairness observed in large groups and among unrelated strangers in non-repeated contexts. Given the genetic homogeneity of the human species, the wide variation in degrees of cooperation observed in human societies points to a cultural or environmental origin. In addition, if the large scale cooperation often observed in humans was purely based on genetic natural selection one would anticipate it would be more widespread in nature. Henrich (2004, 30) suggests:

...rooting the development of large-scale cooperation in the details of human social learning, addresses this challenge. Other mammals do not cooperate to the degree humans do because they lack the social learning abilities that produce cultural evolution and behavioral equilibria not available to genetic transmission alone.

A promising line of research is whether or not there exists a kind of “collective intelligence” related to cooperation in human groups. A recent study by Woolley et al (2010) examined the ability of groups, consisting of 2 to 5 people, to solve a variety of tasks. They found evidence for the existence of a general collective intelligence factor that explained group performance. Furthermore they found that:

This “c” factor is not strongly correlated with the average or maximum individual intelligence of group members but is correlated with the average social sensitivity of group members, the equality in distribution of conversational turn taking, and the proportion of females in the group.

This finding begs for further research into the “ideal” composition of groups for making critical decisions. For example, is there an ideal mix of selfish individuals and altruists in collective decision making? Does voting based on individual decisions preclude solutions based on deliberative valuation that might result in better outcomes?

IV. FRAMING AND BEHAVIORAL CHANGE

It is now well-established that human behavior cannot be understood without considering social context. This insight is self-evident to most people outside the economics profession. But ironically, the belief that people act strictly rationally is implicitly widely held by progressives who have a hard time understanding why so many people act against their own self interest (see the provocative column by George Monbiot 2010). It is ironic that conservatives who strongly support ideas of market rationality have been much more successful than progressives (who generally are more quick to see market imperfections and distortions) in organizing public opinion around tribal identities, not logic and reason. Those concerned about climate change frequently see the public opinion problem as a lack of good information rather than a cultural identity problem. This is not to downplay the role of sound science and dissemination of scientific evidence and arguments. However, it is evident that science-based approaches alone will not be able to create mass public support among the industrialized countries for radical lifestyle changes that will be required to

reduce greenhouse gas emissions to achieve climate stabilization.

The Importance of Reference Groups in Forming Attitudes

The first Garrison Climate Mind Behavior background paper discussed the phenomenon of “us versus them” behavior. The evolution of social behavior is driven in part by a distinction between the in group, deserving of trust, and the out group likely to be the subject of disdain. People in each group—in or out—are distinguished by cultural markers that become proxies for a variety of desirable or undesirable characteristics (Berreby 2005).

A remarkable survey finding is the recent polarization of Democrats and Republicans on the issue of climate change. In 1997 there was practically no difference in the percentage of Republicans (48 percent) and Democrats (52 percent) who agreed that global warming was real and was happening. Ten years later, in 2008, the percentage of Republicans believing in climate change has dropped to 42 percent and the percentage of Democrats believing in climate change had increased to 76 percent. The gap went from 4 percent to 34 percent in just ten years (Maibach, Roser-Renouf, and Leiserowitz 2009). Clive Hamilton (2010) argues that the reason for this remarkable shift is that right-wing think tanks, heavily funded by the petroleum industry, have succeeded in their campaign to undermine climate science as a liberal conspiracy. This campaign has succeeded in associating belief in climate change with a cluster of liberal policies like income redistribution, gay rights, and stricter government regulation. According to Hamilton: “In fact, denial is due to a surplus of culture rather than a deficit of information.”

Climate scientists, for the most part, have acted as if all that is needed is to better publicize the scientific information and scientific consensus about climate change and people will realize the urgency to respond and act to reduce greenhouse gases. This view rests on the assumption of rationality and, as Hamilton points out, it goes back to the Enlightenment and its break with the political privilege and feudalism that were entrenched in medieval beliefs about the natural world. This break came from the view that “potency of knowledge came from nature, not from privileged persons.” Climate scientists are naive about the extent to which their science undermines the established order—the fossil fuel economy, economic growth as the path to success and happiness, and faith in technology to overcome resource constraints and environmental problems.

What can be done to disarm the climate deniers? For one thing we need to separate obviously false anti-climate-change hysteria (that CO₂ and temperature levels are not significantly increasing and climate science is a vast socialist conspiracy). The harder to answer question is, “China is building a coal fired power plant every week, what good does it do for me to turn down my thermostat 2 degrees?” The latter is a legitimate question and one that progressives have not adequately addressed. Individual action may be key

but individuals need to believe their actions are meaningful. Self-efficacy is a critical component of behavior change and it may be that appeals for local actions that have local (and global) effects are more effective than appeals for international cooperation and larger scale politics. “Think globally and locally, knowing your actions have local and global impacts.”

Finding Common Cause

A report published by the UK World Wildlife Fund—*Common Cause: The Case for Working with our Cultural Values* (Crompton 2010) argues that current approaches to solving global challenges are failing because they don’t engage with cultural values.

Whatever the recent successes of civil society organizations in helping to address such challenges, it seems that current responses are incommensurate with the scale of the problems we confront. It is increasingly evident that resistance to action on these challenges will only be overcome through engagement with the cultural values that underpin this resistance. It also seems clear that, in trying to meet these challenges, civil society organizations must champion some long-held (but insufficiently esteemed) values, while seeking to diminish the primacy of many values which are now prominent – at least in Western industrialized society (Crompton 2010, 5).

These values include the importance of family and social relationships, concern for future generations, and empathy toward others. These values are particularly important in addressing “bigger-than-self” problems—problems important to individuals but whose solution is unlikely to be justified by self-interest alone. “Immediate-self-interest” problems, by contrast, are those whose solutions are justified in terms of personal gains alone. Related to this is the distinction between *intrinsic values* and *extrinsic values* (see Sheldon and McGregor 2000). Intrinsic values are those that do not depend on competitive comparisons with others—a sense of community, enjoyment of friends and family, and self actualization. Extrinsic values relate to things that have zero-sum comparisons like material wealth and power. Similar to thoughts in neuroscience, Crompton argues that progressives have missed the boat by focusing exclusively on extrinsic motivations.

1. Appeals to financial success and status, and even energy-efficiency investments based on financial payback, may be self-defeating because they may weaken values needed to address bigger than self problems. Money can crowd out pro-social norms.
2. Framing of social problems is critical. Conservatives have been much more successful than progressives in framing issues as “us versus them.”
3. People have clusters of values that reinforce each other. Activating particular values will reinforce other values in the related cluster

- and tend to suppress values in competing clusters (Crompton 2010, 33). Popular press and the marketing industry emphasize extrinsic values as measures of success and propagate the endless cycle of material wants and consumption having little connection to human needs and personal happiness.
4. As the group selection literature shows, humans have both selfish and altruistic tendencies that can be manipulated through upbringing, education, peer groups, and advertising. The logic of the market—and the economic theories that support market behavior—emphasizes the selfish individual consumer. Ironically, conservatives have been able to promote pro-market policies by framing them to appeal to intrinsic, pro-social, common interest values.

Framing an international issue like climate change, and encouraging viable individual and policy responses to it, requires a focus on intrinsic values because it requires individuals and countries to adopt attitudes of cooperation and unity to join together to make private and public sacrifices to reduce total CO2 emissions. . Self-interest is an important motivation of course, but it should be used with care. And it should be recognized that self-interest can sometimes crowd out the social good. Crompton (2010, 49-53) gives an excellent analysis of the *Stern Review* of the economics of climate change, pointing out that framing climate stabilization strategies as cooperative and intrinsically motivated is undermined by emphasizing the extrinsic benefits to countries that are able successfully complete in the global marketplace as exporters of renewable technologies to the rest of the world. The dissonance that occurs when promoting both selfishness and the common good may act to crowd out the common good.

Monbiot (2010) makes a strong case that progressives are partly to blame for this astonishing turn around in economic opportunities. And his explanation is of direct relevance to the environmental politics debate. He accuses progressives of abandoning their traditional values of community and trust (intrinsic values) and pandering to the extrinsic (status and self-advancement) values of the right.

Rightwing politicians have also, instinctively, understood the importance of values in changing the political map. Margaret Thatcher famously remarked that “economics are the method; the object is to change the heart and soul.” Conservatives in the United States generally avoid debating facts and figures. Instead they frame issues in ways that both appeal to and reinforce extrinsic values. Every year, through mechanisms that are rarely visible and seldom discussed, the space in which progressive ideas can flourish shrinks a little more. The progressive response to this trend has been disastrous.

Instead of confronting the shift in values, we have sought to adapt to it. Once-progressive political parties have tried to appease altered public

attitudes: think of all those New Labour appeals to Middle England, which was often just a code for self-interest. In doing so they endorse and legitimise extrinsic values. Many greens and social justice campaigners have also tried to reach people by appealing to self-interest: explaining how, for example, relieving poverty in the developing world will build a market for British products, or suggesting that, by buying a hybrid car, you can impress your friends and enhance your social status. This tactic also strengthens extrinsic values, making future campaigns even less likely to succeed. Green consumerism has been a catastrophic mistake.

Conservative politicians, and energy-related corporate interests, have succeeded in undermining the consensus about climate change by linking the issue to the decline in economic opportunity for most of the U.S. population. Climate change is seen by many as just another liberal cause to distract politicians and divert resources away from fixing a broken economy. This is why it's even more important to frame the climate change debate in terms of core American values of self-sufficiency, leadership and progress, economic security and job creation.

What the behavioral literature is telling us is that in order to get something done about the climate crisis—and other environmental and social issues—we need more focus on community values and participatory democracy and less focus on financial savings associated with energy-efficiency improvements and conservation.

V. HOMEOSTASIS AND INDIVIDUAL, SOCIAL AND ENVIRONMENTAL SUSTAINABILITY

Homeostasis is an important feature of living organisms as well as living systems. It is the ability (or even the goal) of living systems to maintain balance through a complex, highly evolved system of interacting processes. It can be used as a conceptual framework to link individual behavior, social stability and ecosystem resilience.

Homeostasis and the individual - One of the most interesting things about how the brain works is how it is intricately structured (physically, chemically, and neurologically) to keep living organisms in physical and emotional balance. Traditionally, economists have seen behavior in terms of “satisfying preferences.” People know what they want and rationally choose the things that will best satisfy these wants. A more accurate way to look at “wants” is to view them as one of several mechanisms to maintain homeostasis in the

human mind and body. Camerer, Lowenstein and Prelec (2005, 27) write:

As economists, we are used to thinking of preferences as the starting point for human behavior and behavior as the ending point. A neuroscience perspective, in contrast, views explicit behavior as only one of many mechanisms that the brain uses to maintain homeostasis, and preferences as transient state variables that ensure survival and reproduction. The traditional economic account of behavior, which assumes that humans act so as to maximally satisfy their preferences, starts in the middle (or perhaps even toward the end) of the neuroscience account. Rather than viewing pleasure as the goal of human behavior, a more realistic account would view pleasure as a homeostatic cue—an informational signal.

“Consumption” for example, is one of many kinds of behavior that may move an individual toward, or away from, emotional balance. It is a response to social and neurological signals, not an end in itself.

Homeostasis in human societies - It can be argued that a sustainable human society is also characterized by homeostasis. The economist Nicholas Georgescu-Roegen used to term *viability* for a sustainable economy. An economy was viable if (1) it uses technologies that do not draw down irreplaceable stocks, and (2) it does not impair the ability of fund factors (labor, capital, and land) to maintain themselves through time. Human labor power, for example, must be maintained through adequate nutrition, support of family and friends and other healthy social relationships. These ideas now dominate current work in development economics. Amartya Sen (1999) suggests an approach to development emphasizing the ability to live an informed and full life rather than concentrating solely on increasing per capita income. Nussbaum (2000) called for a focus on “distributive justice”, that is, creating the baseline conditions for the realization of a set of central human capabilities for all people. Such policies offer a more effective approach to development than simply relying on aggregate income growth alone which is not an indicator of distributive justice or average economic wellbeing. They also offer more flexibility for more people, and the species they harvest, in adapting to environmental changes.

Homeostasis and ecosystems - Homeostasis is also related to the concept of “resilience” in ecosystems (Hollings 1973). Maintaining diversity and evolutionary potential is essential to preserving ecosystem integrity. The unsustainability of the current path of ecosystem use by humans is apparent from the catastrophic loss of biodiversity and the destabilization of the earth’s climate regime—both a direct result of pursuing exponential economic growth.

These hierarchies of homeostasis—individual, social and ecosystem—are closely intertwined. Helena Norberg-Hodge (1991) has documented the connection between individual, social and environmental balance in her work

on the transformation of Ladakh. Disruption of the local economy of Ladakh beginning in the 1970s with cheap (subsidized) imports led to a series of disastrous consequences including a deterioration of individual well-being, social disruption and conflict, and environmental degradation.

Identifying feedback mechanisms leading to, or away from, homeostasis (balance) within and among these three hierarchies is a rich research area. A systematic study and identification of social, economic and environmental feedback loops will give policy makers prescient signals of imbalances that threaten system homeostasis and sustainability and will inform the types of interventions that are needed to avert potentially disastrous consequences. The evolutionary context of homeostasis is critical. Evolutionary processes often result in traits that are maladaptive when conditions change. Cultural traits that for a time worked to create prosperous, unified societies sometimes led to disastrous long-term consequences. Cultural evolution, like biological evolution, is also subject to the problem of “mismatch.” Traits that were successful under one set of environmental circumstances may prove to be maladaptive as conditions change.

VI. CONCLUSION: TOWARD A NEW FRAMEWORK FOR CLIMATE POLICIES

Conservatives have succeeded so far in casting the climate debate as a cultural war pitting scientists and liberals against traditional values, particularly the value of individual freedom. For many people climate change has been put in the same category as other threats to traditional values—from same sex marriage to abortion. And somehow the climate change issue has been cast as a governmental intrusion that threatens to undermine traditional values of economic growth and consumer freedom. This plays into the hands of neo-liberals who claim that the social good is maximized by decisions of isolated individuals making selfish choices in competitive markets. This framework has been consciously used to discourage public support for any sort of cooperative, collective public policy, the very kinds of policies that are critical for addressing climate change.

Bromley (2007, 677) describes the takeover of reasoned public discourse and democratically chosen public policies by the let-the-market-decide mentality:

Suddenly, it seems that public policy is not what we thought it was. Democracy as public participation and reasoned discourse is somehow suspect—not to be trusted. It seems that the public’s business cannot

be properly conducted unless it adheres to the precepts of individualistic models of “rational choice” applied to collective action. ... It is a quest for public policy in which applied micro-economics is deployed as the only way to impose “rationality” on an otherwise incoherent and quite untrustworthy political process. This is not a clash of worldviews. It is a clash of contending truth claims about how to figure out what is to be done in the public sphere—it is a confrontation between prescriptive consequentialism and reasoned public debate over how to get to the future.

The public policy of neoliberal “prescriptive consequentialism” is to set markets in motion and then let efficiency in allocation determine the socially optimal outcome. This prescription requires only that prices be “correct” and that property rights be fully specified. These are sufficient conditions to vanquish free riding and inefficiency. The well-documented failure of this approach has led many economists to reconsider the role of public policy in promoting the social good. Daniel Bromley, Paul Krugman in his many outstanding columns in the *New York Times*, Paul Manbriot’s columns in *The Guardian*, John Quiggin in *Zombie Economics* and many others are beginning to carve out a response that will effectively challenge the neoliberal ascendancy of the last thirty years.

The findings from behavioral science and neuroscience are key to systematically understanding the social, economic and environmental challenges we are now facing. The integration of the behavioral sciences and neuroscience also will be able provide new approaches and solutions to for achieving the conditions for homeostasis for the future. Human behavior is an outcome of complex interactions between “nature” and “nurture” and there is no hard and fast separation between humans’ genetic potential and the capabilities and behaviors that are environmentally nurtured and conditioned. Patterns of behavior and neurological structures of the brain have co-evolved over eons and have successfully solved some basic survival problems. Our understanding how cultural traits are generated, propagated, and selected has been greatly enhanced by current advances in neuroscience. This understanding will be crucial in surviving the inevitable rapid environmental shifts and adaptive cultural changes of this century.

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ADDENDUM: THE WHITE UNDERCLASS AS A KEY REFERENCE GROUP

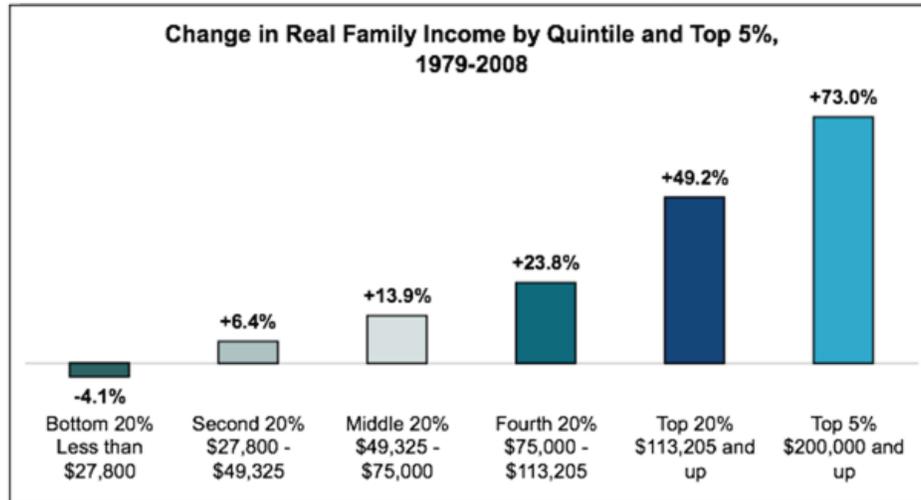
What accounts for the success of conservative corporate power groups to convince such a large number of people to act against their own economic interests? The history of America has many examples of self-made millionaires and the popularity of television serials like “Who wants to be a millionaire?” and mega-jackpot lotteries indicates that many Americans believe they are just one winning number away from being a millionaire themselves. A major reason is that the U.S. white underclass* has been neglected in favor of top down economic policies that have only increased income disparities and further disadvantaged the bottom portion of U.S. income groups. Although this group is culturally diverse, its members form the backbone of the Tea Party, right-wing militia movements, and the growing extremism of the Republican party. In recent decades this group has been ill-served by the Democratic party which has championed trade agreements and tax laws that have helped multi-national corporations but have gutted America’s manufacturing sector and lost skilled factory jobs while protecting the privileges of the wealthy. Democrats have frequently chosen to emphasize social and environmental issues that are irrelevant to many members of the white underclass who are unemployed and underemployed. It is this group’s fears and resentments that have spilled out in anger and votes against government efforts to combat climate change.

Joe Bageant, in *Rainbow Pie: A Redneck Memoir* (2010) writes:

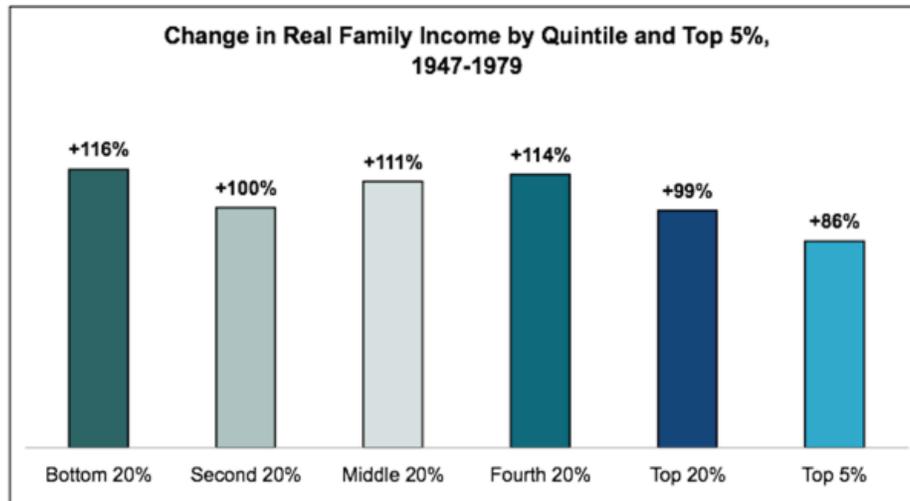
Economic, political, and social culture in America is staggering under the sheer weight of its white underclass, which now numbers some sixty million. Generally unable to read at a functional level, they are easily manipulated by corporate-political interests to vote against advances in health and education, and even more easily mustered in support of any proposed military conflict, aggressive or otherwise. One-third of their children are born out of wedlock, and are unemployable by any contemporary industrialized-world standard. Even if we were to bring back their jobs from China and elsewhere -- a damned unlikely scenario -- they would be competing at a wage scale that would not meet even their basic needs. Low skilled, and with little understanding of the world beyond either what is presented to them by kitschy and simplistic television, movie, and other media entertainments, or their experience as armed grunts in foreign combat, the future of the white underclass not only looks grim, but permanent.

It is no wonder that conservatives are having a field day fomenting fears and prejudices in the white underclass. It is a mystery to most of us why so many

people who are blue-collar workers and unemployed should demand that they be denied healthcare and that the rich should be taxed less. Much of this anger may be a natural reaction to a government and economic system that has presided over an astonishing transfer of the wealth created by our society from the poorest to the richest. The real family income of the bottom 20 percent of the U.S. population has



Source: U.S. Census Bureau, Historical Income Tables, Table F-3 (for income changes) and Table F-1 (for income ranges in 2008 dollars).



Source: Analysis of U.S. Census Bureau data in Economic Policy Institute, The State of Working America 1994-95 (M.E. Sharpe: 1994) p. 37.

actually declined over the past 30 years. Annual income growth has been near zero for the bottom 60 percent of families. Only the wealthiest 5% of families has maintained their income growth since 1979. The contrast between the 30 year period after WWII could not be more stark. During that period, a robust income growth was shared by all social classes as shown in the chart above. [note: this information and more is available at http://extremeinequality.org/?page_id=8]

The disparity in wealth, as opposed to income, is even more shocking. In 2007 the combined net worth of the 400 wealthiest Americans was \$1.5 trillion. The combined net worth of the poorest 50% of American households was \$1.6 trillion. [<http://wealthforcommongood.org/wp-content/uploads/2009/12/inequality-by-the-numbers-2009.pdf>]

A final point to consider is that the tea party movement is far from unique. All over the world the failure of the global economy to solve to problems of poverty and inequality is leading to social unrest. The “solutions” advocated by various rebellious groups—less government, more religion, driving the foreigners out—may be off the mark but the underlying anger is not.

*Clarification - The discussion in the preceding paragraphs about the white underclass is in no way intended to minimize the plight of African Americans, Latinos or any other repressed minority group. Nor is it intended to deny the importance of worthy progressive social causes like gay rights, welfare rights, and abortion rights. Nor is it intended to deny that the white underclass is a homogenous group without progressive elements.