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The Evolution of Free Enterprise Values

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Abstract

Free enterprise economic systems evolved in the modern period as culturally transmitted values related to honesty, hard work, and education achievement emerged. One evolutionary puzzle is why most economies for the past 5,000 years have had a limited role for free enterprise given the spectacular success of modern free economies. Another is why if humans became biologically modern 50,000 years ago did it take until 11,000 years ago for agriculture, the economic foundation of states, to begin. Why didn't free enterprise evolve long ago and far away?

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Introduction

The free enterprise system that today dominates the world economy has deep evolutionary roots even though it has a shallow history. As Darwin (Darwin 1874) argued cogently in the *Descent of Man*, long before geneticists showed that humans have unusually little genetic diversity, all human populations have essentially the same "mental and moral faculties."

> Although the existing races differ in many respects, as in color, hair, shape of the skull, proportions of the body, etc., yet, if their whole structure be taken into consideration, they are found to resemble each other closely on a multitude of points. Many of these are so unimportant or of so singular a nature that it is extremely improbable that they should have been independently acquired by aboriginally distinct species or races. The same remark holds good with equal or greater force with respect to the numerous points of mental similarity between the most distinct races of man. The American aborigines, Negroes, and Europeans are as different from each other in mind as any three races that can be named; yet I was constantly struck, while living with the Fuegians on board the "Beagle," with the many little traits of character showing how similar their minds were to ours; and so it was with a full-blooded Negro with whom I happened once to be intimate (237).

He gave the emotion of sympathy a foundational role in generating our ethical systems. Adam Smith (1790) gave sympathy the same key role in his *Theory of Moral Sentiments*. Zak's (this volume) experiments show that we are some ways towards understanding the neurobiology of sympathy. Darwin suggested that sympathy evolved in "primeval times" among the tribal ancestors of all living humans and proposed what we nowadays call a group selection hypothesis to explain how the moral faculties arose:

> It must not be forgotten that although a high standard of morality gives but a slight or no advantage to each individual man and his children over other men of the same tribe, yet that an increase in the number of well-endowed men and an advancement in the standard of morality will certainly give an immense advantage to one tribe over another. A tribe including many members who, from possessing in a high degree the spirit of patriotism, fidelity, obedience, courage, and sympathy, were always ready to aid one another, and to sacrifice themselves for the common good, would be victorious over most other tribes; and this would be natural selection (178-179).[i]

This left him with the problem of accounting for the rise of civilized nations from tribal ones. Since tribal societies still exist even today in many parts of the world, how does one explain why some societies have "advanced[ii]" and others not? In the *Descent of Man* (179-180) he speculates about the role of a temperate climate and he need for civilization to be based upon agricultural production but concludes "the problem, however, of the first advance of savages toward civilization is at present much too difficult to be solved."

By now anthropologists, archaeologists and historians have given us a very rich picture of how and where complex societies have evolved from simpler ones (McNeill 1963, Diamond 1997, Klein 1999, Johnson and Earle 2000). Note that the civilization-barbarism-savagery terminology has dropped out of technical usage because of the invidious comparisons implied in them; after the horrors that 20th Century "civilizations" inflicted upon one another, the ethical superiority of the civilized nations came in for even more skepticism than Darwin expressed. But much of the puzzle remains. Anatomically modern people arose some 200,000 thousand years ago in Africa and their behavior had a distinctly modern caste by at the latest by 50,000 years ago. Agriculture first arose in the Levant over 11,000 years ago. The first societies with a complex division of labor arose in Mesopotamia about 5,000 years ago. Modern free enterprise economic systems began to emerge in Adam Smith's time in Britain and the US and were still few when Darwin's wrote. Yet, today the democratic, free enterprise society, usually with a more or less generous welfare safety net, has out-competed all challengers and is spreading rapidly across the globe.

The puzzle is why now and why so rapidly. The puzzle is made more acute by the fact that even the simplest human societies anthropologists have had a chance to study are characterized by high levels of individual autonomy, a simple division of labor based on age and sex, and respectable amounts intra and inter-group trade. Modern social systems would seem to be a straightforward extrapolation from abilities and proclivities possessed by humans living tens if not hundreds of thousands of years ago. Indeed, in some key respects, modern free enterprise societies recapture some of the desirable features of tribal societies. Our ancestral tribes managed to combine a high degree of individual autonomy with considerable cooperation, including simple institutions designed to mitigate risk (Boehm 1999). Trade within and between tribes was often well developed, including the use of standardized media of exchange, such as shell bead money in California (Heizer 1978). The state level societies that arose in the wake of agriculture were typically dominated by small elites that restricted individual autonomy and usually provided little social insurance for common people. Max Weber (1930) famously argued that the spirit of capitalism derived from events that combined the Calvinist concept of everyday business as a religious calling with the secular rationalism of Western philosophy. In figures like Benjamin Franklin, the asceticism derived from Calvinism and the rationality of the philosopher produced men devoted to growing their businesses through investment and technical acumen, and creating a political space in business could thrive. The political values fostered by pragmatic free enterprise enthusiasts like Franklin, and enshrined in documents like the US Declaration of Independence, led gradually, but seemingly inexorably to the spread of political rights and ultimately to universal suffrage. Universal suffrage in turn favored the expansion of social insurance schemes and universal state-subsidized education (Lindert 2004). Free enterprise societies have managed to combine a considerable degree of individual autonomy (liberty) with a productive economy (wealth) and low risks of want, disease, and death (welfare). Why didn't Franklin-like innovators launch human societies on the path to free enterprise thousands or even tens thousands of years ago?

Evidently, the wheels of cultural evolution roll on the time scale of millennia, even though when we look closely at any one society over short periods of time, change is often readily perceptible. Biological evolution, incidentally, exhibits the same pattern. Evolution from generation to generation in the wild is often fast enough to be measured, yet average rates of evolution as measured over long spans of time are very slow (Gingerich 1983), so slow that they would be immeasurable in any scientist's lifetime. Most of the time both cultural and genetic evolution seem to noodle about aimlessly in response to local events and forces either only very gradually moving in any particular direction or to make sudden, rare excursions (both patterns appear in the fossil record, (Carroll 1997)).

In this chapter we will review what we have learned since Darwin about how the processes of cultural evolution, particularly about the evolution of social institutions, the rules of our social life. The scientific problems posed by cultural evolution are usefully divided into two sorts, microevolutionary and macroevolutionary. Microevolutionary processes are those that occur over periods of time, short enough to study by direct observation and experiment. Macroevolutionary problems are the long term trends and big events we observe indirectly by historical, archaeological, and paleontological reconstruction. Microevolutionary processes we assume to be the basic engine of macroevolution, borrowing the geologists' doctrine of uniformitarianism. The mathematical theory of evolution is built to allow us to extrapolate from the generation to generation microevolutionary time scale out to the time scales of long term trends and major events. We want to understand events like the origin of agriculture and the development of free enterprise economies in terms of the day-to-day decisions that imitators and teachers make about what cultural variants to adopt and of the consequences of those decisions.

The key to understanding cultural evolution is the idea that it is a population level phenomenon. That is, values[iii] are the individual level motor of social institutions, but we cannot understand the evolution of institutions only in terms of the individual level processes. To put it another way, even if we have perfect information about the innate aspects of human behavior, we can only go part way towards understanding values and institutions. Cultural history matters over medium time scales, and genetic history over somewhat longer time scales. A complex concatenation of evolutionary processes affect the evolution of socially transmitted values over many generation, indeed as we have noted in the previous paragraph, over millennia. The origins of the institutions of free enterprise lie in the cumulative results of decisions and consequences of decisions going back many millennia, although many of the most distinctive departures from traditional agrarian societies evolved during the last half millennium. We will argue that the social instincts that we inherit from our tribal past were shaped by gene-culture coevolution in which group selection on cultural variation played the leading role. This process seems to have been especially active between about 250,000 years ago and 50,000 years ago (McBrearty and Brooks 2000). *The macroevolutionary puzzle is thus why, given the current adaptive success of free enterprise societies and the fact that humans were apparently completely capable 50,000 years ago, did cultural evolution proceed so slowly over the past 50 millennia?* We are still near the beginning of this explanatory

endeavor but we know roughly what dots we need to connect and have the means to draw some interesting hypothetical dashed lines between them. Douglass North (1994) remarked not so long ago that neoclassical economic theory needs to be supplemented by theory that has a richer appreciation of individual psychology and cumulative learning of societies in order to understand the history of economies. Cultural evolutionary theory is a key element of this enlarged theory (Bowles 2003)

The Theory of Cultural Evolution

Organic evolutionists began to use mathematical models to investigate the properties of evolution in the first quarter of the 20th Century. The aim of the effort was to take the micro-scale properties of individuals and genes, scale them up to a population of individuals and deduce the long run evolutionary consequences of the assumed micro level processes. Empiricists have a handle on both the micro scale processes and the long run results, but not on what happens over many generations in between. Moreover, human intuition is not so good at envisioning the behavior of populations over long spans of time. Hence mathematics proved an invaluable aid.

Beginning with the pioneering work of Lucca Cavalli-Sforza and Marc Feldman (1981) in the early 1970s, these *methods* were adapted to study cultural evolution. The problem is similar to organic evolution. People acquire information from others by learning and teaching. Cultural transmission is imperfect, so the transmission is not always exact. People invent new cultural variants, making culture a system for the inheritance of acquired variation. People also pick and choose the cultural variants they adopt and use, processes that are not possible in the genetic system (although in the case of sexual selection individuals may choose mates with the objective of getting good genes for their offspring). Social scientists know a fair amount about such things, enough to build reasonable mathematical representations of the micro-level processes of cultural evolution. The theory is of the form

$$p_{t+1} = p_t + effects\ of\ \ forces$$

where p measures something interesting about the culture of a population, for example the fraction of employees who are earnest workers. Teaching and imitation, all else equal, tend to replicate culture. The fraction of workers in a culture who are earnest tends to remain similar from generation to generation. Earnest workers model earnest behavior for others to imitate and try to teach earnestness to new employees. Likewise slackers. Typically, several processes we call forces will act simultaneously to change culture over time. For example, management may find it difficult to discover and sanction slacking. Earnest workers may experiment with slacking and find that there are seldom any adverse consequences. Hence, some earnest employees may become slackers. New employees may observe that some people slack and some work hard. They may tend to prefer the easier path. At the same time, firms with a high frequency of slackers will tend to fail while those with many earnest workers may prosper. Prosperous firms will have the opportunity to socialize many more new workers than those that fail prematurely. The overall quality of the economy's work force in the long run will be determined by the

balance of forces favoring slacking versus those favoring earnestness. Theorists are interested in the abstract properties of such evolutionary models. Empiricists are interested in finding the models that best describe actual evolving systems. Real world practitioners are interested in predicting the outcomes of policies that might improve or harm the quality of a firm's or an economy's work force.

Our own interest (Boyd and Richerson 1985, Richerson and Boyd 2005) has been to use such models to answer a series of substantive questions. We have been interested in the adaptive costs and benefits of culture, rates of different kinds of cultural evolution, the evolution of symbolic systems, and the role of culture in the evolution of cooperation. Most relevant to this essay, we have tried to ferret out the factors that retard the rate of cultural evolution and thus explain the 50,000 year gap between the last major genetic changes in our lineage and our current extraordinarily successful societies (Boyd and Richerson 1992).

Correcting the Oversimplifications of Selfish Rationality

Challenging the emphasis of selfish rationality in conventional economic theory is the main theme of this book. Neither the neo-classical assumption of selfishness nor the assumption of rationality is an innocent simplification. Cultural evolutionary models are based upon a model of a human decision-maker that exercises effort to select cultural variants in an attempt to increase her genetic fitness. If we make this decision-maker omnisciently rational and selfish, we end up mating neo-classical economics to basic evolutionary theory, giving an in-principle complete theory of human behavior, as Jack Hirshleifer (1977) and Paul Samuelson (1985) have noted. However, if we introduce the simple realistic consideration that rationality is imperfect because information is costly to acquire (Simon 1959) we immediately spawn a great deal of *evolutionary* complexity. In organisms with little or no culture, variable amounts of investment in big brains and other devices for individual level behavioral and anatomical flexibility evolve. But such devices only function at the margin; most organic adaptations are gene-based. Thus we have millions of species with highly evolved, specialized innate abilities rather than a few species that flexibly occupy a wide range of ecological niches. Humans are the biggest exception to this rule. Even as hunter-gatherers we spread to almost all of the presently habitable bits of the world including harsh environments like the high arctic—quite an accomplishment for a tropical ape! In the course of doing so, we have made our living in an almost limitless number of ways. But not just any human can live in the high arctic. You have to have the requisite technology (kayaks, parkas, snow houses) and social organization (institutions underpinning cooperative hunting, emergency assistance, and inter-group trade) that you learn from your parents and others. The latest version of the High Arctic cultural adaptation (The Thule Culture and the ethnographic Eskimo) spread from Alaska to Greenland only after 600 AD or so (Dumond 1984).

The adaptive advantage of culture

The origins of human culture are a macroevolutionary puzzle of the first magnitude. Most "killer adaptations" evolved long ago, multiple times, and are retained by most of the lineages in which they evolved. Take eyes. Eyes are ancient structures and the come in a wide variety of forms (Nilsson 1989). They often perform at close to optically perfect limits. Both compound eyes and camera style eyes, the most sophisticated forms, evolved

in more than one lineage. Paleozoic animals evolved all the basic types of eyes. Most animals living in lighted environments have eyes. Human's advanced abilities to teach and imitate, and hence create cumulative culture, would seem to be a killer adaptation as well on the evidence that it is our basis for becoming the earth's dominant organism. Yet this fancy adaptation only evolved in the middle and late Pleistocene rather than in the Paleozoic and is largely if not entirely restricted to our species.

A considerable amount of evidence supports the hypothesis that recent increases in environmental variability are behind the evolution of culture in humans (Richerson et al. 2005). Theoretical models show that a costly system for social transmission of information out-competes the familiar pattern of genetic inheritance plus individual learning in highly variable environments. The earth's climate has been cooling and drying over the last 60 million years or so, and the Pleistocene Era has seen the cyclical growth and recession of ice sheets. The cyclical component of this variation is probably at too long a time scale (20,000 yrs and longer) to directly favor culture (but see (Potts 1996). During at least the last couple of glacial cycles, glacial climates were extremely variable on millennial and submillennial time scales. Variation on these time scales is exactly what theoretical models suggest should favor culture. These time scales are too rapid for extensive adjustment by innate mechanisms, but cultural evolution, by adding decision-making to the effects of natural selection, evolves faster than genes and can track millennial and submillennial scale variation. Low cost decision rules that people are known to deploy (Gigerenzer and Goldstein 1996), like satisficing, going along with the majority and copying successful individuals, are quite effective at moving culture right along on such time scales. Humans are not the only animals whose brains have gotten larger. Mammalian brains in many lineages have gotten larger as the climate has deteriorated (Jerison 1973), and the rate of evolution in many of them shot up during the Pleistocene. The amount of both social and individual learning is correlated with brain size in non-primates (Reader and Laland 2002) and probably in many other lineages including birds, the living branch of the notoriously small-brained dinosaur lineage.

Even the most complex examples of non-human cultural traditions are quite simple compared to human culture. In particular, non-human culture shows little or no evidence for the cumulative evolution of complex artifacts and social systems in which many successive innovations have led to exceedingly complex, often highly adaptive, traditions (Boyd and Richerson 1996). Animals often make simple tools (e.g. Caledonian crows, (Hunt 2000), but even the most complex animal tools fall short of a stone-tipped spear, much less an Arctic hunter's kayak (Arima 1987). Even chimpanzees, a species that is quite good at social learning compared to most animals, imitate much less accurately than human children (Tomasello 1996). We are probably the only species with advanced culture because we got there first with the most. Bipedal locomotion evolved in our lineage long before our brain size increased relative to other apes and long before any evidence of sophisticated toolmaking. When toolmaking did come along, our hands were relatively free to evolve into technology making organs. Apes are rather social as mammals go, and we were pre-adapted in this way to evolve more complex social systems as well. Once humans acquired the capacity for complex culture we radiated rapidly and spread to distant parts of the earth. Any creature tending to repeat this

trajectory faces stiff competition from humans whom, we might imagine, occupy most of the ecological niches where advanced culture would be a large advantage.

Cultural evolution and the evolution of tribal social instincts

The discoveries of the cultural evolutionists regarding human social systems have two important legs. First, we now have a much deeper insight into human nature than was possible in the absence of an understanding of cultural evolution. Humans have evolved a social psychology that mixes a strong element of cooperative dispositions, deriving from group selection on cultural variation, with an equally strong selfish element deriving from more ancient primate dispositions (Richerson and Boyd 1998). Evolutionary biologists have long argued that group selection of the sort Darwin envisioned for humans is not a very important force in nature (Williams 1966); see (Sober and Wilson 1998) for a contrary view. The problem in theory, and probably in practice, is that, short of the strong reproductive isolation of species, genetic variation between competing populations is hard to maintain. Migration is a powerful homogenizing force. Theoretical models suggest that cultural variation is much more susceptible to group selection than is genetic variation (Henrich 2004). For example, if people use conformity to the majority to bias their acquisition of culture, rare migrants will tend to be ignored and the homogenizing effects of migration are mitigated. Several other mechanisms have a similar effect. For example, human groups are often symbolically marked by linguistic and other differences and people tend to prefer to imitate similar others (McElreath et al. 2003). The upshot is that Darwin's picture of group selection among tribes is plausible for humans if we assume that the variation being selected is cultural not genetic. At the same time, human genetic reproduction is mainly the business of individuals and families, so selection genes still favors individual selfishness and kin-based nepotistic cooperation. Your family is liable to take more interest in your genetic reproduction than are even your close friends (Newson et al. 2005). This sets up a coevolutionary antagonism between genes and culture. Humans are much like a domestic animal—docile and inclined to conform to social conventions (Simon 1990). The flush of oxytocin-induced empathetic feelings that result from acts of trust provide a proximal mechanism for this domesticity (Zak, this volume). Human social behavior differs from that of other primates (Brosnan this volume); a natural hypothesis is that the evolution of human sympathy was driven by increasing oxytosin production in response to empathetic acts of others and to our own empathetic acts. But like domestic animals, we retain a healthy interest in our own comfort and opportunities to reproduce. We call this the tribal social instincts hypothesis in honor of Darwin's original formulation.

Thus, we are imperfect and often reluctant, but often very effective, cooperators. We are contingent cooperators. Few will continue cooperating when others do not. The effectiveness of our cooperation is *not* just a product of our social psychology; rather, our social psychology creates evolutionary forces that build *cultural systems of morality and convention* that in turn make possible sophisticated systems of cooperation such as businesses. Individuals are not really that rational. We depend upon cultural evolution to generate values and social institutions over many generations that are more group-functional than individuals can hope to devise based directly on our social instincts.

Several contributions to this volume point to the importance of culturally evolved institutions in regulating human social life. Kimbrough et al.'s experiment illustrates how much trouble individuals have in discovering efficient solutions to complex cooperative problems. Ostrom and Schwab's contribution argues that humans use quite complex multidimensional institutions to manage common property resources. O'Hara argues that contract law provides an important but blunt tool for encouraging trustworthiness among business partners. We also understand something of how institutions recruit individual level mechanisms like hormone release to do their work (Nisbett and Cohen 1996). The theory of gene-culture coevolution adds an account of where institutions come from and how a biology that can respond to institutions could have evolved.

Tribal human nature, work-arounds, and organizational management

The understanding that human nature is fundamentally tribal is an important insight we believe, but it leaves unexplained the rise of supra-tribal social systems beginning about 5,000 years ago. The organizations of complex societies are made possible, but not easy, by a tribal human nature that is conditionally cooperative. Given the right culturally transmitted rules and enough of our peers willing to honor them, most of us are also willing to honor them. The organizations of complex societies succeed when they manage to recruit the group favoring the tribal impulses that most of us have, but they also have to work against the fact that such organizations face a more constrained job than tribes. Tribes worked only for their members benefit, whereas businesses and other organizations within complex societies have a broad array of "stakeholders" to satisfy—customers, suppliers, owners, lenders, neighbors, and regulators. The great vice of tribes was inter-tribal anarchy. The small compass of tribal patriotism frequently led, particularly when population densities increased after the evolution of agricultural subsistence, to chronic military insecurity. Complex societies use grants of power and other devices as "workarounds" to control inter-"tribal" anarchy in the interests of domestic tranquility and an efficient division of labor. A collection of tribes that owed obedience to paramount chief who settled disputes among them could thus mitigate inter-tribal anarchy. A professional priestly establishment might invent dogma and design rituals by which a tribe might maintain a sense of common culture and social solidarity as it grew far larger than the egalitarian tribe of the ancestral hunters and gatherers. But such workarounds often lead to management problems, such as abuses of power for selfish ends (Richerson and Boyd 1999). Successful management is thus substantially the art of using work-arounds to tap the tribal social instincts while at the same time minimizing their inherent vices.

The moral hidden hand and the functioning of organizations

Conditional cooperation and the existence of social rules, to which we more or less readily conform, constitute a moral hidden hand. One can depend on most people, most of the time, to be spontaneously helpful and honest—even to strangers. Just as no corps of central planners needs to work out the details of how a market economy is to operate, so no central authority needs to comprehensively supervise the day-to-day interactions of a human community to ensure that we all take account of one another's needs and behave decently and honestly. Democracies work, for example, because most voters vote even

though rational selfish individuals would not bother. The evidence also suggests that people vote their principles rather than their pocketbooks (Sears and Funk 1991).

Thus, the moral hidden hand deriving from our tribal social instincts is one foundation upon which our immensely successful free enterprise systems rest. This system has a claim to have better developed work-arounds that refine the tradeoffs between sources of dysfunction in inherent in the moral ambiguity of social instincts the moral hidden hand. The vote in democratic polities and consumer and producer sovereignty in markets restore some of the individual and family autonomy that characterized egalitarian tribes. The rule of law subjects the exercise of power to constraints that favor its prosocial exercise. Common miscreants are punished, but the powerful are also constrained to act out roles that limit abuses of power. The trick is to get the balance right. In particular, attempts to control individual behavior by the use of power to set up incentives designed to appeal to selfish motives risk "crowding out" (Frey and Jegen 2001). When power holders use individualized incentives, such as salary bonuses, motivate the desired behavior, these incentives may impair the functioning of the moral hidden hand. Workers are liable take incentives as a lesson that management is trying to teach them—the smart, if not the right, thing to do is to respond only to incentives that would appeal to the rational selfish worker. If constructs resulting from the operation of the moral hidden hand, like professionalism and pride in honesty, are neglected in favor of responding to incentives, and if incentives are imperfect or game-able, incentives can easily damage not improve performance. As Stout (this volume) remarks, *Homo economicus* sounds suspiciously like a sociopath. The very idea that we have culture depends upon us learning the lessons that society teaches. If it teaches *Homo economicus* . . . . Evidence for the operation of crowding out includes experimental results and a good deal of evidence from the field. Some business management scholars believe that the influence of neo-classical economists with their rational-selfish models and intuitions has crowded out the moral hidden hand in the behavior of management school graduates (Ferraro et al. 2005, Ghoshal 2005). See also Gintis and Khurana, this volume. The use of draconian punishment systems to coerce correct behavior leads to a collapse of a society's morale, as in the East Germans' cynical saying "they pretend to pay us, we pretend to work."

Contrariwise, legal systems attempt to "crowd in" virtuous behavior [Salter, 1995 #7939; O'Hara, this volume]. A trial is a morality play in which offenders, jury members, and spectators are invited to see offending behavior as violating the standards of the community. For first offenders, especially those that confess and show remorse, may be let off with a lecture. Elinor Ostrom (1990) describes the care with which village scale commons management systems punish offenders, ramping up punishments for repeat offenders but treating first offenders as perhaps just not understanding the rules. Strong sanctions must ultimately be applied to the minority of sociopathic strategists who, in the lab and in the field, can cause organizations to collapse.

Nevertheless, legal systems often fail to crowd in virtue. For example, in highly stratified and ethnically divided societies, cultures of resistance may arise if sub-communities, perhaps with reason, feel that the exercise of power is illegitimate (Sidanius and Pratto 1999). In American underclass communities, tribal scale street gangs may arise partly to

serve social functions like protection not furnished by legitimate institutions, partly as symbolic cultures of resistance, and partly to exploit black market business opportunities. Since these cultures are viewed by the dominant culture as evil, they reinforce the dominants' view that what subordinate communities see as abuses of power are in fact a necessary and legitimate part of the legal system. A sick coevolutionary spiral sets in with a culture of increasing resistance driving a culture of increasing repression. Thus we end up with the spectacle of the world's largest free nation on the one hand offering economic opportunity to wave after wave of immigrants while at the same time incarcerating about the same number of its own citizens as the Soviet Union did. A number of inherent difficulties in improving and maintaining the functioning of complex societies led us to characterize them as "crude superorganisms" (Richerson and Boyd 1999).

Adam Smith and Charles Darwin both made empathy the cornerstone of their theories of virtue as we have seen. They observed that without the other-regarding virtue of sympathy, the social life that humans enjoy today would not be possible, much less reforms aimed at improving our social life. Market forces certainly do exert important hidden hand effects, but the effects of everyday virtues are equally pervasive and nearly as hidden in the sense that formal legal institutions and formal policies and procedures represent only a small part of their effect (Ellickson 1991). Informal rules and everyday virtues affect our behavior in a multitude of unforced, unplanned ways. Formal law is costly and cumbersome, and is most often invoked when custom and everyday virtue fail in some way.

Smith's and Darwin's old insight**s** are buttressed by modern theoretical and empirical studies that show how far human behavior deviates from the neoclassic economist's selfish rational assumption. For example, an important component of the moral hidden hand is the fact that many people will altruistically punish cheaters in social games (Fehr and Gachter 2002). Given such results, we should not be surprised that businesses attending to their social and environmental responsibilities make no less money than the average business and in many cases seem to make more money than ones that focus more ruthlessly on the bottom line (Orlitzky et al. 2003).

Businesses and other modern organizations are complex cooperative systems that function best when the moral hidden hand is operating most freely. A business full of high morale cooperators will tend to earn the firm respectable profits and still have plenty of spare energy to help people and the environment. The firm that focuses excessively on the bottom line may find that it has inadvertently handicapped the moral hidden hand by encouraging employees to focus selfishly on their personal bottom lines**,** which might include diverting the firms resources for their own gain by focusing on personal agendas, padding expense accounts, pilfering the supply cabinet, running up sales commissions by making expensive promises to customers, and by the many other ways that selfish employees can exploit the organization. Most economists are surprised by findings, such as Orlitzky et al.'s (as they are by many of the cultural-evolutionary findings that underpin our analysis). Economists have been trained to expect a *tradeoff* to exist between a firm's profitability and any *special* attention it pays to social or environmental

concerns rather than the *synergy* between these goals predicted by cultural evolution (and supported by laboratory experiments). Economics students, incidentally, are quite resistant to the moral hidden hand in the laboratory than other students and have trouble making cooperation work (Marwell and Ames 1981)! Having imbibed the selfish rational assumption, they are handicapped in running the model businesses we set up in the laboratory. Economics, we should add, is changing very rapidly because some of the most elegant support for the moral hidden hand has come from the studies of pioneering experimental economists brought up in the neo-classical tradition.

Explaining 50 Millennia of Cultural History

The moral hidden hand and the evolution of institutions

The moral hidden hand not only functions directly in the operation of organizations, it also certainly functions as an agent of cultural evolution. All else equal, individual decision-makers should espouse norms that result in better-functioning institutions and norms. Collective decision-making, as we have seen with the tendency of people to vote altruistically, ought also to favor prosocial norms and institutions. We have said that the main adaptive advantage of culture is its rapidity adaptation. We know from personal experience that cultural evolution is indeed rather rapid, at least at some times and in some places. If our argument that our tribal social instincts and cognitive capacities were already modern 50,000 years ago, this leaves us with a lot of historical noodling around to explain. Do we have a serious macroevolutionary flaw in the cultural evolutionary explanation? We think the answer is that we do have plenty of macroevolutionary puzzles to solve but that we also have plenty of candidate hypotheses to explain the 50 millennia.

External and internal explanations for macroevolutionary events and trends

Two sorts of processes might be responsible for the patterns we see in history. First, events and processes external to the biological and cultural system that is evolving may be driving the evolutionary process. In invoking the onset of higher amplitude higher frequency environmental variation in the Pleistocene to explain the evolution of large brains in many lineages and culture in the human lineage, we have constructed an externalist explanation. In imagining that the time period from 250,000 years ago to 50,000 years ago was the main period when gene-culture coevolution was building our tribal social instincts we might be appealing to the idea that major genetic change is rather slow. At any rate, responses to selection alone would be slower that the response of culture to selection plus decision-making forces on culture. If the environment changes suddenly and sets evolution in motion in a steady direction towards new cultural and genetic adaptations, new cultural adaptations will evolve at a limiting rate set by the genes rather quickly. New cultural "environments" will then create selection on genes; genetic changes will in turn permit more "advanced" culture. Whether genetic evolution was sticky enough to account for the whole 200,000 years of coevolution in Africa is hard to say. Perhaps the evolution of our large brain was a sticky enough process to explaining the whole 2+ million years of brain expansion in our lineage. Recently raised cores from Lake Malawi promise to give us high-resolution climate data for Africa for the last million years. When this data becomes available we will be able to estimate the lag between the onset of high amplitude millennial and sub-millennial scale variation and the gene-culture coevolutionary response. Suffices to say that at short enough time scales

internal hypotheses are always important; so long as we are dealing with evolution at all, we will see some lag between even changed environments and cultural change. Similarly, at the time scale of the geological evolution of the earth we can be sure that external changes are important. In between, the debate will rage.

The origins of agriculture experiment

Several independent trajectories of subsistence intensification, often leading to agriculture, began during the Holocene (Richerson et al. 2001). By intensification we mean a cycle of innovations in subsistence efficiency per unit of land leading to population growth that in turn leads to denser settlement per unit area of land. No plant-rich intensifications are known from the Pleistocene. Subsistence in the Pleistocene seems to have depended substantially on relatively high-quality animal and plant resources that held human populations to modest densities. Population growth is a rapid process on time scales shorter than a millennium. Cultural evolution is a rapid process on time scales of ten millennia. If agriculture had been possible in the Pleistocene, it should have appeared before the Pleistocene-Holocene transition. The high amplitude variation that we argued above favored the evolution of our capacity for culture would have made heavily plant-based subsistence strategies, especially agriculture, impossible during the last glacial. Climate and weather variation are a major difficulty for farmers today, and with much higher amplitude variations human populations were probably forced to forego specializing on a narrow spectrum of high productivity resources such as proto-domesticates like wild wheat and barley, although we do know that they sometimes used them (Kislev et al. 1992). In addition, last-glacial environments were on average drier than in the Holocene, and the concentration of CO_2 in the atmosphere was significantly lower. The quite abrupt final amelioration of the climate at the onset of the Holocene 11,500 yr B.P. was followed immediately by the beginnings of plant intensive resource use strategies in some areas, although the turn to plants was much later elsewhere. Almost all trajectories of subsistence intensification in the Holocene are progressive and eventually agriculture became the dominant strategy in all but the most marginal environments. The Polynesian expansion of the last 1,500 years and the European expansion of the last 500 years pioneered agriculture in the Pacific Islands, Australia and large parts of Western North America, the last substantial areas of the earth's surface favorable to it.

Thus, evolution of human subsistence systems during the career of anatomically modern humans seems to divide quite neatly into two regimes, a Pleistocene regime of hunting and gathering subsistence and low population density enforced by an external factor, climate, and a Holocene regime of increasingly agricultural subsistence and relatively high and rising population densities. Climate change was a minor factor in the Holocene, and most likely internal factors account the slow growth of economic and political complexity over the last 11 millennia.

The dispersed resources and low mean density of populations in the Pleistocene meant that relatively few people could be aggregated together at any one time and place. The lack of domestic livestock meant that movement of goods on land would be limited to what humans could carry. No evidence of extensive use of boats to transport goods appears in the archaeological record of the late Pleistocene although some significant

water crossings were necessary for people to reach Australia and the larger islands of "near" Oceania, like New Ireland. Low density, logistically limited human populations have small (but far from negligible) scope for exploiting returns to scale in cooperation, coordination and division of labor and their institutions remain comparatively simple.

Intensified subsistence and higher population densities multiply the number of people and volume of commodities that societies can mobilize for economic and political purposes. Expanded exchange allows societies to exploit a finer division of labor. Larger armies are possible to deal with external threats or to coerce neighbors. Expanding the number of people sharing a common language and customs will accelerate the spread of useful ideas. *Given appropriate institutions*, the denser societies made possible by agriculture can realize considerable returns to better exploitation of the potential of cooperation, coordination, and the division of labor. Corning (2005) elaborates the advantage of large scale and greater complexity of social organization along these lines under his synergism hypothesis. Thus, in the Holocene, the origins of agriculture and its rising productivity over succeeding millennia at least permit the evolution of more complex societies.

A competitive ratchet

Intra- and inter-society competition put a sharp point on the potential for more complex societies. Holding the sophistication of institutions constant, marginal increases in subsistence productivity per unit land will lead to denser or richer populations that can out-compete societies with less intensive subsistence systems. Holding subsistence productivity constant, societies with marginally more sophisticated social organization will also out-compete rivals. Within groups, contending political interests with innovations that promise greater rewards for altered social organization can use either selfish or patriotic appeals to advance their cause. Successful reformers may entrench themselves in power for a considerable period. Malthusian growth will tend to convert increases in subsistence efficiency and security against depredations to greater population density, making losses of more complex institutions painful and further advance rewarding. Richerson et al. (2001) argue mathematically that the rate limiting process for intensification trajectories must almost always be the rate of innovation of subsistence technology or subsistence related social organization. At the observed rates of innovation, rates of population growth will always be rapid enough to sustain a high level of population pressure favoring further subsistence and social-organization innovations. Competition may be economic, political/military, or for the hearts and minds of people. Typically all three forms will operate simultaneously. In the Holocene, agriculture and complex social organization are, in the long run, compulsory. In the most dramatic episode of expansion of social complexity, from the 16th through the 19th Centuries, European populations settled many parts of the world and overwhelmed native populations with less efficient subsistence and less complex social organization. In regions such as Asia where disparities of subsistence and social organization with West were less striking, societies like China, Japan and India retained or reclaimed their political independence at the cost of humiliating exposure to Western power and of borrowing many technical and social-organizational techniques from the West. Note that in areas where geography handicapped the armies of states, tribal scale social institutions retained much of their vitality. The diseases of Sub-Saharan Africa and the mountainous topography and protection from the sea enjoyed by Switzerland and Afghanistan allowed

much local autonomy. The power of states and empires is forever being contested by tribal scale organizations (Garthwaite 1993).

The tendency of population to grow rapidly, and for knowledge of advanced techniques to be retained somewhere, act as pawls on the competitive ratchet. Even during the European Dark Ages, when the pawls slipped several cogs on the ratchet, the slide backward was halted and eventually reversed in a few hundred years. (See Turchin (2003) for one explanation of the cycles of boom and bust that afflicted agrarian states.)

Replications of the experiment

Agricultural subsistence evolved independently at least seven times in the Holocene and many more societies have acquired at least some key agricultural innovations by diffusion (Richerson et al. 2001). Although none of these origins are earlier than the early Holocene, many are much later. The trajectory of institutional evolution is similar. To take one benchmark, the origin of the state level of political organization began in Mesopotamia around 5,500 B.P., but most are later, some much later (Service 1975, Feinman and Marcus 1998). For example the Polynesian polities of Hawaii and Tonga-Samoa became complex chiefdoms on the cusp of the transition to states just before European contact (Kirch 1984). Pristine states evolved independently, perhaps ten or so times, in several parts of the world and traditions of statecraft in various areas of the world evolved in substantial isolation for significant periods.

If our basic hypothesis is correct, the climate shift at the Pleistocene-Holocene transition removed a tight constraint on the evolution of human subsistence systems and hence on the institutional evolution. On the evidence of the competitive success of modern industrial societies, subsistence evolution has yet to exhaust the potential for more efficient subsistence inherent in agricultural production and ongoing increases in the complexity of social institutions suggests that institutional evolution is still discovering more synergistic potential in human cooperation, coordination and division of labor. The out-of-equilibrium progressive trend in human evolution over the last 11 millennia means that we can achieve a certain conceptual and probably empirical simplification of the problem of the evolution of institutions in the Holocene. We can assume a strong, worldwide tendency, driven by the competitive ratchet, toward societies at least as complex as current industrial societies. We can assume that changes in climate and similar non-social environmental factors play a small role in the Holocene. Granted these assumptions, we are left with three internalist questions about subsistence and institutional evolution. (1) Why are rates of change so rapid in some areas (Western Eurasia) and slow in others (Western North America)? The competitive ratchet seems to have been routinely cranked faster in some places than others. What are the factors that limit the rate of cultural evolution in some cases relative to others? We shall argue that several processes can retard the rate of cultural evolution sufficiently to account for the observed rates of change. (2) How do we explain the multi-linear pattern of the evolution of institutional complexity? Although an upward trend of complexity characterizes most Holocene cultural traditions, the details of the trajectory vary considerably from case to case. The operation of the ratchet is very far from pulling all evolving social systems through the same stages; only relatively loose parallels exist between the cases. (3) Why

does the ratchet sometimes slip some cogs? In no particular cultural tradition is progress even and steady. Episodes of temporary stagnation and regression are commonplace.

What Regulates the Tempo and Mode of institutional evolution?

The overall pattern of subsistence intensification and increase in social complexity is clearly consistent with the hypothesis that agriculture, and hence complex social institutions, were impossible in the Pleistocene but eventually mandatory in the Holocene, but the real test is whether or not we can give a satisfactory account of the variation in the rate and sequence of cultural evolution. Work on this project is in its infancy, and what follows is only a brief sketch of the issues involved.

Geography May Play a Big Role

Diamond (1997) argues that Eurasia has had the fastest rates of cultural evolution in the Holocene because of its size and to a lesser extent its orientation. Plausibly, the number of innovations that occur in a population increases with total population size and the flow of ideas between sub-populations. Since we know that the original centers of cultural innovation were relatively small compared to the areas to which they later spread, most societies acquired most complex cultural forms by diffusion. Societies isolated by geography will have few opportunities to acquire innovations from other societies. Contact of isolated areas with the larger world can have big impacts. The most isolated agricultural region in the world, Highland New Guinea, underwent an economic and social revolution in the last few centuries with the advent of American sweet potatoes, a crop that thrives in the cooler highlands above the malaria belt of lowland New Guinea (Wiessner and Tumu 1998). The Americas, though quite respectable in size, are oriented with their major axis north-south. Consequently innovations have to mainly spread across lines of latitude from the homeland environment to quite different ones, unlike Eurasia where huge east-west expanses exist in each latitude belt. The pace of institutional change in Eurasian societies mirrors this region's early development of agriculture and the more rapid rate of subsistence intensification.

Climate Change May Play a Small Role.

The Holocene climate is only invariant relative to the high frequency, high amplitude oscillations of the last glacial (Lamb 1977). For example, seasonality (difference between summer and winter insolation) was at a maximum near the beginning of the Holocene and has fallen since. The so-called "Climatic Optimum," a broad period of warmer temperatures during the middle Holocene, caused a wetter Sahara, and the expansion of early pastoralism into what is now forbidding desert. The late medieval onset of the Little Ice Age caused the extinction of the Greenland Norse colony (Kleivan 1984). Agriculture at marginal altitudes in places like the Andes seems to respond to Holocene climatic fluctuation (Kent 1987). The fluctuating success of state-level political systems in the cool, arid, Lake Titicaca region is plausibly caused by wetter episodes permitting economies that support states, while they collapse or fade during arid periods. While the effect of Holocene climate fluctuations on regional sequences must always be kept in mind, the dominance of the underlying monotonic tendency to increase subsistence intensification and evolve more complex institutions seems likely to be driven by other processes.

Coevolutionary Processes Probably Play a Big Role

The full exploitation of a revolutionary new subsistence system like agriculture requires the evolution of domesticated strains of plants and animals. Human social institutions must undergo a revolution to cope with the increased population densities that follow from agricultural production. Human biology changes to cope with the novel dietary requirements of agricultural subsistence.

Agriculture requires pre-adapted plants and animals. In each center of domestication, people domesticated only a handful of the wild plants that they formerly collected, and of this handful even fewer are widely adopted outside those centers. The same is true for domesticated livestock. (Zohary and Hopf 2001) have listed some of the desirable features in plant domesticates. California has so many climatic, topographic, and ecological parallels with the precocious Fertile Crescent that its very tardy development of plant-intensive subsistence systems is a considerable puzzle. Diamond (1997), drawing on the work of Blumler (1992), notes that the Near Eastern region has a flora that is unusually rich in large-seeded grasses. California, by contrast, lacked large seeded grasses, having not a single species that passed Blumler's criterion. Aside from obvious things like large seed size, most Near Eastern domesticates had high rates of self-fertilization. This means that farmers can select desirable varieties and propagate them with little danger of gene flow from other varieties or from weedy relatives. Maize, by contrast, outcrosses at high rates. Perhaps the later and slower evolution of maize compared to Near Eastern domesticates is due to the difficulty of generating responses to selection in the face of gene flow from unselected populations (Diamond, 1997: 137). Smith (1995) discusses the many constraints on potential animal domesticates.

Even in the most favorable cases, the evolution of new domesticates is not an instantaneous process. Blumler and Byrne (1991) identify the rate of evolution of domesticated characters like non-dehiscence as one of the major unsolved problems archaeobotany. Coevolution theorists like Rindos (1984) imagine a long drawn out period of modification leading up to the first cultivation, whereas Blumler and Byrne conclude that the rate of evolution of domesticates *may* be rapid, while stressing the uncertainties deriving from our poor understanding of the genetics and population genetics of domestication. Hillman and Davies' (1990) simulations indicate that the evolution of a tough rachis (the primary archaeological criterion of domestication) in inbreeding plants like the wheats and barley could easily be so rapid as to be archaeologically invisible, as, indeed, it so far is. Their calculations also suggest that outcrossed plants, such as maize, will respond to cultivator selection pressures on the much longer time scales that Rindos and Diamond envision.

Humans have to adapt biologically to agricultural environments. While the transition from hunting and gathering to agriculture resulted in no genetic revolution in humans, a number of modest new biological adaptations were likely involved in becoming farmers. The best-documented case is the evolution of adult lactose absorption in human populations with long histories of dairying (Durham 1991), but one of the fruits of the Human Genome Project has been the detection of other genes that appear to be rapidly evolving in humans including a gene expressed in the brain that might have originated

around the time of the evolution of the first complex societies (Balter 2005). To some extent the relatively slow rate of human biological adaptation may act as a drag on the rate of cultural innovations leading to subsistence intensification and on institutional advances.

Diseases limit population expansions, protect inter-regional diversity. McNeill (1976) and Crosby (Crosby 1986) draw our attention to the coevolution of people and diseases. The increases in population density that resulted from the intensification of subsistence invited the evolution of epidemic diseases that could not spread at lower population densities. One result of this process is possibly to slow population growth to limits imposed by the evolution of cultural or genetic adaptations to diseases. For example, a suite of hemoglobins have arisen in different parts of the world that confer partial protection against malarial parasitism and these adaptations may have arisen only with the increases in human population densities associated with agriculture (Cavalli-Sforza et al. 1994). Cavalli-Sforza et al. estimate that it would take about 2,000 years for a new mutant hemoglobin variant to reach equilibrium in a population of 50,000 or so individuals. Serious epidemics also have direct impacts upon social institutions when they carry away large numbers of occupants of crucial roles at the height of their powers. In such epidemics significant losses of institutional expertise could occur, directly setting back progressive evolution. (Or alternatively, epidemics might sweep away the Old Guard and make a progressive change easier.) Regional suites of diseases handicap immigrants and travelers, thus tending to isolate societies from the full effects of cultural diffusion.

Cultural evolutionary processes play a decisive role

The processes of cultural evolution may generally be more rapid than biological evolution, but cultural change often takes appreciable time. We (Richerson and Boyd 2005) view cultural evolution as a Darwinian process of descent with modification. Evidence about characteristic rates of modification is important for understanding the relative importance of various processes in cultural evolution. In one limit, the conservative, blind, transmission of cultural variants from parents to offspring, the main adaptive force on cultural variants would be natural selection, and rates of cultural evolution would approximate those of genes. At the other extreme, humans may pick and chose among any of the cultural variants available in the community and may use cognitive strategies to generate novel behaviors directly in light of environmental contingencies. In the limit of economist's omniscient rational actors, evolutionary adjustments are modeled as if they are instantaneous. We believe that for many cultural traits, human decisions have relatively weak effects in the short run and at the individual level, although they can be powerful when integrated over many people and appreciable spans of time. For example, the four streams of British migration to North America have led to regional differences that have persisted for centuries (Fischer 1989, Nisbett and Cohen 1996). Archaeological and historical data on the rates of change in different domains of culture will be some of the most important evidence to muster to understand the tempo and mode of cultural evolution. Much work remains to be done before we understand the regulation of rates of cultural evolution, but some preliminary speculation is possible.

New technological complexes evolve with difficulty. One problem that will tend to slow the rate of cultural (and organic) evolution is the sheer complexity of adaptive design problems. As engineers have discovered when studying the design of complex functional systems, discovering optimal designs is quite difficult. Blind search algorithms often get stuck on local optima, of which complex design problems often have very many. Piecemeal improvements at the margin are not guaranteed to find globally optimal adaptations by myopic search. Yet, myopic searches are what Darwinian processes do (Boyd and Richerson 1992). Even modern engineering approaches to design, for all their sophistication, are more limited by myopic cut and try than engineers would like.

Parallel problems are probably rife in human subsistence systems. The shift to plant-rich diets is complicated because plant foods are typically deficient in essential amino acids, and vitamins, have toxic compounds to protect them from herbivore attack, and are labor intensive to prepare. Finding a mix of plant and animal foods that provides adequate diet at a feasible labor cost is not a trivial problem. For example, New World farmers eventually discovered that boiling maize in wood ashes improved its nutritional value. The hot alkaline solution breaks down an otherwise indigestible seed coat protein that contains some lysine, an amino acid that is low in maize relative to human requirements (Katz et al. 1974). Hominy and *masa harina*, the corn flour used to make Mexican tortillas, are forms of alkali treated maize. The value of this practice could not have been obvious to its inventors or later adopters, yet most American populations that made heavy use of maize employed it. The dates of origin and spread of alkali cooking are not known. It has not been reinvented in Africa even though many African populations have used maize as a staple for centuries.

New social institutions evolve with difficulty. An excellent case can be made that the rate of institutional innovation is more often limiting than the rate of innovation of technology. As anthropologists and sociologists such as Julian Steward (1955) have long emphasized, human economies are social economies. Even in the simplest human societies, hunting and gathering is never a solitary occupation. At the minimum, such societies have division of labor between men and women. Hunting is typically a cooperative venture. The unpredictable nature of hunting returns typically favors risk sharing at the level of bands composed of a few cooperating families because most hunters are successful only every week or so (Winterhalder et al. 1999). Portions of kills are distributed widely, sometimes exactly equally, among band members.

The deployment of new technology requires changes in social institutions to make best use of innovations, often at the expense of entrenched interests, as Marx argued. The increasing scale of social institutions associated with rising population densities during the Holocene have dramatically reshaped human social life. Richerson and Boyd (1998, 1999) discuss the complex problems involved in evolutionary trajectory from small-scale, egalitarian societies to large-scale complex societies with stratification and hierarchical political systems. For example, even the first steps of intensification required significant social changes. Gathering is generally the province of women and hunting of men. Male prestige systems are often based on hunting success. A shift to plant resources requires

scheduling activities around women's work rather than men's pursuit of prestige. Using more plants will conflict with men's preferences as driven by a desire for hunting success; it will require a certain degree of women's liberation to intensify subsistence. Since men generally dominate women in group decision-making ("egalitarian" small scale societies seldom grant women equal political rights), male chauvinism will tend to limit intensification. Bettinger and Baumhoff (1982) argue that the spread of Numic speakers across the Great Basin a few hundred years ago was the result of the development of a plant-intensive subsistence system in the Owens Valley. Apparently, the groups that specialized in the hunt would not or could not shift to the more productive economy to defend themselves, perhaps because males clung to the outmoded, plant poor, subsistence. Winterhalder and Goland (1997) use optimal foraging analysis to argue that the shift from foraging to agriculture would have required a substantial shift in risk management institutions, from minimizing risk by intraband and interband sharing to reducing risk by field dispersal by individual families. Some ethnographically known Eastern Woodland societies that mixed farming and hunting, for example the Huron, seemed not to have made this transition and to have suffered frequent catastrophic food shortages.

Institutional evolution no doubt involves complex design problems. For example, Blanton (1998) describes some of the alternative sources of power in archaic states. He notes that archaic states differ widely in time and space as their evolution wanders about in a large space of alternative social institutions. Thus, the Classical Greek system of small egalitarian city-states with wide participation in governance was a far different system from those like Egypt with divine royal leaders from near its inception as a state or the bureaucracies that were common in Western Asia. Philip, Alexander, and their successors substantially rebuilt the Greek state along Western Asian lines in order to conquer and administer empires in Asia. Much of the medium-term change in archaic and classical state institutions seems to involve wandering about in a large design space without discovering any decisively superior new institutional arrangements (Feinman and Marcus 1998).

The spread of complex social institutions by diffusion is arguably more difficult than the diffusion of technological innovations. Social institutions violate four of the conditions that tend to facilitate diffusion (Rogers 1983). Foreign social institutions are often (i) not compatible with existing institutions, (ii) complex, (iii) difficult to observe, and (iv) difficult to try out on a small scale.

Thus the evolution of social institutions rather than technology will tend to be the rate limiting step of the intensification process. For example, North and Thomas (1973) argue that new and better systems of property rights set off the modern industrial revolution rather than the easier task of technical invention itself. A major revolution in property rights is likely also necessary for intensive hunting and gathering and agriculture to occur (Bettinger 1999). Slow diffusion also means that historical differences in social organization can be quite persistent, even thought one form of organization is inferior. As a result, the comparative history of the social institutions of intensifying societies exhibits many examples of societies getting a persistent competitive advantage over others in one

dimension or another because they possess an institutional innovation that their competitors do not acquire. For example, the Chinese merit-based bureaucratic system of government was established at the expense of the landed aristocracy, beginning in the Han dynasty (2,200 B.P.) and completed in the Tang (1,400 B.P.) (Fairbank 1992). This system has become widespread only in the modern era and still operates quite imperfectly in many societies.

To the extent that games of coordination are important in social organization, changes from one coordination solution to another may by greatly inhibited. Games of coordination are those, like which side of the road to drive on, for which it matters a lot that everyone agree on a single solution and less on which solution is chosen (Sugden 1986). Notoriously, armies with divided command are defeated. A poor general's plan formulated promptly and obeyed without question by all is usually superior to two good generals' plans needing long negotiations to reconcile or leaving subordinates with choices of whose plan to follow. We care less whether gold, silver, or paper money is legal tender than we care that we have a single standard. Many if not most social institutions probably have strong elements of coordination. Take marriage rules. Some societies allow successful men to marry multiple wives while others forbid the practice. One system may or may not be intrinsically better, but everyone is better off playing from one set of rules. Since the strategies appropriate for one possibility are quite different from the other, marriage partners would like agreement on the ground rules of marriage up front to save costly negotiation or worse later on. Hence many institutions are in the form of a socially policed norm or standard contract ("love, honor, cherish and obey until death do us part") solving what seems like it ought to be a private coordination problem. However, except in pure cases, different coordination equilibria will also have different average payoffs and different distributions of payoffs than others. Even if most agree that a society can profitably shift from one simple pure coordination equilibrium to another (as when the Swedish switched from driving on the left to the right a couple of decades ago to conform to their neighbors' practices) the change is not simple to orchestrate. One of our universities voted recently not to switch from the quarter to the semester system despite a widespread recognition that a mistake was made 30 years ago when the quarter system was instituted. Large, uncertain costs that many semester-friendly faculty reckoned would attend such a switch caused them to vote no. Larger scale changes, such as the Russian attempt to transition from a soviet to free enterprise economy, face huge problems that are plausibly the result of the need to renegotiate solutions to a large number of games of coordination as much as any other cause.

The design complexity, importance of coordination, slow evolution, limited diffusion, and difficulty of coordination shifts probably conspire to make the evolution of social institutions highly historically contingent. The multilinear pattern of evolution of social complexity could result from two causes. Societies might be evolving from diverse starting points toward a single common optimal state surrounded by a smooth "topography" which optimizing evolutionary processes are climbing toward the summit. Or, societies may be evolving up a complex topography with many local optima and many potential pathways toward higher peaks. In the latter case, even if societies start out at very similar initial points, they will tend to diverge with time. We believe that at least

part of the historical contingency in cultural evolution is due to slow evolution on complex topographies (Boyd and Richerson 1992).

Ideology May Play a Role. Nonutilitarian processes may strongly influence the evolution of fads, fashion, and belief systems. Such forces are susceptible to feedback and runaway dynamics that defy common sense (Boyd and Richerson 1985: Chapter 8). The links between belief systems and subsistence are nevertheless incontestably strong. To build a cathedral requires an economy that produces surpluses that can be devoted to grand gestures on the part of the faithful. The moral precepts inculcated by the clergy in the cathedral underpin the institutions that in turn regulate the economy. Arguably, ideological innovations often drive economic change. Recall Max Weber's classical argument about the role of Calvinism in the rise of capitalism.

Complex social systems are vulnerable. We suggest that the fragility of institutions derives from compromises and tradeoffs that are caused by conflicts between the functional demands of large scale organizations and the trajectory of small-scale cultural evolution often driven by psychological forces rooted in the ancient and tribal social instincts. The evolution of work-arounds seldom results in perfect adaptations. Resistance to the pull of the ratchet can increase sharply when external pressures such as competition from other societies, demographic catastrophes, or internal processes such as the evolution of a new religion put weak work-arounds in jeopardy. All complex societies may have weak work-arounds lurking among their institutions. As we noted above, each of the major types of institutional workarounds has defects that lead to intra-societal conflict. Small-scale societies have appreciable crudities at least in part deriving from conflicts, both intra-psychic and political, between individual and kinship interests and the larger tribe (Edgerton 1992). If our argument is correct, larger scale societies do not eliminate these conflicts but add to them manifold opportunities for conflict between different elements of the larger system. Even the best of such systems current at any one time are full of crudities and the worst are often highly dysfunctional. A considerable vulnerability to crisis, change without progress, setback and collapse is inherent in an evolutionary system subject to strong evolutionary forces operating at different levels (Turchin 2003).

Maynard Smith and Szathmáry (1995) treat the rise of human ultra-sociality as analogous to other major evolutionary transformations in the history of life. As with our tribal social instincts and work-around proposals, the key feature of transitions from say cellular grade organisms to multicellular ones is the improbable and rare origin of a system in which group selection works at a larger scale to suppress conflict at the smaller and eventually to perfect the larger scale superorganisms. Actually, "perfect" is too strong a word, distinct traces of conflict remain in multicellular organisms and honeybee colonies too. We suggest that human societies are recently evolved and remain rather crude super-organisms, heavily burdened by conflict between lower and higher level functions and not infrequently undone by them. Outside of the realm of utopian speculation and science fiction, there does not appear to be an easy solution. Muddle along is the rule, pulled on the trajectory toward more social complexity by the competitive ratchet.

Changes in the rate of cultural evolution and the sizes of cultural repertoires. Rates of social and technical evolution appear to be rising towards the present. Modern individuals know more than their ancestors, and social complexity has increased. The cultural evolution in the Holocene began at a stately pace. Not for some 6,000 years after the initial domestication of plants and animals in southwestern Asia did the first state level societies finally decisively transcend tribal scale roots of human sociality. Tribes, city-states and empires competed to govern Eurasia for another 4,500 years while the first states emerged in the New World and Africa. The rise of the West over the last millennium has brought revolutions in subsistence and social organization, particularly during the last half millennium. Today, globalization is spreading the culture of free enterprise societies. Even in Eurasia, the last pastoral and hunting tribes of the interior were only defeated by Chinese and Russian firearm armies a couple of centuries ago. Only for the last century or two has cultural evolution been sufficiently rapid so that almost everyone is aware of major changes within their lifetime. Malthus, writing around the turn of the 19th Century still regarded technical innovation as quite slow, on sound empirical grounds. Only a couple of decades after his death would cautious empiricists have good grounds to argue that the industrial revolution coupled with free enterprise was something new under the sun (Lindert 1985). The accelerating growth of the global population is a product of these changes and the curve of population growth is one reasonable overall index of cultural change. Another is the increasing division of labor. Innovations on the subsistence side at first rather gradually, and then lately very rapidly, reduced the personnel devoted to agricultural production and shifted labor into an expanding list of mercantile, manufacturing, government, and service occupations.

The reasons for the accelerating rate of increase are likely several. First, the sheer increase in numbers of people must have some effect on the supply of innovations. Second, the invention of writing and mathematics provided tools for supplementing memories, aiding the application of rationality, and for the long distance communication of ideas. Scribes in small numbers first used their new skills to manage state supply depots, tax roles, and land mensuration. Only gradually did procedures in different fields become written and mathematics come to be used to solve an expanding array of problems. Third, books ultimately became a means of both conserving and communicating ideas, at first only to an educated elite. Fourth, quite recently, the mass of people in many societies became literate and numerate, allowing most people to take up occupations dependent upon prolonged formal education, policy and procedure handbooks, technical manuals, reference books, and elaborate calculations. Fifth, the rise of cheap mass communication, beginning with the printed book, has given individuals access to ever-larger stores of information. The internet promises to give everyone able to operate a workstation access to all the public information in the world. Donald (1991) counts the spread of literacy and numeracy as a mental revolution on the same scale as the evolution of imitation and spoken language. Sixth, institutions dedicated to deliberately promoting technical and social change have grown much more sophisticated. Boehm (1996) argues that even acephalous societies usually have legitimate, customary institutions by which the society can reach a consensus on actions to take in emergencies, such as the threat of war or famine (see alsoTurner 1995: 16-17).

Institutions organized as a matter of social policy to further change continue to increase perceptibly in scope and sophistication. Institutions like patents that give innovators a socially regulated property right in their inventions ushered in the industrial revolution. Private companies invest in new technology, under the eye of government regulators beginning about the turn of the 20th Century. Government bureaucracies conduct useful research from the public purse beginning in a small way in the 19th Century. Research universities recruit some of the best minds available, place them in an intellectual hothouse, and reward scholars for new ideas of whatever kind they are prepared to pursue. Masses of young people are educated by such innovators and their students, especially during the last 50 years. Johann Murmann (2003) traces the development of the synthetic dye industry in the 19th Century. German dye manufacturers cooperated to foster the development of research chemistry departments and came to dominate an industry pioneered in Great Britain because university trained chemists in the universities themselves and in industrial labs were at the forefront of innovation in dyes. Development institutions like agricultural extension services and teaching hospitals move innovations in some fields from the university to the farm or doctor's office at a smart pace. Think-tanks ponder public policy in the light of research, national academies of science craft white papers based on elaborate searches for expert consensus, legislatures hold hearings trying to match the desires of constituents with the findings of the experts in order to produce new policies and programs.

We have a shadowy outline of why free enterprise values evolved when and where they did

The Pleistocene onset of high amplitude high frequency climate variation probably drove the increases in brain size we see in many mammalian lineages. The evolution of humans capable of creating complex cultural institutions was only complete about 50,000 years ago, perhaps driven by ongoing climate deterioration. The large, rapid change in environment at the Pleistocene-Holocene transition set off the trend of subsistence intensification and institutional complexity of which modern free enterprise societies are just the latest examples. If our hypothesis is correct, the reduction in climate variability and, increase in CO_2 content of the atmosphere, and increases in rainfall rather abruptly changed the earth from a regime where agriculture was everywhere impossible to one where it was possible in many places. Since groups that utilize efficient, plant-rich subsistence systems and deploy the resulting larger population more effectively will normally out-compete groups that make less efficient use of land and people, the Holocene has been characterized by a persistent tendency towards subsistence intensification and growth in institutional sophistication and complexity. The diversity of trajectories taken by the various regional human sub-populations since ≈11,600 B.P. are natural experiments that will help us elucidate the factors controlling the tempo and mode of cultural evolution leading to more efficient subsistence systems and the more complex societies these systems support. A long list of processes interacted to regulate the trajectory of subsistence intensification, population growth, and institutional change that the world's societies have followed in the Holocene. Social scientists are in the habit of treating these processes as mutually exclusive hypotheses. They seem to us to be competing but certainly not mutually exclusive. Many are not routinely given any attention in the historical social sciences. At the level of qualitative empiricism, tossing

any one out entirely leaves puzzles that are hard to account for and produces a caricature of the actual record of change. If this conclusion is correct, the task for historically minded social scientists is to refine estimates of the rates of change that are attributable to the various evolutionary processes and to estimate how those rates change as a function of natural and socio-cultural circumstances. We lack a quantitative understanding of the burden of flawed work-arounds and other features of complexity that retard and locally reverse tendencies to greater complexity. We only incompletely understand the processes generating historical contingency.

The free enterprise societies' combination of individual autonomy, wealth, and welfare bear a strong resemblance to the preferences that are rooting in our ancient and our tribal social instincts. The rational-selfish picture of free enterprise captures only the first of these. The societies of our ape ancestors, if they were anything like those of living apes, were closer to the rational selfish model than we are. Chimpanzees live in groups regulated by dominance hierarchies leavened with some kin-based altruism. They have very little of the cooperative economic enterprise that characterize humans. They are wild animals, as people who try to raise them as if they were dogs or children discover (Hayes 1951). Chimpanzees are good at autonomy, but weak on wealth and welfare. Humans evolved to be the sort of species we are by adding cooperative wealth acquisition and mutual aid to our repertoire. When 18th Century social theorists like Adam Smith began to tinker with the ideas that would flower in European countries in the 19th and 20th Centuries, they spied a way to free the mass of people from economic and political oppression without risk of political anarchy. Smith and Darwin are often held up as one-dimensional ideologues espousing theories of competitive individualism whereas both rested their theories of ethics on what we have called the moral hidden hand. Utopians, on the other hand, often think that they can educate or coerce the individual and the tribes-person out of us in the interests of some sort of social insect like hyper-cooperative system. If our diagnosis is correct, humans, subject to selection at both the individual and the tribal level, are capable of neither sort of society. Humans exhibit the sympathy and patriotism that make our social life possible, but we know that we also have to look out for our own interests because no one else does, at least not perfectly and reliably. Darwin (1874: 192), we think, put his finger on the motor that makes moral progress possible

> With highly civilized nations continued progress depends in subordinate degree on natural selection; for such nations do supplant and exterminate on another as do savage tribes. . . . The more efficient causes of progress seem to consist of a good education during youth when the brain is impressible, and to a high standard of excellence, inculcated by the ablest and best men, embodied in the laws, customs and traditions of the nation, and enforced by public opinion.

In other words, if we let the moral hidden hand have the largest possible scope when we attend to cultural innovation and cultural transmission we can make progress against the evil in spite of the selfish and chauvinistic elements of our social psychology and the customs they have favored.

While we are quite happy to celebrate the accomplishments of free enterprise, we are not complacent. Not only are many societies still unfree, but even the freest have imperfections. We cannot help even willing recipients to build free societies easily or rapidly. Some contemporary evolutionary trends are disturbing. The present very high rates of technical and institutional evolution are a problem of immense applied importance. For example, our headlong quest for increased material prosperity that guides so much current calculated institutional change not only takes great risks of environmental deterioration and a hard landing on the path to sustainability (e.g.Council 2002), but seems flawed from the point of view of satisfying human needs and wants (Frank and Cook 1995, Easterlin 2001). The collapse of birth rates in the developed and increasingly in the developing world is starting to replaces fears of a population explosion with fears of an implosion (Bongaarts and Watkins 1996). The growth of international institutions in the 20th Century was impressive (Jones 2002), but much work needs to be done to bring the dangerous adventurism of states to heel even as the technical capability of states, and even stateless groups like Al Qaeda, to cause mischief grows.

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[i] Solomon (this volume) and Stout (this volume) note the importance of sympathy in the systems of several moral philosophers, Adam Smith notable among them

[ii] Advanced in quotes here because Darwin had complex opinions about the concept of progress, as do many of us do today. Darwin did think that moral progress was possible, but he also had a nuanced critique of the moral behavior of peoples of different grades of civilization. He was prone to celebrating the moral accomplishments of "savages" and, particularly in his passionate critique of slavery in the *Voyage of the Beagle* (Darwin 1845), he excoriated the civilized nations that tolerated slavery. The term "social Darwinism" and the oft-repeated idea that Darwin was a typical Victorian racist (Alland 1985) have led an unfortunately large number of people to have a highly erroneous concept of Darwin's views on races and progress. Historians note that Darwin's politics were leftish and that he subscribed fully to the doctrine of the psychic unity of humankind, as our quotes above illustrate (Richards 1987).

[iii] Most of the other authors in this volume allude to individual-level and institutional level explanations of behavior. Evolutionists are driven to ask where values, emotions, norms, and institutions come from. We assume that some mixture of genetic and cultural evolution shapes the raw material out of which individuals and communities continually reconstruct their behavior.