

Religion: The dynamics of cultural adaptations

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The goal of science is to achieve a level of understanding which not only explains current observations but also allows us to make predictions. Can science provide this kind of understanding of religion? Can it allow us to predict how holding beliefs categorized as “religious” is likely to affect people’s lives, how these effects are likely to play out in the future or how religion itself will change? Despite its interdisciplinary nature, research in cognitive science cannot by itself provide this kind of practical understanding. In this chapter, we will argue that a broader approach, which includes insights gained through studies of cognition, can allow us to develop theories of how changes in the social environment people experience bring about religious change and changes in the values that govern their lives.

Cognitive scientists observe and develop theories about how individual brains process information. However, as Purzycki, Haque and Sosis (this volume) suggest, gaining a practical understanding of how human minds process information, requires that we take into account that fact that humans process information *socially* as well as within their own individual minds. The human brain is equipped with an array of psychological mechanisms which allow us to share the processing of information during social interactions. As children we acquire a large repertoire of cognitive skills, emotions, attitudes, beliefs, and behaviors from the older people who care for us, not just as a result of the genetic endowment from our parents. As we go through life we observe our environment in the presence of other minds. We observe people around us and are aware that they can observe us. We use our unique communication system, language, to discuss perceptions, behaviors, the mental representations that appear to motivate behaviors and many other aspects of our shared lives. The individual and social information processing mechanisms are intricately interconnected and continuously feedback on each other. We share thoughts and create ideas *together*. We are often not aware if our beliefs about an event are based on our witnessing of the event or the stories told by our fellow witnesses (Loftus, 1996).

We will argue that, to gain an understanding of how minds develop the beliefs, values, and behaviors categorized as “religious,” it is necessary to take into the account that this development occurs in minds that are situated within social networks. Our argument begins with an explanation of why we see cultural change as a “Darwinian process.” We then proceed to review of recent work in comparative primatology and human development which suggests that children are adapted to acquire a vast amount of relatively unconstrained information by imitation and teaching and that humans are able and motivated to “change their minds” throughout their lives. Like all aspects of human culture, religious beliefs can be thought of as being “held” both by the community and the minds of the community members in which the information is actually experienced and stored. Like all aspects of culture, religious beliefs and customs, don’t remain static. The culture of a population

changes as its membership changes, through birth, death, migration and experience. Members are constantly learning and sharing new information. New beliefs, customs and rules are “born” while old ones are abandoned, forgotten or modified (Boyd & Richerson, 1985).

Centuries of scholarship have been devoted to developing explanations of cultural change, identifying the events, individuals and environmental factors that might have influenced its course. But in recent years, a growing number of scholars have begun to develop broad theories of cultural change with the help of mathematical modeling tools similar to those used by population geneticists to understand the genetic changes that occur in a population (e.g., Boyd & Richerson, 1985; Cavalli-Sforza & Feldman, 1981; Joseph Henrich, 2004; McElreath, Boyd, & Richerson, 2003; Newson, Richerson, & Boyd, 2007; Richerson & Boyd, 2005, 2010). This amounts to the revival of an approach outlined by Darwin (1874) in the *Descent of Man*, and which was pursued by a number of prominent pioneers in the social sciences, including William James. However, for historically contingent reasons Darwinian ideas virtually disappeared from the social sciences around the beginning of the 20th century (Hodgson, 2004; Richards, 1987). The applicability of these ideas to cultural change was rediscovered in the mid-century by a number of authors (Alchian, 1950; Campbell, 1960; Gerard, Rapoport, Gerard, Kluckhohn, & Rapoport, 1956). Sophisticated theoretical models of cultural evolution were pioneered by Cavalli-Sforza and Feldman (1973) and we are currently in the midst of an explosion of empirical work (e.g., Joe Henrich & Henrich, 2010; Mesoudi, 2007).

Darwinian theory is often thought of as one of those grand theories of everything of which most modern social scientists and historians are properly skeptical (Slingerland, 2008). It should instead be thought of as a large toolkit of models and empirical approaches which can be deployed flexibly to solve a wide range of problems (Richerson & Boyd, 1987). This toolkit is useful whenever a problem involves transmitted information changing over time. It is easy, for example, to use Darwinian theory to show how historical contingency creates cultural (and genetic) diversity (Boyd & Richerson, 1992). We have used this approach to look at the pattern of cultural change sometimes referred to as “modernization” which is associated with economic development (Newson & Richerson, 2009). These changes include changes in religious belief.

In this chapter we give a non-mathematical summary of the cultural evolutionary approach to explaining cultural change and the evolution of human behavior and show that this provides us with a novel view of the role of changing religious belief in modernizing societies. We review the evidence that the size and connectedness of a population determines the complexity of the culture that a population can support. We then look at the changes in the size and connectedness of populations which have occurred in the last 200 years as societies have undergone economic development. The change in structure of societies is accompanied by a process of cultural change which is broadly similar in most but not quite all populations (Newson & Richerson, 2009). Finally, we look more closely at the pattern of change in religious belief that accompanies this process.

“Cognition-lite” and the evolution of culture

For many, the word “evolution” implies progression – progress from the less complex to more complex. Darwin (1859) didn’t see evolution in this way. In fact, he didn’t use the word “evolution.” He described a process (“descent with modification”) by which the variety of life on Earth, both complex and simple, could be the result of a long and continuing process of change. Darwin noted that even though groups of organisms may be similar enough to be categorized as belonging to the same species, individual variation can still be detected. Offspring are more similar to their parents than they are to the population at large; descendants inherit some of the characteristics of their parents. Characteristics associated with individuals who survive and produce more offspring will therefore be more common among the offspring generation than the parents’ generation. In the course of a number of generations this “natural selection” of characters can transform a population. In this way, a population of organisms considered to be a single species can diversify into two or more species if it is divided into groups that occupy environments which favor different characteristics.

Since Darwin’s time, biologists’ have gained and greater and greater understanding of the mechanisms by which variation is inherited. When variation is due to differences in genetic information (DNA), individuals resemble their parents because their genes are copies of their parents’ genes. During the 20th Century most scholars who used an evolutionary approach to understanding human behavior concerned themselves with speculating about how variation in this genetically stored information might result in behavioral variation. But the information stored in our genes is not main source of variation in human behavior. Behavioral variation is far more likely to be the result of differences in the information stored in our *brains*. Each individual has had a unique set of experiences and they have processed the information gathered during these experiences in a unique way.

The information in our brains is clearly not “inherited” in the sense that it is copied from the information possessed by our parents. But it is equally clear that much of the information in our brains is very similar to information held in the brains of our parents and the other people we have associated with. We usually speak the same language as our parents, for example. We may have our own way of phrasing and pronouncing our speech but our vocabulary is (and has to be) virtually identical to the people we interact with. The mental representations that underpin our behavior have to be similar to those of the people we interact with or we could not coordinate our behavior. This is why the information stored in our memory cannot simply be the result of our own independent processing of our own independently acquired information.

We not only learn a great deal from other people, we also rely on other people to help us process information from our environment. Humans’ highly developed capacity to make use of learning from one another and learning *with* one another is one of the things that sets us apart from other animals (Tomasello, 1999). The ability and the motivation to share learned information results in human populations developing a complex culture and this capacity has made our species highly successful (Robert Boyd, Peter J. Richerson, & Joseph Henrich, 2011; Whiten, Hinde, Laland, & Stringer, 2011). A young human born today can expect to benefit from a legacy of information that

has been built up over thousands of years and continues to increase in diversity and complexity at an increasingly rapid rate (Carey, 2009). When humans are young, a phase of our lives when we acquire many of our most fundamental beliefs, we readily adopt socially transmitted information that is not supported by evidence from our own senses. For example, interviews with children aged four to eight revealed them to have a firm belief in invisible entities, such as germs (P. L. Harris & Koenig, 2006; P. L. Harris, Pasquini, Duke, Asscher, & Pons, 2006). On Harris' and co-workers' account, children believe all sorts of things on the basis of the testimony of adults without any direct evidence of their own. They note that American children are more skeptical about the existence of God than of oxygen perhaps because they know that adults in their culture have various attitudes about the existence of God but no adults dispute the existence of oxygen, even though few people besides chemists have actually seen persuasive evidence of the existence of the element. On this account the human mind need not have any special cognitive propensity to believe in gods, just a general tendency to trust the evidence of adult testimony. Carey (2009) argues that an early developing "core cognition" sets up a culturally scaffolded developmental process that allows children to acquire concepts that are quite outside the concepts of core cognition themselves.

Let us call this the "cognition-lite" picture of how human minds acquire culture. Cognition is fundamental to this picture, but it supports a relatively weakly constrained system of cultural transmission in which entirely novel culturally constructed concepts, such as the scientific discoveries of the last few centuries, are relatively easily transmitted to children. This key cognitive adaptation created a system for producing highly creative solutions to living in almost all of the world's terrestrial environments, including a diverse array of amphibious adaptation that exploit freshwaters and oceans. The cognition-lite picture may be contrasted with the cognition-heavy explanations of human which rely heavily on innate cognition. This is applied to religion most forcefully by Pascal Boyer (2001):

"In particular, it is clear that our minds are not really prepared to acquire just about any kind of notion that is "in the culture." We do not just "learn what is in the environment," as people sometimes say. That is not the case, because no mind in the world-this is true all the way from the cockroach to the giraffe to you or me-could ever learn anything without having very sophisticated mental equipment that is prepared to identify relevant information in the environment and to treat that information in a special way. Our minds are prepared because natural selection gave us particular mental predispositions. Being prepared for some concepts, human minds are also prepared for certain variations of these concepts. As I will show, this means, among other things, that all human beings can easily acquire a certain range of religious notions and communicate them to others (Kindle locations 52-57)."

"The idea of "replication" is very misleading. People's ideas are sometimes roughly similar to those of other people around them, not because ideas can be downloaded from mind to mind but because they are reconstructed in a similar way. Some ideas are good enough that you will entertain them even though your elders did not give you much material to work

with, and so good again that your cultural offspring will probably hone in on them even though you too are an incompetent transmitter! (Kindle Locations 542-544).”

This is of, course, a quantitative issue. As the mathematical models of cultural evolution make clear, the biases on cultural variants can in principle be so strong as to essentially obviate the influence of culture or so weak as to make culture essentially gene-like in its transmission fidelity and resistance to cognitive remodeling (Boyd and Richerson, 1985). Empirically, we can easily make a case for the cognition-lite picture of culture (Boyd, Richerson and Henrich, 2011a). A completely novel concept like oxygen and facts about its basic causal properties can be successfully reproduced in any mind which has received a modicum of science education—and in no mind before oxygen’s discovery in 1744. Only a tiny scientific elite understands the actual evidence for this particular theory of combustion and aerobic metabolism but “oxygen” and myriad similar concepts are part of our system of beliefs. This is testimony to the relative freedom of human cultural variants from strong cognitive editing. Of course, religious ideas have a much deeper evolutionary history than oxygen and it remains plausible that relatively weak cognitive biases specific to religion exist, either as byproducts of other cognitive functions or as specific adaptation to aspects of religion. Hervas et al. (2011) review this issue in an even-handed attempt to roughly locate religion on the cognition lite-heavy continuum.

In the cognition-lite view, much of the cognitive work in shaping cultural evolution derives from necessarily weak general purpose decision-making systems, with the cognitive workload spread over many individuals and substantial periods of time. Indeed, the cognitive forces often end up acting a bit like natural selection. They influence the adoption of novel cultural adaptations but allow it to still behave like a system of descent with modification (Perreault, 2012). Incidentally, Chomsky, whose ideas were highly influential in the development of the “cognition heavy” position, has now adopted both an evolutionary and a cognition-lite position (Hauser, Chomsky, & Fitch, 2002). Recent advances in evolutionary linguistics have also now take the cognition-lite perspective (Bouckaert et al., 2012; Hurford, 2011).

A cultural evolutionary cognition-lite view of allows the development of theories of cultural change with generate testable hypotheses about cultural change. Beginning in the early part of the twentieth century, biologists studying genetic change in organisms making up ecosystems developed mathematical tools to model the change processes and predict the long term effects. The similarity between genetic change and cultural change has motivated mathematically inclined students of cultural change to reshape some of these tools to study the evolution of the culture of human populations (Boyd & Richerson, 1985; Cavalli-Sforza & Feldman, 1981; Mesoudi, Whiten, & Laland, 2004). These are the sorts of tools we have used to try to help explain the phenomenon of modernization and related religious change. Some features of cultural evolution are rather similar to those of genetic evolution. For example, natural selection ought to act on cultural variation much as it does on genetic variation – useful ideas persist and not so useful ones die out. But mechanisms of cultural inheritance are different from the passing on of genes from parents to offspring. For example, we were endowed with our parents’ genes at the moment of conception but we have inherited our religious beliefs from a host of people and these beliefs are likely to change throughout our lives. Modeling cultural evolution requires modification of the population genetics

models to account for these differences but the basic workings of the cultural inheritance system make cultural change (“cultural evolution”) a Darwinian process of “descent with modification.” Cultural change can be seen as being pushed in one direction or another by various forces, which include biases introduced by human cognition. Even if cognitive effects are weak at the individual level they act strong forces at the population level (Robert Boyd, Peter. J. Richerson, & J. Henrich, 2011).

Demography and the evolution of cultural complexity

One basic pattern in cultural change which has been observed is the existence of a relationship between the size of a population and the complexity of its culture (Joseph Henrich, 2004; Kline & Boyd, 2010). The larger the population, the more often one of its members will add to their cultural information by discovering a useful piece of information, inventing a new tool or developing some other useful innovation. Also, a larger population is more likely to continue to preserve the useful knowledge and expertise of earlier generations. For a cultural variant to be retained, at least one individual from every couple of generations has to be willing and able to acquire that expertise and pass it on. When a skill or body of information is complex and difficult to learn, individuals with the motivation and cognitive ability to learn them are likely to be rare. In a small population an individual with sufficient expertise may not occur in any given generation. The hard-to-learn skills that are most easily forgotten by a population are also the ones that are hardest to reinvent.

A link between the size of a population and cultural complexity does not just make theoretical sense; it is supported empirically. The best known evidence is provided by the 4000 or so people living on the island Tasmania when the first Europeans landed there in 1642. For many years, anthropologists judged the Tasmanian natives to be a quite different and much more primitive people than aborigines living a mere 200 kilometers away in Australia. Unlike the Australians, the Tasmanians had no needles and so they had to survive in their chilly habitat without tailored clothing. They had no boats and no means of catching the fish that surrounded their island. Their technology, which consisted of only 24 tools, was the simplest of any known human group. But when archaeologists began to dig on Tasmania in the 1970s, they found that the people who had lived on Tasmania thousands of years earlier did have boats, fish hooks, needles – the same technology as the people of Australia. It is now known that until 10,000 years ago the Tasmanians and Australians were one people. Tasmania was not an island but a peninsula attached to Australia by a bridge of land. The rise in sea level that occurred about 10,000 years ago drowned this land bridge and the Tasmanians became a small isolated island population. The evidence suggested that at this point the Tasmanians began to gradually lose technology.

More recently, comparisons of the cultural complexity found in the islands and archipelagos in Polynesia have revealed the same effect (Diamond, 1978; Kline & Boyd, 2010). The smaller and more isolated the population, the simpler its culture. Thus, when we observe the religious beliefs and rituals of a fishing community on a small Pacific Island to be simpler than those we observe at the Vatican, we do not conclude that the genes Europeans endow them with a more complex religious mind. In fact, we know the genes of Pacific Islanders to be virtually identical to those of

Europeans. Instead we conclude that Roman Catholicism is more complex because many more people have been involved in using and contributing to this body of cultural information.

For many years, however, speculation about the course of human evolution has been dominated by the idea that the size and complexity of human culture can be explained by the size and complexity of the human brain. This is in spite of the observation that skulls of hominids who lived 200,000 appear to have housed a brains about the same size of modern human brains which left no evidence of having created complex tools, religion or art (Shea, 2008; White et al., 2003). A small number of more complex human artifacts have been found in Africa dating from between 164 and 40 thousand years ago. But these finding suggest that cultural complexity began to emerge several times, was limited to a single region, and maintained for only a short time period (Jacobs et al., 2008). All contemporary humans are undoubtedly descended from African emigrants but it was not until about 45,000 years ago in Eurasia that complex culture arose and was sustained. The artifacts left by these “Cro Magnon” people clearly demonstrate they were inventive and capable of symbolic thought. This sudden “great leap forward” in what archaeologists call the “Upper Paleolithic” has led to speculation that a genetic mutation occurred which caused the large hominid brain to be reorganized in such a way that its cognitive capacities were greatly enhanced (Diamond, 1997; Klein, 2009). No evidence of such a genetic change has yet been found, however.

A link between cultural complexity and the size of the communicating population provides another plausible explanation for the time lag between the evolution of large brains and the emergence of complex culture (Powell, Shennan, & Thomas, 2009). The paucity of hominid fossils dating from the last two million years compared to that of other animal genera suggests that for most of human evolution, our ancestors were not very abundant (Bobe & Leakey, 2009). The larger-brained hominids of the *Homo* genus were widely dispersed and have been found in a range of habitats. This suggests they were able to adapt to making a living in different environments. But the small number of fossils found suggests that they were seldom very abundant until after 40,000 years ago. The Pleistocene was generally a time of great climatic instability but human abundance in Africa did not increase appreciably during the last interglacial period between about 80 and 125,000 years ago when the climate was relatively warm and stable for a considerable portion of the time. When humans left Africa about 60 to 70,000 years ago, and became more abundant everywhere, the climate was at the beginning of a time of extreme climate variability (Atkinson, Gray, & Drummond, 2008; Martrat et al., 2007). The isolated periods of increased cultural complexity observed in Africa may have coincided with times when conditions in an area allowed the human population to temporarily rise. When conditions deteriorated, members of the population were forced to disperse and, like the isolated Tasmanians, they began to lose knowledge and technology. Alternatively, the reverse might have been true. The times of climatic variability might have been the times when large brained and quick witted hominids thrived relative to the canids and big cats they were competing with. This would explain why our ancestors made their exodus from Africa during the time of greatest climatic variability.

If this suggestion is correct, the “great leap forward” in cultural complexity of the Upper Paleolithic occurred because the peoples inhabiting Europe and Asia during found it possible to maintain a sufficiently large communicating population. Cultural artifacts of these people, such as the “Venus

figurines” have been found thousands of miles apart, from western Europe to southern Siberia (Saunders, 1985). Shared religious beliefs and ceremonies may have been among the cultural mechanisms these people used to facilitate the sharing of cultural information between large numbers of people dispersed over a large area (Atran & Henrich, 2010). Upper Paleolithic art has been interpreted as a product of religious ritual (e.g., Lewis-Williams, 2002) On the other hand, Guthrie (2005) argues that the corpus of Upper Paleolithic art is remarkably naturalistic compared to the supernatural themes that are common in ethnographically well attested contemporary hunter-gatherer art. Of course it is possible naturalism and religion to coexist (Armstrong, 2009).

The next leap forward in cultural complexity began after the start of the current geological epoch (known as “the Holocene,”) about 11,000 years ago, when the climate became warmer and wetter and the extreme climatic fluctuations ceased. The last 10 millennia provide a useful natural experiment to help us choose between the cognition-lite and cognition heavy pictures of human behavior. If the cognition heavy concept were correct, we would expect human culture to have made a rapid response to the rapid climate transition because no cultural evolution would have been necessary to allow human populations to adapt to the new environment. (Cognition heavy theorist do not generally envision any *genetic* evolution since this time (e.g., Tooby & Cosmides, 1992). In fact, humans did *not* immediately adapt to the new more hospitable environment. Over the millennia, populations experimented with the new ways of making a living as climate zones became relatively permanent. This slow adjustment to the new environment is predicted by a cognition-lite concept of change. Individuals don’t use their innate cognition to immediately work out how best to deal with the problems and opportunities presented by new circumstances. People do have ideas and some of them are good but new lifeways come about by many people working together over generations (Richerson & Boyd, 2001). Hunter-gatherers evolved economies to exploit an array of hard-to-process plant resources. Agricultural and pastoral cultures developed, stable settlements grew and permanent trade and communication routes became established. This progressive trajectory was roughly parallel in most parts of the world albeit at rather different rates. It set of a wave of genetic evolution as our digestive physiology and ability to resist new diseases coevolved with new diets and population densities that could support epidemic diseases (Laland, Odling-Smee, & Myles, 2010). This allowed a further expansion of human populations and was accompanied by further increases in cultural complexity (Richerson, Boyd, & Bettinger, 2001). Large cities and associated civilizations appeared and collapsed. Christianity, Islam, Buddhism and other systems of religious belief emerged and were disseminated widely. They provided shared beliefs and rules and unifying rituals which facilitated the spread of ideas, technology and trade among people who lived far apart and spoke different languages. Karl Jaspers (1953) classically proposed that Axial Age religions arose as the ideological part of a wave of political consolidation that was ultimately to be explained by the creation of mega-empires to defend agrarian societies from the new threat of mounted archer armies of pastoral nomads. Peter Turchin (2009) provides quantitative support for this idea.

Economic development, “modernization” and “fitness”

The vast changes in population size and cultural complexity triggered by economic development comprise the most recent “leap forward” that our species has experienced. It is also the first of the

“cultural revolutions” to receive scientific scrutiny as it actually occurs. In the 20th century Western social scientists began to focus on describing and attempting to explain the processes by which populations develop or fail to develop modern economies and the changes in attitudes and values that are associated with economic development (e.g., Baran, 1957; McClelland, 1961; Rostow, 1960). Developing societies have been observed to abandon a set of “traditional” values, which hinder economic growth and adopt a set of “modern” values, which are essential for a modern economy to thrive (Inkeles & Smith, 1974) Even though the values and preferences of people in modern and modernizing cultures continue to reflect aspects of the populations’ cultural heritage, the empirical evidence is strong that economic development is associated with a fairly coherent cultural shift away from a set of behaviors and preferences that is shared by all pre-modern peoples toward one shared by all modern peoples (Inglehart & Baker, 2000; Inglehart & Welzel, 2005).

Early social theorists such Marx, Weber and Durkheim had personal experience of the modernization of European societies and it is not surprising that their ideas are still influential with their intellectual descendants in the West. But as the 20th century proceeded and more populations began the process of modernization, it became possible for researchers to observe the process more objectively and outside a Western context. In “Becoming Modern,” Inkeles and Smith (1974) provided evidence of specific changes that occur in the attitudes of people in modernizing cultures. Relative to “modern” people, members of “traditional” cultures are disinclined to question the teachings and rulings of elders and those in authority, including the teachings and rules often characterized as “religious.” They are more likely to feel resigned to a fate which cannot be altered by their own efforts. Their choices are limited by strong feelings of loyalty and obligation to their kin and family allies. They are more likely to believe that men and women should play different roles and that women should concentrate of children and family. They want to marry and have a large number of children.

For scholars who have adopted a view common in Western democracies – that humans are motivated to seek freedom, comfort, pleasure and status – then traditional beliefs and values inhibit the achievement of what appear to them to be “natural” human goals. From this perspective, it appears reasonable to suggest that ongoing environmental changes brought by economic development, which bring greater financial and personal security, free people from the constraints of tradition and family and allow them to be more self-oriented, to question traditional beliefs and be more tolerant of diversity in belief and behavior (Inglehart, Foa, Peterson, & Welzel, 2008; Inglehart & Welzel, 2005). This idea receives some support from the literature on cognitive style (Witkin & Goodenough, 1981) .

Darwinian theory demands that we be skeptical of the idea that humans are fundamentally motivated to seek freedom, comfort, pleasure and status. Nor does it give us reason to believe that they will be anxious to embrace the idea that all humans have certain rights, or that everyone (including themselves and their family) should be subject to the rule of law. All living things are descended from individuals who succeeded in reproducing and have therefore inherited characteristics consistent with achieving reproductive success. We therefore do not expect animals to seek freedom, comfort, pleasure, status and enlightenment ideals if this pursuit is inconsistent with efficiently converting resources into offspring and achieving what Darwinian theorists call

“fitness.” If one’s views of animal behavior are informed by Darwinian theory, the behavior of people in economically developed populations is very puzzling. They exploit resources at a rate unprecedented in human history and yet the vast majority “chooses” to limit the number of children they produce. In previous generations, the individuals who left the most descendants would have been those who increased their rate of reproduction when their circumstances were good and who favored their kin and family allies over strangers. Evidence suggests that in traditional societies this is indeed the case (e.g., Borgerhoff-Mulder, 1988; Chagnon, 1988; Lee Cronk, 1989; L. Cronk, 1991; Hill & Hurtado, 1996; Irons, 1979; Lindert, 1985; Low, 1993, 1999, 2000; Wang, Lee, & Campbell, 1995).

A scientific explanation for the cultural changes of modernization has to account for why they include the abandonment of norms that promote fitness and the adoption of norms that limit their success in the production of descendants. The norms of pre-industrial societies encourage members to eschew individual desires and rebellious thoughts and concentrate on cooperating with family and friends, supported by a local community, to produce and raise the next generation (Newson & Richerson, 2009). The constraints imposed by traditional norms discourage young people from wasting their time and energy in pursuits unlikely to enhance their biological fitness. For example, girls are expected to learn childcare and homemaking skills rather than the skills associated with men’s work because raising a family is considered vital work. When a population begins to undergo economic development, priorities change and traditional norms begin to relax. This relaxation allows economic development to proceed. Once people feel less loyalty to their family and are less motivated to help maintain their family, they can devote more effort to being part of the wider economy, contributing to the production of industrial goods and consuming them.

Almost all populations that have undergone economic development have experienced similar changes so it is reasonable to speculate that something about economic development causes the culture of a population to change in these ways. Newson and Richerson (2009) suggest that, in common with the previous “revolutions” in human history, it is due to demographic change – the expansion of the communicating population. Economic development changes the structure of communities and the pattern of social interaction so that people spend less time working with and interacting with family members and family friends. Working and being educated in industrial setting forces people to make new friends and interact with strangers. Historical accounts based on archaeological and records of the literate elite can give the impression that this sort of social life was not unusual in pre-industrial times but, in fact, the vast majority of our ancestors spent most, if not all, of their lives in much smaller communities. As Bryan Wilson (1976) points out, what we call “societies” were often no more than “loose agglomerations of communities, partially and spasmodically drawn into association and into shared involvements by the centralized political agencies”^{p.263}. Gregory King estimated that as the 18th began, nearly eighty percent of the English population lived in villages or hamlets and few of the towns and cities, apart from London, had a population that reached 10,000.

For those of us who take a Darwinian approach to understanding human behavior it is particularly relevant that the social networks of our ancestors living in pre-industrial communities were dominated by their relatives and local community members they had known for most of their lives.

Prior to economic development, the family is the main unit of production and the main source of support (Davis, 1937/1997). Members work to acquire resources and to raise children. As children grow up, they begin to contribute and their contribution grows as they gain competence. Once they reach adulthood children may stay with their natal family, move to the family of their spouse or be employed by another family, often that of a relative. A high proportion of social interaction, therefore, is between people who see themselves as belonging to the same family or close allies of the family. Fitness-promoting norms are maintained in such a social structure because members of a family have an interest in each other's successful reproduction. Without healthy offspring the family has no future. Communication during interactions among family members is therefore likely to advise and reward behaviors that enhance family fitness (Newson, Postmes, et al., 2007).

With economic development, other institutions take over production (Davis, 1937/1997). Travel becomes easier and young adults can move away from their family entirely to gain employment in a center of industry or trade. Literacy becomes nearly universal bringing urban ideas to the remotest rural communities. The resulting change is commonly described in economic terms – in terms of division of labor and increasing productivity. But as Steve Bruce (2011) says, it is not just a division of labor but a division of life – social life fragments. And, as Bryan Wilson puts it, the population becomes “societalized.” The likely effects of these changes have been widely discussed by social scientists but they have paid little attention to a change that Darwinian theory suggests should be very important (Emlen, 1995). As economic development proceeds, interaction between kin makes up a smaller and smaller proportion of people's social interaction. Even the people who stay in rural villages have increased interaction with the wider world through contact with visitors, education and the mass media. Individuals feel that they belong to a number of different social groups throughout their lives. Members of non-family groups have no particular interest in each other's fitness so communication during the interactions among members is less likely to encourage behaviors that enhance fitness. These groups may instead have shared economic, educational or leisure interests that compete with family interests and fitness.

We have argued that it is the reduction of contact between kin and the inevitable reduction in influence from kin which causes people in developing countries to change their minds about the number of children they want to have (Newson, Postmes, Lea, & Webley, 2005; Newson, Postmes, et al., 2007). The emergence of a desire to limit family size is one of the earliest changes to occur as a population begins to undergo economic development. The adoption of a “small family norm” has been linked to the widening of social networks in every developing society that has been studied (e.g., Bongaarts & Watkins, 1996; Kohler, 2001; Watkins, 1990; Zelinsky, 1971). Its adoption is easily detected in a population. Fertility (number of children born per women) begins to decline. Fertility is now very low or declining rapidly in almost all contemporary human populations. Some of the exceptions are theoretically quite significant. For example, Old Order Anabaptist communities in which it is common to have families of nine children are scattered across North America. Their populations are prosperous and fully integrated into the economies of their region. They take advantage of modern health care. But they take considerable care to isolate themselves culturally from their US and Canadian host cultures and live in small, rural communities amid their kin (Kraybill & Bowman, 2001).

A large change in the size and structure of a population is unlikely to have a single contemporaneous effect. Rather pro-family norms will decline over several generations as each succeeding generation becomes more and more modern. In the Western populations that were first to experience economic development, the adoption of the small family norm has been accompanied and followed by other cultural changes (Newson & Richerson, 2009). Many of these changes further weakened the family and encouraged behavior that reduces fitness. Even several generations after the change in the structure of communities in Western societies, cultural change is still rapid and there is no sign of it slowing down (Inglehart & Welzel, 2010). It would be surprising if this ongoing cultural change did not include changes in those aspects of culture categorized as religious. A cultural evolutionary perspective is likely to shed new light on the pattern of changes that are observed.

Religion and the modernization process

Enlightenment scholars and early social theorists observed knowledge and rational thought tackling superstition and supernaturalism. They predicted that religious belief and observance would gradually fade. Subsequent examinations of modern and modernizing societies have shown the pattern of change in religious behavior to be very different from this (Finke & Stark, 2005; Martin, 2005; Norris & Inglehart, 2004). European societies (including those living in colonies outside Europe) were industrializing rapidly in the 19th and early 20th Century and their members were adopting modern values. Birth-rates were plummeting, causing amazement and consternation among politicians and scholars (e.g., National Birth-Rate Commission, 1916). Yet many populations were experiencing religious revivals at this time (McLoughlin, 1978). It was a time of much religious discussion, innovation and church-building. As the 20th Century progressed, however, these societies have become more secular.

As the influence of organized religion waned in Western societies, many of the non-European populations that began to undergo economic development during the middle part of the 20th Century began to experience religious revivals, often described as “fundamentalist movements.” Such movements are found today in Africa, the Middle East, Latin America and Asia and include practitioners of Judaism, Hinduism, Islam, Sikhism, neo-Confucianism, Christianity and Buddhism (Emerson & Hartman, 2006). Their popularity has inspired a number of commentators to describe a “clash of civilizations” between their own secular Western societies and populations of faith, and particularly of the Islamic faith, which refuse to embrace rationality, tolerance and other modern values (e.g., L. Harris, 2004; Huntington, 1993).

Norris and Inglehart (2004) suggest that those promoting secularism may have reason for more optimism. Using data from the European and World Values Survey (2009), they compared the religious beliefs and practices of over a quarter of a million people in more than 70 countries who were surveyed between 1981 and 2001. Participants in the surveys included members of all major religions, although Christians made up a much larger proportion of the surveyed population than they do of the world population. Their analysis of the data shows that “the publics of virtually all advanced industrialized societies have been moving toward more secular orientation.^{p.24-5.}” But they attribute this trend not to increasing rationality but to rising levels of security. They argue that

their data disputes the suggestion that the “demand” for religion is constant (Iannaccone, Finke, & Stark, 1997) because religious belief and observance increase with stress and insecurity. The influence of religious institutions weakens with modernization, they say, because rising levels of education and wealth makes people’s lives less stressful. If this interpretation of the data is correct, then people in developing countries will start behaving more like Westerners if they enjoy increased security and other advantages of economic development that Westerners enjoy. Norris and Inglehart warn, however, that poor people are having more children and they attribute this to their religious values, which emphasize a traditional role for women and limit their lives to producing and raising as many children as possible. Having so many children will reduce their chances of becoming wealthier and more secure. They are likely, therefore, to continue eschew secularism and because of their rapid population growth, religious believers will make up a growing proportion of the world’s population.

A cultural evolutionary analysis of the European and World Value Survey and demographic trend data suggests very different explanations for the cross-national differences in religiosity. First of all, as explained above, from a Darwinian perspective, the “traditional family values” of pre-industrialized societies are explained by the high level of social interaction between kin that occurs in pre-modern populations. The idea that the abandonment of these values is prevented or slowed by the influence of religion is not supported. For example, as Figure 1 shows, in Iran the adoption of family limitation occurred after the 1979 Islamic revolution and once it began it proceeded at the same pace as it had in China. Now both Iran and China have lower fertility than the United States and a number of European countries. The adoption of family limitation is occurring more slowly in India, which has more heterogeneous population. What may be called “traditional family value” norms begin to relax once economic development communities to be less kin based. But the relaxation is part of a *process* of change. People don’t change their minds instantaneously the process takes generations to play out. The adoption of family limitation occurs relatively early in the process. Changes in other norms, such as those prescribing gender roles and sexual conduct have tended to occur later (Newson, 2009). Members of a modernizing population who continue to hold more traditional norms about gender and sexual conduct may categorize these values among their religious beliefs and they may use religious texts to justify them, but this does not mean that these texts are the source of these values.

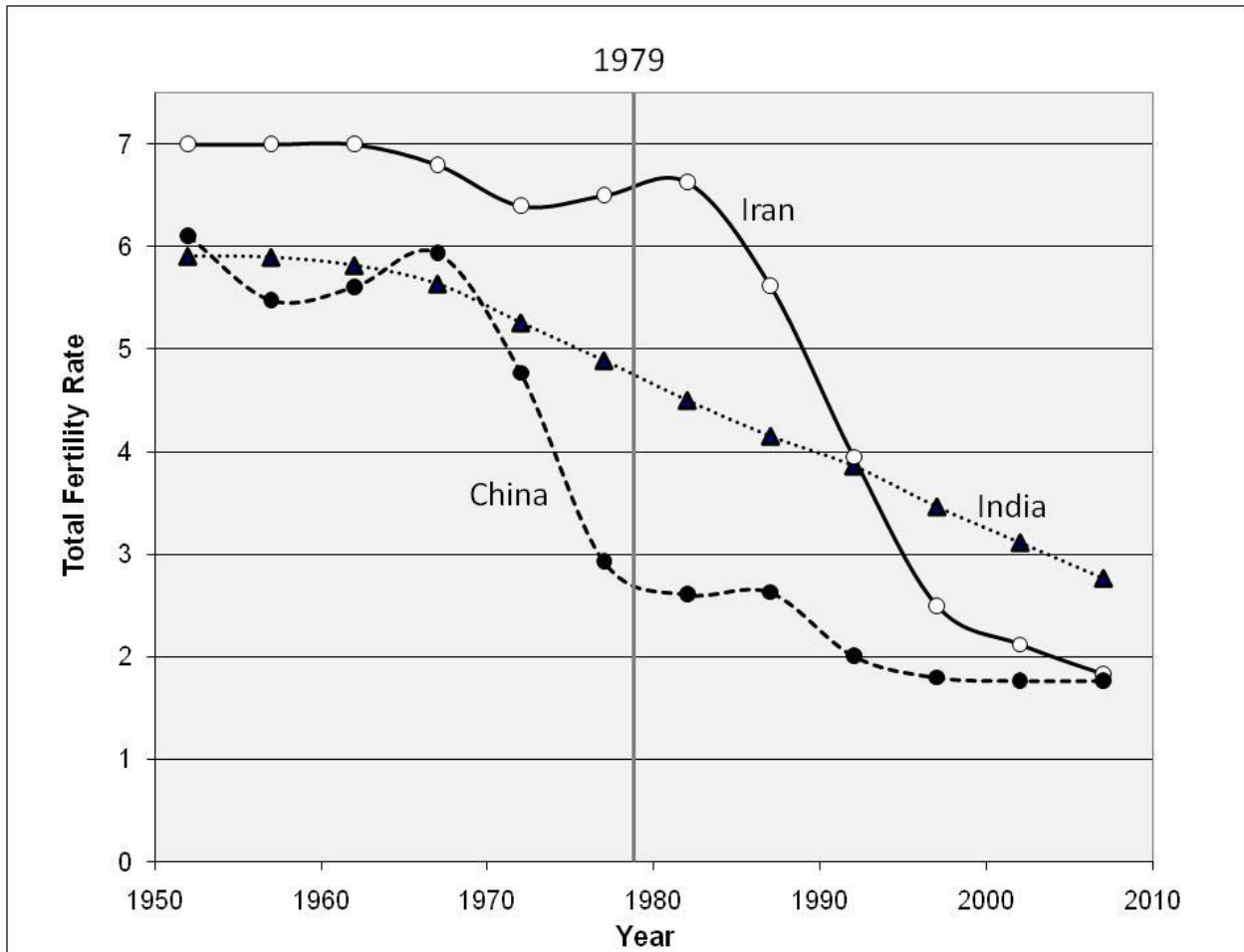


Figure 1. Total fertility rate, the number of children produced per woman per year, has declined in all countries which are experiencing economic development. Fertility began to decline in Iran after it became an Islamic republic. The decline began earlier in China than in Iran but they proceeded at the same pace even though religious belief and observance is higher in Iran. The small family norm is spreading more slowly in the large and very diverse population of India. 1979 was the year of the Islamist revolution in Iran and also the year that China instituted its “one child policy”.

Norris and Inglehart's suggestion that higher levels of insecurity lead to increased demand for religion may be supported by an analysis comparing countries that began to modernize some time ago with those that began to modernize more recently. But it ignores the pattern of religious change observed at early stages of economic development. When a population begins to undergo economic development, employment and education opportunities increase. People become more prosperous and secure. Yet, in many populations, religious belief and observance remain high or even increase as the society begins to develop (Bruce, 2000; Emerson & Hartman, 2006; Finke & Stark, 2005; McLoughlin, 1978).

A cultural evolutionary approach suggests an alternative explanation for the associations that Norris and Inglehart observed in their analysis of the European and World Values Survey. The link between secularization and economic development suggests that this cultural change might also be due to the change in the structure of society economic development brings. The increased spatial and social mobility that occurs with economic development not only increases interaction between kin, it also increases interaction between people who do not share the same experiences or beliefs. A population living in loosely agglomerated small communities may all be of the same religion in the sense that they are all familiar with certain religious texts and rituals. They may all enjoy religious holidays, have life transitions marked by religious ceremonies and even make the stipulated contributions to the religious infrastructure. But as Pyysiäinen points out (this volume) some forms of religion are more convincing and more easily remembered than others and this is bound to result in regional differences in the details of customs, religious practices and superstitions. Clusters of villages and hamlets whose inhabitants regularly meet with one another and frequently intermarry are likely to share basically the same beliefs but when communities are isolated from one another and have little contact with the religious elite, a wide range of heretical beliefs and practices are likely to emerge. The historical record shows that this was indeed the case in Europe (Foster, 1960; Thomas, 1971; Watkins, 1991).

Economic development provides people from isolated communities with the means and opportunity to travel to centers of industry and commerce. Upon arrival they become part of a community made up of people from different locales whose beliefs, values, customs and dialects are different. Newcomers find that some of their beliefs are considered bizarre by many of their new neighbors. And these neighbors have incredible beliefs and strange customs of their own. In small communities, whose members share a small number of limited experiences and group memories, many of their beliefs have "social validity" (Turner, 1991) and are seldom questioned. On moving to a larger community, especially a diverse immigrant community, such villagers find the validity of these beliefs questioned. Life in the village didn't prepare them for this. They lack a basis on which to decide which beliefs might be valid and which to abandon. Urban areas with jobs that attract people from country villages receive a steady stream of lonely, awkward and confused young immigrants. In such an environment, institutions that provide guidance such as political movements, learned societies, and religious congregations can be very helpful and very influential. Carvalho(2013) provides an interesting analysis of veiling, which becomes more common in Muslim populations as they begin the early stages of modernization. He suggests that veiling permits young women to make a visible statement of their commitment to their still-traditional community while at the same time seeking modern educations and employment in the modern

economy. In general, fundamentalist religious movements are a product of the interaction of urbanizing traditional communities with modernism (Al Sayyad & Massoumi, 2011). They are one part adaptation to modernity and one part resistance to it. It is not surprising that among the more successful religions that emerge in such environments are those which base the validity of their belief on something with which potential members are familiar, such as a sacred text. Among the five ideological characteristics of fundamentalist groups, identified by the Fundamentalisms Project (Almond, Appleby, & Sivan, 2003) is a belief that the text of the religious tradition is “of divine (inspired) origin and true and accurate in all particulars.” In religions like Hinduism, which do not have a single clear sacred text, fundamentalist movements are inclined to nominate one text or a set of texts to this position. Thus, we agree with Norris and Inglehart (2004) that religious belief helps to relieve insecurity but the insecurity is not caused by poverty. It is due to the lack of a clear social identity as well as the lack of functional social networks to give support and advice on such things as finding a spouse or medical help.

It may be that the cultural changes of modernization progress towards more secularism and greater tolerance of religious differences because the children and grandchildren of the immigrants from the village grow up surrounded by diversity. They have the chance and the necessity to develop more sophisticated heuristics to allow them choose among beliefs and also to choose not to choose, to decide that some things simply cannot be known for certain. They feel secure in a community with people who hold different beliefs. Thus, our hypothesis is that the influence of religious organizations tends to rise after the start of economic development and then begins to decline as modernization proceeds. But these cultural changes are not instantaneous and, like the changes in reproductive norms, they can take generations to play out.

If this cultural evolutionary interpretation secularization is correct, then the differences in religiosity observed in contemporary populations may not be the result deep-seated cultural differences between the populations. The populations may actually be experiencing similar cultural evolutionary processes and the countries which began economic development earlier may simply be further along that process. Modernization includes a large number of highly correlated changes – cultural changes and changes in lifestyle. The suggestion one of the changes causes another – that poverty causes religiosity and religiosity causes high birth-rates, for example – is consistent with the observations. But correlation does not imply causation. The same correlations would be observed if the changes are part of an evolutionary process that began with the profound change in the structure of societies that occurs early in economic development before many of the changes are measurable.

The European World Values Survey (2009) data analyzed by Norris and Inglehart (2004) can also be analyzed from a cultural evolutionary perspective. If countries are experiencing a cultural evolutionary process and fertility begins early on in that process, then the year the fertility began to decline in a country provides a culturally neutral means determining how far along the process the different countries are. We found that this single variable, the year fertility began to decline in a country, explains about 50 percent of the variance between countries in mean response to questions about religious attendance (Figure 2) and belief in hell (Figure 3). It explains about a quarter of the variance in belief in God and life after death. Like Norris and Inglehart, we found the

United States to be a significant outlier. A number of explanations have been offered for high proportion of Americans for whom religion is important (Wald & Calhoun-Brown, 2007), such as the entrepreneurial nature of religion in the United States (Iannaccone et al., 1997) and the high levels of inequality (Norris & Inglehart, 2004).

An alternative explanation consistent with our cultural evolutionary approach is that important subpopulations in the US have entered the modernization processes later than others. For example, the South-eastern US, where many Conservative Protestants have their roots, lagged the rest of the country in urbanization in the early 20th Century, continuing to live in small communities (Fischer & Hout, 2006). Also, in 1965, changes to legislation governing immigration to the United States increased rates of immigration and dramatically decreased the proportion of immigrants coming from Europe (Segal, Elliott, & Mayadas, 2010). In 2007, 12.6 per cent of Americans were foreign born and approximately 85 per cent of immigrants were from less developed countries like Mexico and the Philippines, where fertility only began to decline in latter part of the 20th century. Thus, even though much of the United States began the modernization process at the same time as West European countries, a substantial portion of its population were, until recently, part of populations that began to modernize much later. The fertility of Conservative Protestants in the US, mainly native born Whites but also including many of African-American descent, remained higher than the US average until the 1970s, which also suggests that a portion of the population began the modernization process later. However, despite their espousal of “family values” for more than two generations the fertility of the conservative Protestants in the US has been roughly equal to those attending other churches, which suggests that they are well advanced in the modernization process (Hout, Greeley, & Wilde, 2001). Fertility is still high, however, in religious groups known as “Old order Anabaptists” who maintain kin-based communities and have little contact with modern culture.

Populations on a cultural evolutionary continuum?

The desire to limit family size occurs early in the process of cultural change which accompanies economic development. We use the year fertility began to decline in a country as a way of determining how far along the modernization process countries are likely to have progressed.

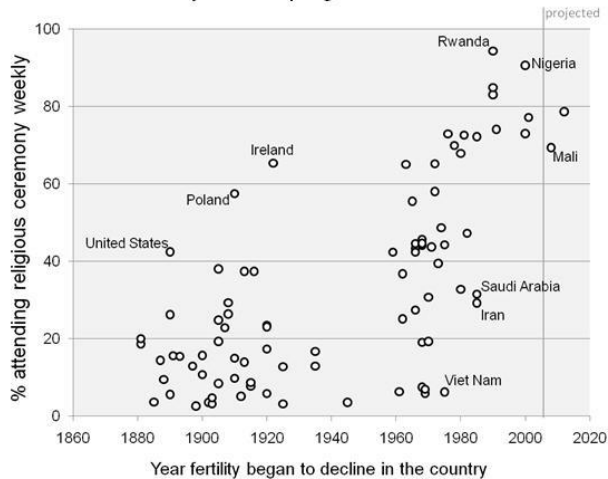


Figure 2. Per cent of population in 87 countries saying they attended a religious ceremony once a week or more*.

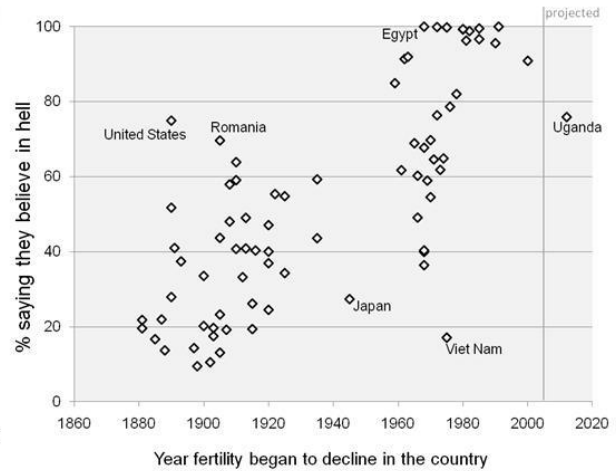


Figure 3. Per cent of population in 77 countries saying they believe in hell*.

* Based on responses to a European and World Values Survey (2009) questionnaire issued to a representative sample of the countries' population between 1994 and 2008.

Conclusion

Our cultural evolutionary explanation of religious change and modernization differs in several ways from the narrative of what David Martin (2005p. 8) calls the variety of secularization stories. We do not assume that "Once there was a religious past, and that this has bit by bit emerged as *the* secular future" and we do not suggest that "The natural (often equated with science) wins out over religion." In fact, we see religion as playing a similar role to science in the cultural changes of modernization. Religion and science both provide mechanisms by which immigrants from different local cultures can assign validity to certain beliefs. Science argues for the validity of certain beliefs on the basis of evidence obtained through experiment and observation of the natural world. Religions, and particularly "fundamentalist" religions, argue for the validity of certain beliefs on evidence obtained from a commonly respected source of enlightenment. The sciences and other academic studies, including theology help to unify the beliefs and values of the upper middle class elite of modern societies. Fundamentalisms serve a similar function for the urbanizing lower middle, working and under classes.

The cultural evolutionary approach is also different from many secularization stories in that it does not consider a population's religion to be the source of the beliefs that run counter to a number of currently emerging Western beliefs about sexual behavior. People who are most influenced by religion may also hold more "traditional" beliefs about sexuality. But a Darwinian approach suggests that beliefs about sexuality, marriage, sexual division of labor (as well as, nepotism and respect for elders) are a product, not of religion, but of the kin-based communities in which most people were socialized prior to economic development. Religious texts may include references to

such beliefs but these texts are also often the product of kin-based communities. Religions can encourage their members to be tolerant and respect human rights but the beliefs that support the tolerance and respect have to evolve in the population and cannot be imposed from “above” or outside. This is consistent with the observations of some scholars studying the adoption of beliefs about human rights by Islamic populations (e.g., Dalacoura, 2007).

Finally, we support our suggestion that the cultural evolutionary approach is “scientific” by making a prediction. We predict that cultural differences between the West and many developing countries will be reconciled peacefully despite religious differences. The cultural evolutionary process known as modernization is proceeding in both cultural groups. Immigration and communication technologies are strengthening social links. Social links between the groups will help the cultures of populations to converge. The near future provides a test for this optimistic prediction. However, “modernization” is a continuing process. What is “modern” will keep changing. Indeed, modern behavior in its current form is clearly unsustainable. Not only will it not be possible to keep up the levels of consumption which many modern and modernizing people aspire to, but we will simply not be able to maintain our populations. In many modern societies, fertility is below replacement. Selection even on cultural variation will favor subpopulations that maintain above replacement fertility. In the long run, perhaps the population of the world will be dominated by Anabaptists, Ultra-orthodox Jews, Roma and whatever other societies that manage to resist modernity. Perhaps the meek shall inherit the earth.

Literature cited

- Al Sayyad, N., & Massoumi, M. (2011). *The Fundamentalist City: Religiosity and the Remaking of Urban Space*. Oxford: Routledge.
- Alchian, A. A. (1950). Uncertainty, evolution and economic theory. *Journal of Political Economy*, 58, 211-222.
- Almond, G. A., Appleby, R. S., & Sivan, E. (2003). *Strong Religion: The Rise of Fundamentalisms Around the World*. Chicago, IL: Chicago University Press.
- Armstrong, K. (2009). *The Case for God*. New York: Alfred A. Knopf.
- Atkinson, Q. D., Gray, R. D., & Drummond, A. J. (2008). mtDNA variation predicts population size in humans and reveals a major southern Asian chapter in human prehistory. *Molecular Biology and Evolution*, 25(2), 468-474.
- Atran, S., & Henrich, J. (2010). The evolution of religion: How cognitive by-products, adaptive learning heuristics, and group competition generate deep commitments to prosocial religions. *Biological Theory*, 5(1), 18-30.
- Baran, P. A. (1957). *The Political Economy of Growth*. New York: Monthly Review Press.
- Bobbe, R., & Leakey, M. G. (2009). Ecology of plio-pleistocene mammals in the Omo-Turkana basin and the emergence of Homo. In F. E. Grine, J. G. Fleagle & R. E. Leakey (Eds.), *The First Humans: Origins and Early Evolution of the Genus Homo*. New York: Springer.
- Bongaarts, J., & Watkins, S. C. (1996). Social interactions and contemporary fertility transitions. *Population And Development Review*, 22(4), 639-682.
- Borgerhoff-Mulder, M. (1988). Behavioural ecology in traditional societies. *TREE*, 3(10), 260-264.
- Bouckaert, R., Lemey, P., Dunn, M., Greenhill, S. J., Alekseyenko, A. V., Drummond, A. J., . . . Atkinson, Q. D. (2012). Mapping the origins and expansion of the Indo-European language family. *Science*, 337(6097), 957-960.

- Boyd, R., & Richerson, P. J. (1985). *Culture and the Evolutionary Process*. Chicago: University of Chicago Press.
- Boyd, R., & Richerson, P. J. (1992). How microevolutionary processes give rise to history. In M. H. Nitecki & D. V. Nitecki (Eds.), *History and Evolution* (pp. 179-209). Albany: State University of New York Press.
- Boyd, R., Richerson, P. J., & Henrich, J. (2011). The Cultural Niche. *Proceedings of the National Academy of Sciences of the United States of America*, 108, 10918-10925.
- Boyd, R., Richerson, P. J., & Henrich, J. (2011). Rapid cultural adaptation can facilitate the evolution of large-scale cooperation. *Behavioral Ecology and Sociobiology*, 65(3), 431-444.
- Boyer, P. (2001). *Religion explained : the evolutionary origins of religious thought*. New York: Basic Books.
- Bruce, S. (2000). *Fundamentalism*. Malden, MA.: Blackwell.
- Bruce, S. (2011). *Secularization: In Defence of an Unfashionable Theory*. Oxford: Oxford University Press.
- Campbell, D. T. (1960). Blind Variation and Selective Retention in Creative Thought as in Other Knowledge Processes. *Psychological Review*, 67, 380-400.
- Carey, S. (2009). *The Origin of Concepts*. New York: Oxford University Press.
- Carvalho, J. P. (2013). Veiling. *Quarterly Journal of Economics*, 128 (in press).
- Cavalli-Sforza, L. L., & Feldman, M. W. (1973). Models for cultural inheritance: I. Group mean and within group variation. *Theoretical Population Biology*, 4, 42-55.
- Cavalli-Sforza, L. L., & Feldman, M. W. (1981). *Cultural Transmission and Evolution: A Quantitative Approach*. Princeton, NJ: Princeton University Press.
- Chagnon, N. A. (1988). Life histories, blood revenge, and warfare in a tribal population. *Science*, 239, 985-992.
- Cronk, L. (1989). Low socio-economic status and female biased parental investment: The Mukogodo example. *American Anthropologist*, 91, 441-429.
- Cronk, L. (1991). Human behavioral ecology. *Annual Review of Anthropology*, 20, 25-53.
- Dalacoura, K. (2007). *Islam, liberalism and human rights: implications for international relations*. London: I.B. Tauris.
- Darwin, C. (1859). *On the Origin of Species by Means of Natural Selection, or, The Preservation of Favoured Races in the Struggle for Life*. London: John Murray.
- Darwin, C. (1874). *The Descent of Man and Selection in Relation to Sex* (2nd ed.). New York: American Home Library.
- Davis, K. (1937/1997). Kingsley Davis on reproductive institutions and the pressure for population. *Population and Development Review*, 23(3), 611-624.
- Diamond, J. (1978). The Tasmanians: the longest isolation, the simplest technology. *Nature*, 273, 185-186.
- Diamond, J. (1997). *Guns, Germs, and Steel: The Fates of Human Societies*: Norton; Jonathan Cape/Random House.
- Emerson, M. O., & Hartman, D. (2006). The rise of religious fundamentalism. *Annual Review of Sociology*, 32, 127-144.
- Emlen, S. T. (1995). An evolutionary theory of the family. *Proceedings of the National Academy of Sciences of the United States of America*, 92, 8092-8099.
- European and World Values Surveys. (2009). Five-wave integrated Data File 1981-2007 v20090914. Retrieved 19 Nov, 2009, from European Values Study Foundation and World Values Survey Association
- <http://www.worldvaluessurvey.org/>
- Finke, R., & Stark, R. (2005). *The Churching of America, 1776-2005: Winners and Losers in Our Religious Economy*. New Brunswick, NJ: Rutgers University Press.

- Fischer, C. S., & Hout, M. (2006). *Century of Difference*. New York: Russell Sage Foundation.
- Foster, G. M. (1960). *Culture and Conquest: America's Spanish Heritage*. New York: Wenner-Gren Foundation for Anthropological Research.
- Gerard, Rapoport, Gerard, W. R., Kluckhohn, C., & Rapoport, A. (1956). Biological and Cultural Evolutions *Behavioral Sci. Vol. 1*.
- Guthrie, R. D. (2005). *The Nature of Paleolithic Art*. Chicago: Chicago University Press.
- Harris, L. (2004). *Civilization and its enemies*. New York: The Free Press.
- Harris, P. L., & Koenig, M. A. (2006). Trust in testimony: How children learn about science and religion. *Child development, 77*(3), 505-524.
- Harris, P. L., Pasquini, E. S., Duke, S., Asscher, J. J., & Pons, F. (2006). Germs and angels: The role of testimony in young children's ontology. *Developmental Science, 9*(1), 76-96.
- Hauser, M. D., Chomsky, N., & Fitch, W. T. (2002). The faculty of language: What is it, who has it, and how did it evolve? [filed with review: Bever, Thomas and Mario Montalbetti 2002. *Science 298*: 1565]. *Science, 298*(5598), 1569-1579.
- Henrich, J. (2004). Demography and cultural evolution: Why adaptive cultural processes produced maladaptive losses in Tasmania. *American Antiquity, 69*(2), 197-214.
- Henrich, J., & Henrich, N. (2010). The evolution of cultural adaptations: Fijian food taboos protect against dangerous marine toxins. *Proceedings of the Royal Society B: Biological Sciences*. doi: 10.1098/rspb.2010.1191
- Hill, K., & Hurtado, A. M. (1996). *Ache Life History: The Ecology and Demography of a Foraging People*. New York: Aldine de Gruyter.
- Hodgson, G. M. (2004). *The Evolution of Institutional Economics: Agency, Structure and Darwinism in American Institutionalism*. London: Routledge.
- Hout, M., Greeley, A. M., & Wilde, M. J. (2001). The demographic imperative in religious change in the United States. *American Journal of Sociology, 107*(2), 468-486.
- Huntington, S. P. (1993). The clash of civilizations. *Foreign Affairs, 72*(3), 22-49.
- Hurford, J. R. (2011). *The Origins of Grammar: Language in the Light of Evolution II: Language in the Light of Evolution II* (Vol. 2): OUP Oxford.
- Iannaccone, L. R., Finke, R., & Stark, R. (1997). Deregulating religion: The economics of church and state. *Economic Enquiry, 35*, 350-364.
- Inglehart, R., & Baker, W. E. (2000). Modernization, cultural change, and the persistence of traditional values. *American Sociological Review, 65*(1), 19-51.
- Inglehart, R., Foa, R., Peterson, C., & Welzel, C. (2008). Development, freedom, and rising happiness: A global perspective (1981-2007). *Perspectives on Psychological Science, 3*, 264-285. doi: 10.1111/j.1745-6924.2008.00078.x
- Inglehart, R., & Welzel, C. (2005). *Modernization, cultural change, and democracy: the human development sequence*. New York: Cambridge University Press.
- Inglehart, R., & Welzel, C. (2010). Changing mass priorities: The link between modernization and democracy. *Perspectives on Politics, 8*(2), 551-567.
- Inkeles, A., & Smith, D. H. (1974). *Becoming Modern: Individual Change in Six Developing Countries*. Cambridge MA: Harvard University Press.
- Irons, W. (1979). Cultural and biological success. In N. A. Chagnon & W. Irons (Eds.), *Evolutionary Biology and Human Social Behavior*, (pp. 257-272). North Scituate, MA: Duxbury Press.
- Jacobs, Z., Roberts, R. G., Galbraith, R. F., Deacon, H. J., Grun, R., Mackay, A., . . . Wadley, L. (2008). Ages for the Middle Stone Age of Southern Africa: Implications for human behavior and dispersal. *Science, 322*, 733-735.
- Jaspers, K. (1953). *The Origin and Goal of History*. New York: Routledge & Kegan Paul.
- Klein, R. G. (2009). *The Human Career: Human Biological and Cultural Origins, 3rd edition*. Chicago: Chicago University Press.

- Kline, M. A., & Boyd, R. (2010). Population size predicts technological complexity in Oceania. *Proceedings of the Royal Society B*, 277, 2559-2564.
- Kohler, H. P. (2001). *Fertility and Social Interactions*. Oxford: Oxford University Press.
- Kraybill, D. B., & Bowman, C. F. (2001). *On the Backroad to Heaven Old Order Hutterites, Mennonites, Amish, and Brethren*. Baltimore: Johns Hopkins University Press.
- Laland, K. N., Odling-Smee, J., & Myles, S. (2010). How culture shaped the human genome: bringing genetics and the human sciences together. *Nature Reviews Genetics*, 11, 137-148.
- Lewis-Williams, D. (2002). *The Mind in the Cave: Consciousness and the Origins of Art*. London: Thames and Hudson.
- Lindert, P. H. (1985). English population, prices, and wages, 1541-1913. *Journal of Interdisciplinary History*, 15, 609-634.
- Loftus, E. F. (1996). *Eyewitness testimony*: Harvard University Press.
- Low, B. S. (1993). Ecological demography: A synthetic focus in evolutionary anthropology. *Evolutionary Anthropology*, 1, 177-187.
- Low, B. S. (1999). Sex, wealth and fertility: Old rules in new environments. In L. Cronk, N. A. Chagnon & W. Irons (Eds.), *Human Behavior and Adaptations: An Anthropological Perspective* (pp. 323-344). New York: Aldine de Gruyter.
- Low, B. S. (2000). *Why Sex Matters*. Princeton, N.J.: Princeton University Press.
- Martin, D. (2005). *On Secularization: Towards a Revised General Theory*. Aldershot, Hants.: Ashgate Publishing Limited.
- Martrat, B., Grimalt, J. O., Shackleton, N. J., de Abreu, L., Hutterli, M. A., & Stocker, T. F. (2007). Four climate cycles of recurring deep and surface water destabilizations on the Iberian margin. *Science*, 317, 502-507.
- McClelland, D. (1961). *The Achieving Society*. Princeton, N.J.: D. Van Nostrand.
- McElreath, R., Boyd, R., & Richerson, P. J. (2003). Shared norms and the evolution of ethnic markers. *Current Anthropology*, 44(122-129).
- McLoughlin, W. G. (1978). *Revivals, Awakenings, and Reform: An Essay on Religion and Social Change in America. 1607-1977*. Chicago: Chicago University Press.
- Mesoudi, A. (2007). Using the methods of experimental social psychology to study cultural evolution. *Journal of Social, Evolutionary, and Cultural Psychology*, 1(2), 35-58.
- Mesoudi, A., Whiten, A., & Laland, K. N. (2004). Is human cultural evolution Darwinian? Evidence reviewed from the perspective of "The Origin of Species". *Evolution*, 58(1), 1-11.
- National Birth-Rate Commission. (1916). *The Declining Birth-rate: Its causes and effects*. London: Chapman and Hall.
- Newson, L. (2009). Cultural versus reproductive success: Why does economic development bring new tradeoffs? *American Journal of Human Biology*, 21(4), 464-471.
- Newson, L., Postmes, T., Lea, S. E. G., & Webley, P. (2005). Why are modern families small? Toward an evolutionary and cultural explanation for the demographic transition. *Personality And Social Psychology Review*, 9(4), 360-375.
- Newson, L., Postmes, T., Lea, S. E. G., Webley, P., Richerson, P. J., & McElreath, R. (2007). Influences on Communication about Reproduction: The Cultural Evolution of Low Fertility. *Evolution and Human Behavior*, 28, 199-210.
- Newson, L., & Richerson, P. J. (2009). Why do people become modern: A Darwinian Mechanism. *Population and Development Review*, 35(1), 117-158.
- Newson, L., Richerson, P. J., & Boyd, R. (2007). Cultural evolution and the shaping of cultural diversity. In S. Kitayama & D. Cohen (Eds.), *Handbook of Cultural Diversity*. New York: Guilford Press.
- Norris, P., & Inglehart, R. (2004). *Sacred and Secular: Religion and Politics Worldwide*. Cambridge: Cambridge University Press.
- Perreault, C. (2012). The pace of cultural evolution. *PLoS ONE*, 7, e45150. doi: doi:10.1371

- Powell, A., Shennan, S., & Thomas, M. (2009). Late Pleistocene demography and the appearance of modern human behavior. *Science*, 324, 1298-1301.
- Richards, R. J. (1987). *Darwin and the Emergence of Evolutionary Theories of Mind and Behavior*. Chicago: University of Chicago Press.
- Richerson, P. J., & Boyd, R. (1987). Simple models of complex phenomena: The case of cultural evolution. In J. Dupré (Ed.), *The Latest on the Best: Essays on Evolution and Optimality* (pp. 27-52). Cambridge: MIT Press.
- Richerson, P. J., & Boyd, R. (2001). Institutional evolution in the holocene: The rise of complex societies. In W. G. Runciman (Ed.), *The Origin of Human Social Institutions* (Vol. 110, pp. 197-234). Oxford: Oxford University Press.
- Richerson, P. J., & Boyd, R. (2005). *Not By Genes Alone: How Culture Transformed Human Evolution*. Chicago: Chicago University Press.
- Richerson, P. J., & Boyd, R. (2010). The Darwinian theory of human cultural evolution and gene-culture coevolution. In M. A. Bell, D. J. Futuyma, W. F. Eanes & J. S. Levinton (Eds.), *Evolution Since Darwin: The First 150 Years*. Sunderland, MA: Sinauer.
- Richerson, P. J., Boyd, R., & Bettinger, R. (2001). Was agriculture impossible during the Pleistocene but mandatory during the Holocene? A climate change hypothesis. *American Antiquity*, 66(3), 387-411.
- Rostow, W. W. (1960). *The Stages of Economic Growth: A Non-communist Manifesto*. Cambridge: Cambridge University Press.
- Saunders, N. K. (1985). *Prehistoric Art in Europe (2nd edition)*. New Haven, CT: Yale University Press.
- Segal, U. A., Elliott, D., & Mayadas, N. S. (2010). *Immigration worldwide: policies, practices, and trends*. Oxford: Oxford University Press.
- Shea, J. J. (2008). The Middle Stone Age archaeology of the Lower Omo Valley Kibish Formation: Excavations, lithic assemblages, and inferred patterns of early Homo sapiens behavior. *Journal of Human Evolution*, 55(3), 448-485.
- Slingerland, E. (2008). *What Science Offers the Humanities: Integrating Body and Mind*. New York: Cambridge University Press.
- Thomas, K. (1971). *Religion and the Decline of Magic*. Oxford: Weidenfeld & Nicholson.
- Tomasello, M. (1999). *The Cultural Origins of Human Cognition*. Cambridge MA: Harvard University Press.
- Tooby, J., & Cosmides, L. (1992). The psychological foundations of culture. In J. Barkow, L. Cosmides & J. Tooby (Eds.), *The Adapted Mind: Evolutionary Psychology and the Generation of Culture* (pp. 19-136). New York: Oxford University Press.
- Turchin, P. (2009). A theory for the formation of large empires. *Journal of Global History*, 4, 191-217.
- Turner, J. C. (1991). *Social Influence*. Milton Keynes: Open University Press.
- Wald, K. D., & Calhoun-Brown, A. (2007). *Religion and Politics in the United States*. Lanham, Maryland: Rowman & Littlefield.
- Wang, F., Lee, J., & Campbell, C. (1995). Marital fertility control among the Qing nobility: Implications for two types of preventive checks. *Population Studies*, 49, 383-400.
- Watkins, S. C. (1990). From Local To National Communities - The Transformation Of Demographic Regimes In Western-Europe, 1870-1960. *Population And Development Review*, 16(2), 241-272.
- Watkins, S. C. (1991). *From Provinces into Nations: Demographic Integration in Western Europe, 1870-1960*. Princeton, NJ: Princeton University Press.
- White, T. D., Asfaw, B., DeGusta, D., Gilbert, H., Richards, G. D., Suwa, G., & Howell, F. C. (2003). Pleistocene Homo sapiens from Middle Awash, Ethiopia. *Nature*, 423, 742-747.
- Whiten, A., Hinde, R. A., Laland, K. N., & Stringer, C. B. (2011). Culture evolves. *Philosophical Transactions of the Royal Society (B)*, 366, 938-948.

- Wilson, B. (1976). Aspects of secularization in the West. *Japanese Journal of Religious Studies*, 3/4, 259-276.
- Witkin, H. A., & Goodenough, D. R. (1981). *Cognitive Styles, Essence and Origins: Field Dependence and Field Independence*. New York: International Universities Press.
- Zelinsky, W. (1971). The hypothesis of the mobility transition. *The Geographical Review*, 61, 219-249.