

Comment on Royal Society Study: People and the planet: the role of global population in sustainable development. Peter J. Richerson and Lesley Newson, March, 2011

Cultural evolutionists model the cultural change of populations, defining “culture” as the body of information which population members have acquired from others by imitation or teaching (including beliefs, customs, rules, norms, values, technology, expertise, etc.) (Boyd & Richerson, 1985; Richerson & Boyd, 2005). All the fundamental issues in the social and behavioural sciences have cultural evolutionary roots. For example, economic growth is essentially cultural evolution, relying as it does on the emergence of new institutions, technological progress and changes in taste and patterns of consumption. I therefore think that cultural evolutionary theory and the growing body of empirical research in the field can make a useful contribution to your study. For example, evolutionary approaches to economics are well advanced (e.g. Bowles, 2003; Greif, 2006). Cultural evolution has been described as one of the fundamental synthetic ideas uniting the social and behavioural sciences (Gintis, 2007).

The contribution cultural evolutionists could make to your discussion is to provide formal models and empirical analyses of cultural change viewed as an evolutionary process. Ever since Darwin first proposed “descent with modification” as an explanation for the origin of species, there has been a growing realization of how powerful this theory is. Darwinian theory is now seen as providing a set of tools for understanding change in all systems in which information is transmitted, not just the changes in the composition of a population’s gene pool in response to natural selection. It isn’t only nature that selects. Humans acquire an immense amount of information from other people by imitation and teaching, creating an inheritance system that has some properties in common with genes as well as many important differences. The ways that individuals “make up their minds” and “change their minds” in the light of experience act as forces in cultural evolution which are analogous to natural selection but again with important differences. We survey a variety of possible beliefs. We choose to adopt some of them and we reject, forget or ignore the rest. Aggregated over many individuals and over time, a culture is reshaped by such decisions. For example, migration is a highly selective process. People leave poor and repressive regions for more prosperous and more tolerant ones, generally assimilating to their host cultures. This leads to the expansion of societies that function better at the expense of ones that function poorly (Boyd and Richerson, 2009). This process is documented in simple societies and the importance of selective streams of migration in contemporary societies can hardly be overestimated.

In modelling the likely direction of cultural change, the present state of the culture must be a factor. The culture of a population is undoubtedly influenced by environmental changes such as the availability of resources and influences from outside such via education and the media. But the models typically used in policy analysis assume that current behaviour is to be explained by current environments. Cultural evolution uses models with an explicit time dimension to capture the fact that extant culture was shaped over some period of time in *past* environments. Cultures are no doubt responding to contemporary environments but it is rash to assume that they are in equilibrium. Cultural evolutionists have a large and growing toolkit of formal models that have only just begun to be turned to applied questions (e.g. Cordes, et al., 2010; Richerson et al., 2006)

To illustrate the evolutionary nature of cultural change, consider the changes experienced by the British population over the last two centuries. Toward the end of the 19<sup>th</sup> Century, more than a century after they had begun to experience economic development, the British population began to adopt “modern” attitudes about family size. This change shocked contemporary commentators who considered the falling birth-rate to be unfortunate, “dysgenic” and probably the result of immoral behaviour (National Birth-Rate Commission, 1916; Webb, 1906). As the 20<sup>th</sup> Century proceeded other “modern” values were progressively adopted by the British population, such as the belief that women should not be disqualified from performing certain work, that divorce could be granted to a woman on the grounds of a man’s adultery, and that those who commit sodomy should not be imprisoned.

My collaborator Lesley Newson and I have sought to understand this suite of cultural changes, often referred to as “modernization”, which include adopting the idea that all humans have rights and many other trends. These tend to have similar patterns in virtually all modernizing populations. We argue that the changes in the structure of societies that are wrought by economic development are an important trigger of this ongoing process of cultural change. Cultural evolutionists have performed a number of studies which suggest that the size and complexity of the cultural information which a population shares is correlated with the size and connectedness of the population (Henrich, 2004; Kline & Boyd, 2010; Powell, Shennan, & Thomas, 2009). We have presented evidence that changes in the size and composition of social networks that occur with economic development partly explain why members of the population begin to abandon “traditional” values and adopt “modern” ones (Newson & Richerson, 2009), first changing their minds about family size and modifying their views on gender roles, marriage and other aspects of behaviour affecting reproduction.

In developing their public statements encouraging the adoption of modern ideas about equality, freedom of religion and the like, Western policy-makers ignore the fact that it took a century or two for their own cultures to evolve the values that they take for granted today. It is therefore unrealistic and perhaps counterproductive to expect the populations of developing countries to rapidly abandon a set of cultural norms which are similar to those of 17<sup>th</sup> and 18<sup>th</sup> century Britain and embrace those of contemporary Westerners. Perhaps the best that practical policy can hope to do is to encourage somewhat faster change than would otherwise be the case.

The issue of the rate of cultural evolution is also important to understanding adaptation to current environmental problems. Policy scientists often argue that adaptation will be a key element of our response to global warming and other anthropogenic environmental changes, yet we have only a rudimentary understanding of adaptive cultural change and how quickly it might happen. History and archaeology do teach us that major cultural evolutionary phenomena often unfold over several centuries. Thus, the normal course of cultural evolution may be too slow to readily adapt to major environmental change on the scale of a century or less. Understanding what controls and possibly limits rates of cultural evolution is an urgent applied question.

Cultural evolution is a phenomenon that is not, in general, under control. Exercises like the Intergovernmental Panel on Climate Change are based on the idea that policy, and subsequently behavioural change, can be driven by rational analysis. Such efforts are relatively feeble in the face

of cultural inertia, the public's desire to maintain their accustomed behaviour and carry on with their plans. The ongoing collapse of fisheries is a similar example.

Culture does change. The explosive growth of human populations, the sudden and rapid decline in fertility and the current explosive growth of income per capita and consumption are examples of rapid cultural change. In unpublished modelling work, Charles Efferson and I have constructed a system of three differential equations representing human demography, the state of an agro-ecosystem that the human population depends upon, and the state of technology that can be used to expand the productivity of the agro-ecosystem. Our objective is to develop models akin to economic growth models but that incorporate realistic representations of human demography and the state of the environment. This simple system behaves quite like the human population and economy actually has over the last 10 millennia. Population, technology and productivity can grow very slowly over many millennia and then explode very rapidly toward infinity. We have plans to model factors, such as the exhaustion of non-renewable resources and transition paths to sustainability, that will prevent growth to infinity. In the case of a hunted resource, humans are able to develop technology to capture prey species more efficiently but with no possibility of using it to increase prey numbers. This tends to make humans technological "super-predators" causing the collapse of the resource. Fossil evidence suggests that this is why large herbivores such as equids and bovids disappeared from the Americas after the arrival of humans. Much the same thing is happening in all too many fisheries. We believe that these models will be useful to guide the thinking of policy analysts and policy makers. Cultural evolution can have powerful feedback processes that seem to be very difficult to control.

Trying to make culture change in desirable ways using social policy has so far proven to be like controlling a flood without knowledge of hydraulics. The issue of the rate and direction of cultural evolution is important to understanding adaptation to current environmental problems. Policy scientists often argue that adaptation will be a key element of our response to global warming and other anthropogenic environmental changes. To achieve this we need a better understanding of adaptive cultural change. History and archaeology teach us that major cultural evolutionary phenomena often unfold over several centuries. Thus, the normal course of cultural evolution is too slow to readily adapt to major environmental change on the scale of a century or less. Understanding what shapes the direction and limits rates of cultural evolution, and what might be done to adaptively shape the direction and rate, are urgent applied questions.

### **Literature cited**

Bowles, S. (2003). *Microeconomics: Behavior, Institutions and Evolution*. Princeton: Princeton University Press.

Boyd, R., & Richerson, P. J. (1985). *Culture and the Evolutionary Process*. Chicago: University of Chicago Press.

Boyd, R., & Richerson, P. J. (2009). Voting with your feet: Payoff biased migration and the evolution of group beneficial behavior. *Journal of Theoretical Biology*, 257, 331-339.

Cordes, C., Richerson, P. J., & Schwesinger, G. (2010). How corporate cultures coevolve with the business environment: The case of firm growth crises and industry evolution. *Journal of Economic Behavior and Organization*, 76, 465-480.

Gintis, H. (2007). A framework for the unification of the behavioral sciences. *Behavior and Brain Sciences*, 30, 1-61.

Henrich, J. (2004). Demography and cultural evolution: Why adaptive cultural processes produced maladaptive losses in Tasmania. *American Antiquity*, 69(2), 197-214.

Kline, M. A., & Boyd, R. (2010). Population size predicts technological complexity in Oceania. *Proceedings of the Royal Society B*, 277, 2559-2564.

National Birth-Rate Commission. (1916). *The Declining Birth-rate: Its causes and effects*. London: Chapman and Hall.

Newson, L., & Richerson, P. J. (2009). Why do people become modern: A Darwinian Mechanism. *Population and Development Review*, 35(1), 117-158.

Powell, A., Shennan, S., & Thomas, M. (2009). Late Pleistocene demography and the appearance of modern human behavior. *Science*, 324, 1298-1301.

Richerson, P. J., & Boyd, R. (2005). *Not By Genes Alone: How Culture Transformed Human Evolution*. Chicago: University of Chicago Press.

Richerson, P. J., Collins, D., & Genet, R. M. (2006). Why managers need an evolutionary theory of organizations. *Strategic Organization*, 4(2), 201-211.

Webb, S. (1906). Physical degeneracy or race suicide? *The Times*.

From: Rumsby, Marie [Marie.Rumsby@royalsociety.org]

Sent: Tuesday, March 01, 2011 1:27 AM

To: Richerson, Peter J

Subject: RE: People and the planet: the role of global population in sustainable development

Dear Professor Richerson

Many thanks for making this submission. This email confirms that your submission will be considered as evidence.

Kind regards

Marie

-----Original Message-----

From: Richerson, Peter J [mailto:pjricherson@ucdavis.edu]  
Sent: 01 March 2011 05:08  
To: Rumsby, Marie  
Cc: Newson, Lesley  
Subject: People and the planet: the role of global population in sustainable development

Dear Ms Rumsby,

I was contacted by Maike Rentel of the UK Science & Innovation team at the British Consulate in San Francisco. He invited me to submit feedback on your request for evidence for your "People and the planet" study.

Attached are a number of documents. The final file, a Word document, "Richerson Roy Soc feedback", is our response to your request for feedback. The rest of the files are copies of some of the papers which we cited.

Thank you very much for inviting me to contribute to this.

Best,

Peter J. Richerson, Distinguished Professor Emeritus Department of  
Environmental Science and Policy University of California Davis Davis CA 95616  
USA 530 400-4061(C) 756-5054(H) Skype pjricherson  
[www.des.ucdavis.edu/faculty/richerson/richerson.htm](http://www.des.ucdavis.edu/faculty/richerson/richerson.htm)