

UC Riverside

Cliodynamics

Title

Institutional Rigidity and Evolutionary Theory: Trapped on a Local Maximum

Permalink

<https://escholarship.org/uc/item/43w3q5kp>

Journal

Cliodynamics, 2(2)

Authors

Lustick, Ian S
Nettle, Daniel
Wilson, David Sloan
et al.

Publication Date

2011

DOI

10.21237/C7clio2211722

Copyright Information

Copyright 2011 by the author(s). All rights reserved unless otherwise indicated. Contact the author(s) for any necessary permissions. Learn more at <https://escholarship.org/terms>

Peer reviewed

SOCIAL EVOLUTION FORUM

Institutional Rigidity and Evolutionary Theory: Trapped on a Local Maximum

Ian S. Lustick

University of Pennsylvania

A prime focus for social scientists, and in particular political scientists, is on institutions. Institutions are stabilized sets of expectations that establish frameworks for social action that affect behavior because they affect calculations and inspire attachments. Institutions do change, but they change slower than life changes. This creates a paradoxical reality. On the one hand, the relative stability of institutions—the rules and procedures they establish for interaction and decision—compared to the fluctuations of circumstances and preferences is what makes it possible for human groups to take effective action. On the other hand, their very stability means that the decisions they enable are almost inevitably suboptimal.

Accordingly, although most political scientists are committed to a general view that the interests and beliefs of human beings and human groups are the primary drivers of political behavior and political change, a good deal of attention by ‘institutionalists’ is directed to relishing the ironies or bemoaning the tragedies of rationality ignored and interests contradicted. Indeed you do not need a political scientist to point out numerous examples of institutional forms or collective beliefs or norms that are severely suboptimal for precisely those populations and communities that uphold and honor them. Political scientists, as well as pundits, are well aware of the obstacles sclerotic institutions pose to good policy, progress, and a general sense that our political communities work for us rather than against us. References abound to ‘institutional inertia,’ ‘the stickiness of institutions,’ or the institutionalization of answers to questions that current circumstances no longer pose.

However, if it is well understood that institutions cannot change fluidly with changing needs and changing insights, it is also known that institutions do change, and sometimes they adapt. What is not well understood are the limits to the effectiveness and pace of institutional change and, specifically, why some institutions are exceedingly resistant to change, even when the deficiencies of the practices, policies, and predicaments associated with them

Corresponding author's e-mail: ilustick@sas.upenn.edu

Citation: Ian S. Lustick. 2011. Institutional Rigidity and Evolutionary Theory: Trapped on a Local Maximum (*with comment*). *Cliodynamics* 2: x–xx.

are fully appreciated by influentials as well as ordinary people. In this essay I want to suggest the contribution that evolutionary theory, as a tool in the hands of trained social scientists, can make to finding answers to these questions.

In part because political scientists are so aware of how bad things are compared to what they theoretically could be, they commonly reject evolutionary theory and thinking as inappropriate for application to the worlds they seek to explain. This rejection is usually based on a fundamentally incorrect understanding of evolution as “survival of the fittest”—short-hand for the (incorrect) idea that Darwinian evolution produces the ‘best’ version of what could be out of a ferocious competition among versions that can be. Let us not linger over the reasons for this error. There are many candidates for explanations including past abuses of evolutionary theory by Social Darwinists and some sociobiologists, cultural or psychological fears, and religious commitments. One oft-neglected explanation is perhaps the easy identification of such a Panglossian understanding of evolution with the principle of neoclassical economics that free, unconstrained competition in a market place can yield a Pareto optimal set of prices for guiding the most efficient use of resources possible.

In any case, this notion—that “history is efficient”—is certainly *not* an implication of evolutionary theory, not in the natural world and not in the social world either. Indeed it is the very effectiveness of evolutionary theory in accounting for suboptimality that offers political scientists and social scientists more generally, an approach to explaining the prevalence, not only of institutional suboptimality, but to the combination of adaptation and extreme resistance to change that institutions display.

A common trope among historically minded political scientists is that severely suboptimal outcomes are the product of the inheritance from the past of an institutional form or policy implemented to serve a particular purpose under particular circumstances.¹ The simplest form of this explanation is that the outcome is fully explained by ‘path dependence’ and ‘inertia;’ that is to say by the contingency of what happened in the past and by the difficulty of changing the status quo, even if the status quo no longer reflects the purposes or circumstances that resulted in the contingent outcome that was deposited in the present by the past.

Of course many political scientists offer very nuanced and learned ‘process-tracings’ of these outcomes and the ironies and tragedies associated with them.

¹ For a detailed assessment of ‘historical institutionalism’ from the standpoint of evolutionary theory, see Ian S. Lustick, ‘Taking Evolution Seriously: Historical Institutionalism and Evolutionary Theory,’ *Polity* (2011) pp. 1-31. http://www.polisci.upenn.edu/faculty/faculty-articles&papers/Lustick_Polity_2011.pdf

But for more systematic and generalizable explanation for the regularity of this type of outcome, we can profitably turn to evolutionary theory. To appreciate how, we must understand the standard concept in evolutionary theory of a ‘fitness landscape.’

From an evolutionary point of view, the particular history of a polity or society is one path through the ‘state-space’ of possible ways that society could have changed over time, from one combination of characteristics to another. Since each of these distinctive combinations of characteristics is a separate point, or ‘state’ in the space of possible states, the trajectory of the society over time is a path through the state space achieved by movement from one state to another ‘accessible’ to it. The idea of ‘accessibility’ here reflects whatever laws are governing the behavior of relevant entities so that once relevant elements are configured in a particular way, a subset of possible successor states exists that includes the state that actually materializes. As a social or political institution or practice changes over time, slowly or rapidly, it can be imagined to be exploring a particular, and, in all likelihood, relatively small, portion of the state space it inhabits. Evolutionary mechanisms are ways of explaining patterns of movement through the state space that do not rely on calculated strategic choices at the level of the entity moving through the space. Instead, these mechanisms rely on the outcome of competition for replicative success among large populations of variants at levels of analysis below the ontological level of the entity moving through the state space. Another way of saying this, indicating the links between evolutionary and complexity theories, is that the path through the state space is an emergent property of unguided evolutionary processes at a lower level of analysis.

Thus, in evolutionary biology, the unit of selection reflects a particular level of analysis. The effects of evolution are traced on levels higher than that of the unit of selection. Sometimes the unit of selection is the codon, sometimes the gene, sometimes the trait which might be expressed by a combination of genes; sometimes a species and sometimes varieties within a species. Whenever evolutionary, or at least natural selection, questions are asked at one of these levels, we identify variation, a selection criteria arising from circumstances/competition, and retention ability across generations of replication. The result of processes of variation, selection, and retention at any particular level is a pattern of outcomes at a higher (emergent) level. For example, giant tortoises in the Galapagos Islands vary, island by island, by the shape of their shells near their necks and by the length of their necks. This pattern of differences at the level of tortoise anatomy resulted from competition, at a lower level of analysis, among different rates of reproductive success for individuals on different islands with traits (slightly longer necks and slightly notched shells) that marginally advantaged the individuals possessing those traits wherever food was relatively higher. The result was that

the state space for the configuration of neck and shell on giant tortoises was explored along different routes on different islands.

A 'fitness landscape' is a heuristic device for analyzing the opportunities and challenges of changing for the 'better' (by whatever metric is imagined as selecting or pressuring behavior). For a simple example, picture a three dimensional grid comprised of columns rising from a checkerboard along the Y (vertical) axis (Figure 1). The squares on the checkerboard represent all the different ways the entity could behave or be constituted so as to combine every available value on the X (horizontal) axis (Attribute 1, e.g. neck length) with everyone on the Z (depth) axis (Attribute 2, e.g. shell shape). In other words, the checkerboard is the space of possible states the entity can 'be.' Since evolution seeks explanations for patterns of change in response to circumstances without endowing the units of selection with the capacity to look far ahead for their success, the only states that can be achieved by an institution, policy, or practice are those adjacent to it. The columns rising from the squares on the grid register their relative 'fitness' by their different heights. *If* change is incremental and myopically driven toward whichever adjacent (i.e. only very marginally different) column is higher, then 'hill-climbing' will be normal. The trajectory of an entity through the state space will be upward.

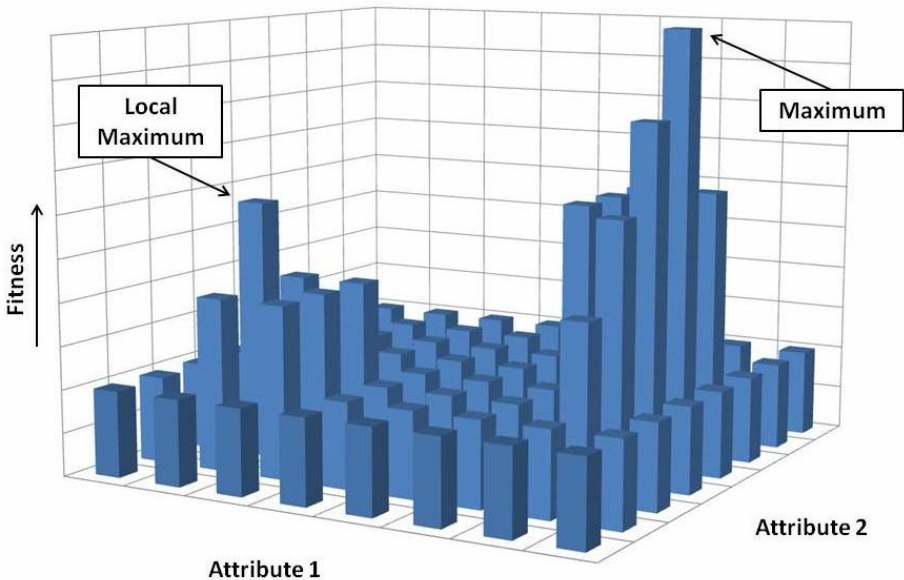


Figure 1. A fitness landscape.

However, and this is one key to understanding why history is ‘inefficient’ from an evolutionary point of view, ravines and chasms may exist in the landscape, or may come into existence as changes in circumstances degrade the effectiveness of strategies (ways of being; traits; call them what you will) that worked in the past while enhancing strategies that performed (or would have performed) poorly in the past. In such a rugged landscape, many better ways of being are not ‘accessible’ without going ‘downhill,’ or becoming less ‘fit’ in the process of becoming more fit. But *if* the processes producing change are truly myopic, or only responsive to direct local stimuli and information, then they themselves, i.e. evolution, per se, will never produce downhill trajectories. Absent non-evolutionary, or at least non-natural selection processes of change, a stabilized set of practices (i.e. an institution) can evolve to, or become stuck on, one of many suboptimal ‘local maxima’ that may exist in the state space.

In our checkerboard illustration, this occurs if an entity is not the highest peak, but is surrounded by columns that are lower than the column it occupies. Without look-ahead powers that evolution does not, per se, assume, that entity will not be able to improve its ‘fitness’ by relocating to a higher, but distant and therefore non-accessible location. To do so would require some extraordinary event that exogenously relocates the entity to a position from which it could hill-climb to the highest peak available in the state space. This is of course not impossible, but it would run against the grain of normal interactions. In any event, the predicament outlined here proves the point that history’s inefficiencies can be modeled evolutionarily with no contradiction whatsoever to the fundamentals of evolutionary theory, i.e. to the claim that unguided change in the deployment or appearance of strategies drawn from a repertoire of those available arises from the immediate successes and failures that determine rates of replication of alternatives. In the world of institutions this means that memos identifying pathologies and offering plans for institutional change that entail high short-term costs in favor of long-term gains will tend to be out-replicated, and effectively suppressed, by memos warning of immediate pain, discounting the future heavily, and distorting the benefits of staying the course.

Let us look more closely at how these ideas could be used to do some work in the political world. We can do this by recognizing that political institutions, political practices, or the campaign strategies of politicians are entities that can be moved through state spaces. The trajectories can be understood as the product of evolution to the extent that they result from competition at lower levels among varieties of organizational forms, rhetorical appeals, political positioning, slogans, and formulas—these are the equivalent of the genes, codons, traits, or varieties that compete to drive the trajectory of evolution in biological contexts, depending on the level of analysis of the entity whose position in the state space is under examination.

Students of the political economy of advanced industrial societies are familiar with the ‘Japanese model.’ This refers to the distinctive and enormously successful combination of institutional forms and attendant policies that produced the stupendous success of the Japanese economy in the 1980s. We need not go into detail here, but the Japanese economic miracle is widely understood to have been due to effective planning and implementation by a developmentalist state intent on harnessing its resources for efficient production and prevailing against international competitors.² Key ingredients in the ‘Japanese model,’ imitated to one extent or another by a number of East Asian and Southeast Asian countries in the 1970s and 1980s, included a deferential political culture; well-trained, well-coordinated, and political protected bureaucracy; a dense patron-client network with massive corporations working closely with banks and the national bureaucratic apparatus toward goals of growth of the economy; job security for the middle class; a disciplined working class; massive subsidies for agriculture; and the effective exclusion of women from the upper levels of the work force. Trusting in the wisdom of the state, and willingly following its directives, Japanese firms fully cooperated in tax, trade, and monetary policies to override market forces and endow Japan with tremendous competitive advantages in the global market place. Between 1960 and 1980 annual per capita growth grew at a rate nearly two and a half times that of the United States.

But in the early 1990s the real estate market tanked. Banks incurred immense losses on their books in order to prevent large firms from failing. This was imperative based on the corporatist organization of the economy and the concomitant absence of a welfare state to cushion unemployment. The political system churned away, producing government after government, but no reforms that could help Japan confront the huge challenges from its own ageing work force and from increasingly severe global competition. In her closely argued and extensively researched study of what happened to the Japanese economic miracle, Jennifer Amyx identifies the gradual crystallization of the Japanese model, but asks why it seemed incapable of grappling with the challenges posed in the late 1980s and early 1990s. Amyx credits Japan with a gradualist, evolutionary path to the economic model to which it owed its immense success, but then notes the sudden reversal of Japanese economic fortunes and the seeming inability of Japan to adjust in a timely manner to patently new circumstances. The result was a national debt more than twice as large as the OECD average by 2008 and an economy, once the envy of the world, now entering its third decade of stagnation. In her 2004 study, Amyx focuses her questions on the crucial finance sector of the

² Chalmers Johnson (1982). *MITI and the Japanese Miracle*. Stanford University Press; Alice Amsden (1989). *Asia's Next Giant: South Korea and Late Industrialization*, Oxford University Press.

Japanese economy, noting the difficulty existing theoretical approaches to institutional adaptation had in explaining Japan's predicament.

Existing theories cannot explain the length of delayed government response to banking problems, the magnitude of breakdown seen in Japanese finance, or why Japanese authorities are unable to restore the financial sector to health even thirteen years after the onset of the crisis.³

As Amyx makes clear, the problem was not that Japanese experts did not, and do not, understand the problem or were/are not committed to change or reversing Japan's economic performance. The problem is that the kind of reformation required threatened and has threatened even more pain for the Japanese people and for the government, in the short run, than would be experienced (in the short run) by continued stagnation. Evolution toward optimal policies arising from the kind of gradualism that has characterized Japanese institutional adaptation in the past has not occurred, and will not occur. In essence, Japan has been stuck on the 'local maximum' it had achieved in the 1980s in a fitness landscape that changed to reduce the relative fitness of its historically evolved strategy, but whose ruggedness has prevented normal processes of institutional adaptation to replace the 'less fit' strategy with a 'more fit,' but not immediately accessible alternative. While it is likely, if not certain, that Japan will eventually change its policies, when and how that happens will likely have little to do with myopic, evolutionary processes of natural selection per se, but will depend heavily on shifts in circumstances that remove ruggedness from the fitness landscape, on far-sighted leadership prepared to whether high political costs, and/or the *force majeure* associated with devastating shocks.

As noted, the problem of institutional rigidity is well-known and pervasive, and it would be wrong to characterize all instances as the result of being stranded on a local maximum. Determined, albeit mistaken, policies of powerful elites; the effects of vested and well-positioned interests or veto-players; the existence of determinative but latent or obscured functions; or the suppression of ideas about how change might be achieved are examples of alternative explanation for the failure of institutions to adapt. Nonetheless, as suggested above, the effects of being stranded on a local maximum is a powerful explanation and valuable tool for thinking about the predicaments faced by political systems and how they might be escaped.

In the 1950s it was clear to most Frenchmen that the Fourth Republic was a severely dysfunctional institution, but it was governed by parties and leaders that had evolved to perform well within its institutions and no matter how many opportunities they were given to adapt the regime to the requirements of the political system, they could not. It was the genius of de Gaulle to realize

³ Jennifer Amyx (2004). *Japan's Financial Crisis: Institutional Rigidity and Reluctant Change* (Princeton University Press,) pp. 17-18.

this, to withdraw from ‘*le systeme*,’ and then use the regime-threatening problem of Algeria to replace it wholesale with the Fifth Republic. There was no gradual, evolutionary path from the Fourth to the Fifth Republic, but there was a revolutionary path. It is widely understood, in Israel and outside the country, that the country desperately needs a peace agreement with the Palestinians. But it is just as well understood that Israeli political institutions, however effective they are at maintaining democracy and producing opportunities for political office and patronage to those in power, have insured that every Israeli government has been coalition-based and reliant on small religious and highly ideological right-wing groups that prevent any realistic peace plan from being put forward. Gaullist solutions in Israel have been attempted—by Rabin and, to an extent, by Sharon—but so far Israeli elites have failed to weather the storm of political opposition associated with efforts to ‘deinstitutionalize’ deeply embedded arrangements.⁴ In the United States, the Madisonian system described in Federalist 10, that prevents tyranny by dividing and balancing power among states, Houses of Congress, and branches of the Federal government, has also institutionalized a kind of gridlock in so many domains that the confidence of the American people in its government is falling to record lows. Just as Washington may well be understood as stuck on a local maximum—fit enough to allow incumbents to be re-elected, but not fit enough to solve the problems posed to it in the twenty-first century *while* enabling re-election—so may we understand the predicament of the Republican Party in this election cycle. As has been widely observed, any candidate wishing to win the Republican nomination may be forced to position himself or herself in such a way as to attract Tea Party support; thereby greatly complicating if not rendering impossible the rapid adaptation that will be necessary to achieve a position on the rugged ‘electability’ fitness landscape near the position that wins by attracting independents and conservative Democrats.

Identifying a syndrome in politics with an evolutionary dynamic does not itself solve any problems. On the other hand, our understanding of evolution in fields as far removed from one another as psychology, botany, agronomy, pest control, pharmaceutical research, and cancer treatment, has helped enormously to explore state spaces for solutions and improvements that were not imagined beforehand. By understanding key predicaments in political life with the same conceptual, theoretical, and analytic equipment used to solve problems in evolutionary theory, we can begin to see the quandaries we face more clearly and imagine more systematically possible opportunities to escape or overcome them.

⁴ Ian S. Lustick (1993). *Unsettled States, Disputed Lands: Britain and Ireland, France and Algeria, Israel and the West Bank/Gaza* (Cornell University Press)

Commentaries

Daniel Nettle: *The Individual and the Greater Good*

University of Newcastle

e-mail: daniel.nettle@newcastle.ac.uk

Many of us biologically-minded folk have been appealing for years for social scientists to take evolution seriously (Nettle 2009). Thus, it is very gratifying to read Lustick's thoughtful analysis of how institutional political scientists could employ evolutionary concepts. There are good and bad ways of bringing evolution into social science (and you can find plenty of examples of both in recent literature). Bad ways have two characteristics: the evolution they appeal to is a highly simplified and sometimes wrongly characterized version of the nuanced edifice of evolutionary biology; and in their enthusiasm to embrace their Darwinian idea, they are less rigorous than they could be in the deployment of methods and knowledge base of the social science discipline which they purport to be expanding. The good ways, happily, are represented by Lustick's work: it grows from a deep grounding in political science itself, and employs a sophisticated evolutionary metaphor in which both adaptation and history are important.

Lustick's essay is based on the idea of institutional forms as replicating themselves through time, giving rise to a process of institutional descent with modification which happens more slowly than the change in the environment of people's lives. Although institutional adaptation does occur, the fitness landscape has a complex shape, such that institutions can become trapped on local maxima. This analysis potentially has a lot to recommend it. However, I was surprised he did not invoke another important principle in evolutionary thinking, namely conflicts of interest between the individual and the collective as a source of suboptimality in design. The idea of the social dilemma—the tragedy of the commons—is already much discussed in political science, and indeed evolutionary biology got much of its thinking in this arena from social scientists (e.g. Ostrom 1990).

In evolutionary genetics, for example, there are many aspects of genomes which perpetuate themselves despite having no functionality for the organism as a whole (Burt and Trivers 2006). Transposable genetic elements make many copies of themselves despite not serving any function at the organismal level. Segregation distorters bias meiosis in their favour, and can spread despite being costly to the health of the animal carrying them. The replicatory interests of the segregation-distorting allele and the rest of the genome of the organism carrying it are partly, but not perfectly, aligned. The consequence is that things which are inefficient at the organismal level often persist.

How might we apply these ideas at the institutional level? The long-term efficiency of government might, hypothetically, be served by reducing the size of the political class. However, any individual leader introducing this reform reduces the size of his alliance base, and consequently risks personal loss of power. All politicians might agree that this is the reform needed, but it is not good for the career of any of them. Thus, it is a very hard reform to introduce. The same is true by definition of any policy which makes governments unpopular over the timescale of the electoral cycle, even if it would be good for society in the very long term. These social traps essentially arise because the interests of society and of individuals, whether politicians or not, are partly but not perfectly aligned.

Something I found interesting in Lustick's analysis is the potential role of rare massive upheaval in overcoming these traps. If society occasionally becomes completely destabilized, then no individual has any possibility of doing well personally by continuing with the status quo, then an adaptive radiation of new and better institutional forms is possible. I can only hope that, in this era of financial crisis and looming environmental problems, our political masters understand this.

References

- Burt, A. and R. Trivers (2006). *Genes in Conflict: The Biology of Selfish Genetic Elements*. Cambridge, MA: Belknap Press.
- Nettle, D. (2009). Beyond nature versus culture: Cultural variation as an evolved characteristic. *Journal of the Royal Anthropological Institute* 15: 223-40.
- Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.

David Sloan Wilson

Evolution Institute and Binghamton University

e-mail: dwilson@binghamton.edu

Thanks to Ian Lustick for his stimulating essay. He correctly notes that stasis and change are two sides of the same evolutionary coin, for biological evolution no less than the cultural evolution of human political institutions. Sewall Wright, one of the fathers of population genetics theory, was the first to appreciate that when phenotypic traits have a complex genetic basis, natural selection can result in multiple stable local equilibria (the 'peaks' of a multi-peak landscape), which are internally stable by definition but can differ in their absolute fitness (the 'altitude' of each peak). His shifting balance theory was a complex scenario involving selection among populations occupying different adaptive peaks (Provine 1986). He originally developed the theory for

individual traits with a complex genetic basis (such as coat color in guinea pigs), but it applies equally to social adaptations with a complex basis, where it is called 'equilibrium selection' (Binmore and Samuelson 1997, Boyd and Richerson 1992, Samuelson 1997)

Applying these and other evolutionary ideas to stasis and change in political institutions is even more complex than Lustick suggests. I would like to introduce three additional factors and conclude with a reflection on how to manage the study of highly complex systems in both biology and the human-related sciences.

1. Multilevel selection theory needs to be distinguished from evolution on multi-peaked landscapes. The classic group selection model posits two traits, selfish and altruistic, in a multi-group population. The altruistic trait is selectively disadvantageous in all groups containing both types; there is no local equilibrium favoring altruism. Nevertheless, altruism can evolve in the total population if the differential fitness of groups containing the most altruists outweighs the selective disadvantage of altruism within groups. A political institution can be dysfunctional, not because it is trapped on a small peak, but because individuals or subgroups are maximizing their relative advantage within the institution, at the expense of the institution as a whole and even their own long-term welfare (Wilson 2004).
2. The term 'evolutionary mismatch' refers to adaptations to one environment that become dysfunctional in a changed environment. Our adaptations for evaluating and copying behaviors evolved in the context of small-scale social interactions and can easily malfunction in the context of large-scale political institutions, resulting in the paradox of practices that work but don't spread and spread but don't work. This class of institutional dysfunction needs to be distinguished from both multiple adaptive peaks and multilevel selection (Wilson et al. 2011)
3. Rational thought and intentional planning might seem to be furthest removed from evolution, especially with respect to escaping local maxima. However, these are better regarded as evolutionary processes in which both variation (efforts to imagine alternatives) and selection (explicitly stated goals) are highly organized. Moreover, our genetically evolved reasoning abilities might be better adapted to winning arguments than solving collective action problems (Mercier and Hugo 2011), accounting for some of our reasoning inabilities in addition to our abilities.

This degree of complexity might seem daunting, but it is not evolutionary theory that makes the topic complex. It is inherent in the subject matter and must be faced by anyone who studies political institutions from any perspective. The question is whether an explicitly evolutionary perspective

adds value to other perspectives. Along with Lustick, I think that the answer is emphatically ‘yes’—for the cultural evolution of political institutions on rugged adapted landscapes and the additional factors that I have briefly identified in this commentary.

A manuscript titled *Evolution as a General Theoretical Framework for Economics and Public Policy* (Wilson and Gowdy 2011) makes some of these points at greater length and is equally relevant to the field of political science.

References

- Binmore, K., & Samuelson, L. 1997. Muddling through: Noisy equilibrium selection. *Journal of Economic Theory*, 74, 235-265.
- Boyd, R., & Richerson, P. J. 1992. Punishment allows the evolution of cooperation (or anything else) in sizable groups. *Ethology and Sociobiology*, 13, 171-195.
- Mercier, H., & Sperber, D. 2011. Why do humans reason? Arguments for an argumentative theory. *Behavioral and Brain Sciences*, 34, 57-111.
- Provine, W. B. 1986. *Sewall Wright and Evolutionary Biology*. Chicago: University of Chicago Press.
- Samuelson, L. 1997. *Evolutionary games and equilibrium selection*. Cambridge, MA: MIT Press.
- Wilson, D. S. 2004. The New Fable of the Bees. In K. R. (Ed.), *Advances in Austrian Economics* (Vol. 9, pp. 201-220). Greenwich CN: JAI Press.
- Wilson, D. S., & Gowdy, J. 2011. *Evolution as a General Theoretical Framework for Economics and Public Policy*. First article of special issue planned for the *Journal of Economic Behavior and Organization*.
- Wilson, D. S., Hayes, S. C., Biglan, A., & Embry, D. 2011. *Evolving the Future: Toward a Science of Intentional Change*. *Behavioral and Brain Sciences*, submitted.

Hanna Kokko: *Evolution Predicts Suboptimality, but not Only Because of Getting Stuck on Local Peaks*

Australian National University

e-mail: hanna.kokko@anu.edu.au

That institutions can become trapped on local maxima (with respect to some measure of performance) does not come as a surprise to any evolutionary biologist. I am probably not alone in my field when welcoming a move towards interdisciplinary understanding of complex systems, political and social science included. In addition to ‘food for thought’ provided by essays such as that by I. S. Lustick, researchers working in this area would also greatly benefit

from moving towards quantitative rigour in this area (e.g. Turchin 2006), a step that biologists took long ago (for a historical review see Kingsland 1995).

There is one aspect in Lustick's otherwise thought-provoking essay that warrants comment: it remains silent on the fact that even if an evolutionary process found itself on a slope towards highest peak, subsequently reaching it, the solution thus found can be maladaptive compared with a hypothetically reachable peak that could be found if entities forming the group (e.g. individuals in a society) forgot about their selfish short-term interests and pulled together to reach a common goal. This problem is one of the levels of selection, and it provides a clear counterexample for those who believe in invisible hands that create the best possible society simply by letting competition run free.

Lustick mentions that the unit of selection can be a codon, or a gene, or perhaps an entire species. Biologists agree, but only when the statement comes with a reminder that processes acting on the lower end of this spectrum often override selection on the higher units. This is why reaching outcomes that are good for the group is difficult, except—arguably—in the special case of multicellular individuals, where specialized adaptations exist to make sure that individual cell lineages do not take over and start proliferating at the expense of how well the entire organism functions and survives.

After all, it'd be terrible if some cells in your liver, or brain, started dividing haphazardly, without the law and order that states they have to serve the greater good of the multicellular society (i.e. you). Unimaginable? In fact, I have just described cancer, which quite commonly causes death in senescing animals (though not in plants, which do not have animal-like circulatory systems that would allow rogue cells to spread around the entire body). Despite cancer-killing cells and other similar adaptations shown by tightly regulated multicellular creatures like you and me, the system may, to its detriment, sometimes fail to extinguish the selfish, short-term interests of individual cells (Lewis et al. 2008). Here, it is irrelevant that cells do not really have aspirations in any cognitive sense. Short-term proliferation of cells can be selected for in the simple sense that more cells of the cancerous type is by definition a short-term reproductive improvement in this lineage. Given a short enough timeframe, this remains true despite extinction looming in the near future: cancer often kills, and the death of the organism kills the cancer.

We tend to think of cancer as a medical rather than an evolutionary problem. The beauty of evolutionary theory, however, is that it provides a framework for thinking about the commonalities of problems occurring at every level of selection. Fishermen unable to resist the temptation to overfish this year, despite fish stocks depleting to levels that threatens the entire industry? A virulent pathogen spreading in the local population of schoolchildren, even though this means that soon everyone will be immune, and the virus has nowhere to go? These are all examples of the tragedy of the

commons, which means that evolution often favours short-term success over more prudent behaviour, even if the latter meant better performance as a whole in the fitness landscape (Rankin et al. 2007).

In fact, human institutions could be viewed as adaptations that try to keep some level of order intact at a higher level of selection that is vulnerable to the invasion of short-term interests. Societies fund police forces that have been given the power to punish thieves, for essentially the same reason as our bodies produce cancer-killing cells: to prevent detrimental selfishness from spreading. It is also the same reason why we spend money on negotiations over quotas for dwindling stocks of cod in the sea—or over the right to dump CO₂ in the atmosphere. The struggle between interests of different entities, each of which takes a shorter term view than would be ideal, is the root of much what is problematic in the world. Add to that the types of myopia that Lustick mentions—the inability of an evolutionary process to be farsighted enough to jump to distant peaks — and the power of evolutionary theory to predict suboptimal design should be clear to anyone.

References

- Kingsland, S.E. 1995. *Modeling nature*. The University of Chicago Press, Chicago.
- Lewis, Z., Price, T.A.R. & Wedell, N. 2008. Sperm competition, immunity, selfish genes and cancer. *Cellular and Molecular Sciences* 65:3241-3254.
- Lim, M., Metzler, R. & Bar-Yam, Y. 2007. Global pattern formation and ethnic/cultural violence. *Science* 317:1540-1544.
- Rankin, D.J., Bargum, K. & Kokko, H. 2007. The tragedy of the commons in evolutionary biology. *Trends Ecol. Evol.* 22:643-651.
- Turchin P. 2006. *War and Peace and War: The Life Cycles of Imperial Nations*. Pi Press

Bradley A. Thayer

Baylor University

e-mail: bradley_thayer@baylor.edu

Ian Lustick has produced an important argument by thoughtfully applying evolutionary ideas to a major problem in the study of institutions. Lustick demonstrates how an evolutionary approach may explain why institutions resist change even when their faults and limitations are well understood, while at the same time remain adaptive. To advance his argument, he draws on the central concept of evolutionary theory: natural selection. Evolution through natural selection operates through variation within a population, a selection criterion or criteria arising from competition, and replication.

From this foundation, Lustick artfully creates a ‘fitness landscape’ for illuminating why institutional change is so difficult—in sum, entities are trapped on a local maximum, plans for change entail short term cost for long term gain, and will lose out to those discounting the future. When these ideas are applied to political problems, they can explain major phenomenon like the rigidity of political systems in important and novel ways.

In this brief commentary, I evaluate Lustick’s use of evolutionary ideas and conclude that Lustick’s approach is a model of how evolutionary ideas and theory may be applied to social science.

Lustick’s use of evolutionary ideas is well done. Here I offer two points to place the discussion in greater context. A critical point in the operation of evolution through natural selection is the selection pressure on variation within a population. Selection pressure is broader than Lustick’s treatment, and should be thought of as competition for resources among conspecifics, for example, institutions and states, but also with other species, predators, and changing immediate, seasonal, and long-term ecological conditions (the impact of the international system, if you will). The last point underscores the consideration of time. Benign ecological conditions, for example, abundance of resources or few predators reduce selection pressure and may do so over a considerable period of time. The reverse is likely to accelerate change over a relatively short period. Recognizing the broader scope of selection pressures will only assist the study of institutions.

Second, evolution lacks teleology. With that in mind, it is important to stress a major point: ‘better’ and ‘best’ are relative, and are so for given ecological conditions. As conditions change, what was the ‘best’ for a specific condition may be fatal for the species in new conditions. Better to be ‘good enough’ and adaptable to changing ecological conditions than the ‘best’ and inflexible. Here evolution agrees with Voltaire’s quip that the perfect is the enemy of the good enough. As I read Lustick’s consideration of ‘fitness’ in his presentation of his ‘fitness landscape,’ he is implicitly sensitive to this point, which I would encourage to be drawn out in the future.

Finally, Lustick deserves great credit for advancing the goals of consilient social science, the use of insights from the life sciences to inform, improve, and augment our understanding of major social problems. Sven Steinmo’s (2010) recent examination of political economies of Sweden, Japan, and the United States joins Lustick as another excellent example of the use of a consilient approach to aid our comprehension of institutional change. As other scholars join Lustick and Steinmo in a consilient approach, the knowledge of institutions, and politics and, more broadly, social science may advance.

References

Sven Steinmo. 2010. *The Evolution of Modern States: Sweden, Japan, and the United States* (New York: Cambridge University Press).

Reply

Ian S. Lustick: *Evolution and Social Science: Toward a Real Conversation*

University of Pennsylvania

e-mail: ilustick@sas.upenn.edu

The replies and comments posted in response to my essay on institutional rigidity and evolutionary theory are heartening. This is a promising start to the Social Evolution Forum's effort to encourage fruitful dialogue and mutual learning across a divide that has too long separated the life sciences from the social sciences, in particular in matters related to evolution. It is no coincidence that all the respondents to my essay emphasize what social scientists have to learn from natural scientists. That is, in large measure, the message of my posting. Animated by the wonders, subtleties, and power of evolutionary theory, and aware of the challenges, predicaments, and inadequacies of social science, we each hail and encourage efforts to mobilize substantive evolutionary theory to do work in the worlds of social scientists.

My response here is designed to encourage the conversations that will make this possible by emphasizing that while social scientists must make a serious and sustained effort to become literate in evolutionary theory, so too will evolutionary biologists need to become more sophisticated about social science and its accomplishments. Otherwise social scientists, hearing well-intentioned but naïve suggestions from evolutionists, will take the easy path, turning away from a conversation based on a quick impression that "I already knew that. Nothing new here."

I was delighted that Bradley Thayer cited Sven Steinmo's important book on the political economies of Sweden, the United States, and Japan as a promising example of a prominent social scientist turning toward evolutionary theory. Indeed I was recently a participant in a panel at the annual meeting of the American Political Science Association entirely devoted to that book. The panel featured vigorous discussion of the value of bringing evolutionary thinking into contact with political science and of different strategies for doing so. One of the main points I made in that discussion is that Sven's strategy—to use evolutionary vocabulary, but not theory, to depict the distinctive trajectories of three political economies as idiosyncratic phenotypes—was

insufficiently ambitious. To advance this project we need to mobilize evolutionary propositions and explanations, not just evolutionary vocabularies. Evolution must do work, and be seen to do work, in the social sciences—work that could not be done without it.

As I read the four responses to my posted essay, I am convinced that colleagues in evolutionary biology and related fields feel similarly and are anxious to contribute to that effort in ways that social scientists will be able to appreciate. Thayer emphasizes the absence of teleology in evolution, successful replicators are ‘better’ or ‘best’ only as replicators, not according to some metric of progress toward a destined endpoint or on a scale of values of any sort. Indeed my decision to use ‘stranded on a local maximum’ to analyze a particular problem in political economy was precisely intended to help disabuse social scientists of the misconception—only too prevalent—that evolution cannot explain sub-optimality. The falsity of his idea is obvious, of course, to any evolutionary theorist, but not to many social scientists. In fact, based on the misconception that evolution explains why the ‘fittest’ survive, and knowing full well that optimal outcomes are almost never observed in the social world, social scientists are naturally expect the disutility of evolutionary thinking for their kinds of problems.

David Sloan Wilson’s comment also focuses on the question of explaining sub-optimality, while also noting evolutionary mechanisms to escape from it. Thus his multi-level selection theory can help explain why selection against a trait of value to a population at the individual level could still lead to its successful replication (because of disproportionately successful replication of groups that feature individuals with that trait). David’s comment about rationality as “better adapted to winning arguments than solving collective action problems” also highlights one of the most influential political science theory of sub-optimality, namely the ‘prisoner’s dilemma.’ The combination of rationality and uncertainty under common kinds of incentive structures leads not only to maximum jail terms in the famous game theoretic fable, and various tragedies of the commons. It is also the source for powerful explanations of wars and arms races that are much more destructive or expensive than the interests at stake would warrant, and of the widely observed failure of governments to produce nearly the amount of public goods that would be ‘rational’ for their societies.

Interestingly, the key focus of Daniel Nettle’s comment is also on the variety of ways that evolutionary theory can be mobilized to explain sub-optimal outcomes. The notion, familiar to Nettle from biology, that traits replicating successfully at lower levels can be dysfunctional to the organism, is rightly identified as isomorphic to the tragedy of the commons. It is also, not so incidentally, the basis for the crystallization of the state and the ‘social contract theory’ of the state in the philosophy of Hobbes, Locke, and Rousseau. Few political scientists have thought that the problems they find familiar in their

domain correspond quite closely to patterns observed at various analytic levels in evolutionary biology. But I also suspect that few evolutionary biologists are aware, or are presently equipped to appreciate, the variety of solutions political scientists have come up with to what is familiar to political scientists as the ‘collective action problem’—solutions that help explain why, despite the disincentives for rational actors associated with contributions to group goals, so much of it occurs. My point is that what we need is a conversation across disciplinary boundaries. Not only can social scientists benefit from learning evolutionary theory, but it is highly likely that evolutionary biologists can learn from the social science literatures on sub-optimality—literatures that explain why, under some circumstances, outcomes are not as sub-optimal as one might have expected. Among these solutions, for example, are exploitation of the strong by the weak, cultivation of small groups, centralized enforcement mechanisms, selective benefits, ideology, and indoctrination or programming.

I would make the same point in response to Hanna Kokko’s comment that evolutionary processes often feature sub-optimal outcomes at higher levels because selection processes at lower levels “override” processes of selection “on higher units.” Kokko rightly identifies this pattern as corresponding to a critique of the invisible hand as always likely to produce, as a result of bottom-up processes of competition, Pareto optimal outcomes at the macro level. Of course in both political science and economics there is a vast literature on ‘market failure’ and the perverse incentives that arise depending on how competition is structured by institutions and the rules that comprise them.

In sum, I am grateful and appreciative of these four generous comments and of the prospect for a real and professional dialogue between social scientists and evolutionary biologists. But I would also emphasize that the curiosity that social scientists must cultivate about evolution will need to be matched by the curiosity of natural scientists about the world, perhaps equally mysterious to them, of sophisticated social science. It would be a pity to make Thomas Kuhn’s error—to reject social science as so much unscientific gobbledygook, even while using, or misusing, an underspecified social scientific theory of ‘revolutions’ to analyze the progress and process of science.