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ARTICLES

Classical Liberalism's Evolutionary Foundations Reconsidered

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The economist and Nobelist Friedrich (F. A.) Hayek argues that classical liberal principles of individual liberty, free markets, and spontaneous order are rooted in evolved aspects of human nature. To establish a natural-law proof supporting this argument, Hayek borrowed from Charles Darwin's controversial theory of natural selection occurring at the group level. Some scholars challenge Hayek's reliance upon Darwinian theory, and yet the modern literature in economics, history, biology, paleontology, sociobiology, physical sciences, and nonlinear complex adaptive systems supports the conceptual basis of Hayek's evolutionary approach. It also suggests that the civil and economic strands of classical liberalism and libertarianism represent a distinct phase within an evolutionary progression, although not the telos that Hayek claimed. This article examines Hayek's argument, its criticisms and justifications, and alternative scientific and linguistic theories explaining the adaptive evolution of social and economic systems. The implications of this examination transcend the bounds of Hayek's argument.

> Society works not because we have consciously invented it, but because it is an ancient product of our evolved predispositions. It is literally our nature.
>
> —Matt Ridley (1996, 5)
>
> Wherever there is behavior of significant complexity its most plausible explanation tends to be some explicit process of evolution, not the implicit satisfaction of constraints.
>
> —Stephen Wolfram (2002, 351)

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> In the view of [chemist and Nobelist] Ilia Progogine, the sudden appearance of order out of chaos is the rule rather than the exception. . . . For him, the idea of communication and information is intimately tied up with how random behavior leads to complex coupling of feedback and spontaneous order.
>
> —John Briggs and David Peat (1990, 134)
>
> Thanks to feedback in particular, economies are actually self-organizing systems on the edge of chaos, with all that that implies.
>
> —John Gribbin (2004, 161)
>
> Evolution is chaos with feedback.
>
> —Joseph Ford (quoted in Gleick 1988, 314)

The superiority of classical liberalism's civil and economic principles for promoting prosperity and flourishing via spontaneous order is readily observable, although a positive explanatory proof for this outcome remains elusive. Economist Robert Nelson explains that

> in truth, the market mechanism has never been analytically demonstrated to be the most efficient means of producing and distributing the resources of society, when all costs—including information costs, search costs, costs of wasted resources due to failures, and other trial-and-error costs—are taken into account. Neither, however, has any other economic system ever been shown to be superior to the market. At the level of economic theory, the issue remains almost entirely unresolved. Indeed, it is more obscured than illuminated by most existing economic theory. It is only at the level of practical economic experience that a verdict in favor of the market system seems to stand on firm ground. . . . Contemporary economists can observe this fact and can give many commonsense explanations. But the most highly developed theoretical apparatus thus far produced by the economics profession is almost powerless to explain it. (R. Nelson 1991, 235)

John Stuart Mill addresses this lacuna when writing that "questions of ultimate ends are not amenable to direct proof. Whatever can be proved to be good, must be so by being shown to be a means to something admitted to be good without proof. . . . Considerations may be presented capable of determining the intellect either to give or withhold its assent to the doctrine; and this is equivalent to proof" (Mill 1887, 9–10).

Economic and social systems are inscrutable in large measure because, as this article argues in part, they are *nonlinear* complex adaptive systems in which feedback causes evolution to occur at the edge of chaos. "Chaos," in the technical (rather than colloquial) sense, occurs "when a small change in the starting conditions of a process produces a big change in the outcome of the process" (Gribbin 2004, 255); it is "the irregular, unpredictable behavior in a simple deterministic, clock-work like system" (Gleick 1988, 306). Chaos, in short, is apparent disorder (i.e., entropy). New phenomena emerge spontaneously out of chaos as adaptive economic and social systems coevolve symbiotically (see R. R. Nelson and Winter 1982). Within such systems, "chaotic processes can occur at the level of individuals and small groups, as well as at highly aggregated levels of analysis" (Kiel and Elliott 1997, 9). Economist and Nobelist Herbert Simon was among early social scientists who recognized the significance of nonlinear adaptive systems and so shifted his work away from neoclassical economics and toward information and systems theory.

Another economist and Nobelist, Friedrich (F. A.) Hayek, sought an adaptive, evolutionary foundation to explain classical liberal principles. His argument is based upon both the hallmarks of liberalism's apparent economic success and the authority of Charles Darwin's theories of biological evolution (see especially the epilogue to the third volume of Hayek's *Law, Legislation, and Liberty: The Political Order of a Free People* [1979] and early chapters in *The Fatal Conceit* [1988]). Hayek grounded his argument upon Darwin's views regarding "natural" and "artificial" selection occurring not only at the individual level but also at the group level. Darwin, unlike Hayek and others since, disliked the term "evolution" because he thought it misleadingly implied progress toward teleological goals of nature; that is, toward an end of natural history.

Economist and Nobelist Kenneth Arrow's (1963) "impossibility" theorem prompted modern researchers to acknowledge that "the individual-group connection is not as straightforward as early democratic theorists assumed. The process of reaching a societal agreement between a group of individuals, each with their own preferences and ability to act strategically, is no longer subsumed under a simple additive relation where group interest is merely the sum of individual interests. . . . [Instead,] the process of aggregation from individual to group is in the realm of chaotic dynamics" (Richards 1997, 89).

An evolutionary process therefore is in play. The philosopher of history Oswald Spengler is correct to stress destiny over causality when considering the evolution of Western civilization (Spengler 1926, 26).

Scholars nevertheless have challenged many aspects of Hayek's interpretation and application of Darwinian theory, including his claim that natural selection contains within itself a proof of classical liberalism's "naturalistic" (i.e., causal rather than freely chosen) necessity. Some supporters defend

Hayek's argument as being metaphorical; that is, to be taken seriously but not entirely literally. In any case, Hayek's approach is consistent with the thick and growing literature applying dynamic evolutionary concepts across the breadth of the natural and social sciences. The prominent Santa Fe Institute in particular is devoted to the multidisciplinary study of complex adaptive systems and related emergent phenomena.

Hayek alludes to adaptive-systems theory when explaining that

> the theory of cultural evolution (sometimes also described as psycho-social, super-organic, or exosomatic evolution) and the theory of biological evolution are, although analogous in some important ways, hardly identical. . . . All evolution, cultural as well as biological, is a process of continuous adaptation to unforeseeable events, to contingent circumstances which could not have been forecast. This is another reason why evolutionary theory can never put us in the position of rationally predicting and controlling future evolution. All it can do is to show how complex structures carry within themselves a means of correction that leads to further evolutionary developments which are, however, in accordance with their very nature, themselves unavoidably unpredictable. (F. A. Hayek 1991, 25)

Systems theorist Kenyon De Greene observes along Hayekian lines that

> the concept of evolution is finding increasing application in physics, chemistry, astronomy, and astrophysics, as well as, of course, in biology, geology, and paleontology. But it appears that all too few behavioral and social scientists use the evolutionary framework, and that all too many theories, hypotheses, and empirical research efforts are directed toward the static, the cross-sectional, the linear, the equilibrium seeking, the stable, the reversible, and the structurally constant. [These efforts] operate within a prevailing but exhausted paradigm. (De Greene 1997, 275)

A likely reason why theorizing in the behavioral and social sciences has lagged progress in the natural sciences is that "science itself has become déclassé in many circles. The cultural revolution of the sixties identified science with the repressive and dehumanizing tendencies of modernism. Influenced by this radical humanism, many social scientists rejected quantification with a vengeance and have opted for a hermeneutic method in their research. In the process, they have steadily retreated into the deconstruction of texts, or into the study of postmodern and poststructural *mentalities*" (Harvey and Reed 1997, 295). Hayek's attempt to root classical liberalism in naturalism is an exception to this generalization.

The new scientific paradigm identified by De Greene (and alluded to by Hayek in an earlier quotation)—that is, the paradigmatic "set of interrelated *Weltanschauungen*: theories, models, practices, findings, explanations, values, beliefs, and feelings that characterize a given culture at a given time" (De Greene 1997, 286)—is subsumed by the label "chaos theory." De Greene observes that "the [linear; i.e., $y = \alpha + \beta$] Newtonian paradigm is best fitted to a static or slowly changing world of stability and structural continuity, not one of evolution, instability, and structural change. In contrast, the new paradigm encompasses nonrationality, nonlinearity, mutual causality, nonequilibrium, irreversibility, stochasticity/determinism, uncertainty, opportunity and choice seen in fluctuations and apparent noise" (287).

Political economists L. Douglas Kiel and Euel Elliott observe that

> Chaos theory has now been applied to a wide variety of social phenomena ranging across the subject matter of the traditional social science disciplines of economics . . . and political science. Economists and political scientists have applied chaos theory with considerable methodological rigor and success to the temporal dynamics of a variety of phenomena in their fields. Chaos theory has also been applied to sociology. In this field, however, more than in economics and political science, such efforts have tended toward metaphorical and postmodernist or poststructural uses. (Kiel and Elliott 1997, 3)

Hayek's naturalistic explanation for classical liberal principles nevertheless fails, for two essential reasons, to provide the positive foundation and ultimate proof that he sought for his argument. First, the theory rests upon Darwin's contested claim that evolution occurs at the group level. Second, even granting that Hayek's descriptive theory is valid, it fails to explain why social and political evolution has drifted away from classical liberal principles rather than cementing them in place. Casual observation reveals instead a chaotic evolutionary path from classical liberalism into contrary "conservative" and "progressive" political systems. Classical liberal principles nowadays are invoked only occasionally, often when buried within otherwise empty political rhetoric.

This article centers on Hayek's naturalistic argument, although its conclusions have broader analytical implications. The first section below provides contextual historical perspective. The following section summarizes Hayek's argument with attention to its justifications and criticisms. The next section examines relevant modern thinking regarding Darwinian evolution, the significance of human rationality, and the nature of evolution within nonlinear complex adaptive systems theory. The article concludes in the final section.

Historical Perspective

The conventional wisdom that social, cultural, economic, and political developments follow a linear evolutionary trajectory has a long history. Karl Marx, for example, imagined a linear social transition from feudalism to a workers' paradise. The philosopher and sociologist Auguste Comte (influenced perhaps by Hegel's dialectical historicism) proposes that "all subjects whatsoever pass necessarily through three successive stages: the Theological stage, in which free play is given to spontaneous fictions admitting of no proof; the Metaphysical stage, characterized by the prevalence of personified abstractions or entities; lastly, the Positive stage, based on exact views of the real facts of the case" (Comte 1875–1877, 1:26). In Comte's view, "the laws of Evolution will connect Human Progress as a whole with the constitution of Human Nature in its broad general features" (3:5). Furthermore, "*the unity of the individual* is ever being developed, and a closer connection is established between the two essential properties of religion, by virtue of which it binds men together, and regulates their conduct" (3:8). Comte proposed to "systematize the art of social life" under the banner "Love, Order, Progress," which was to be achieved through "the substitution of the permanent government of Humanity for the provisional government of God" (1:2, 1:5, 1:325). In the fourth volume of his magnum opus, Comte synthesizes a positive religion (anointing himself as its high priest) representing the final evolutionary stage of human development. Belief in this scheme's ultimate success rests upon two wild imaginings: (i) the "charm" of altruism; and (ii) the "sweet" feeling that comes from obeying a wise and trustworthy leader.

F. A. Hayek (1952, 168–206) aptly critiques Comte's radical social vision. Another Austrian school economist, Ludwig von Mises, dismisses Comte's "positive polity" brusquely and somewhat unfairly: "Comte can be exculpated, as he was insane in the full sense which pathology attaches to the term" (Mises 1998, 72–73)—Comte in fact was institutionalized for a time following his wife's death. His "positive polity" vision nevertheless influenced profoundly the twentieth century's radical utilitarian and progressive movements, especially as interpreted by the American social philosopher Herbert Croly (1911; see also Montanye 2020, 50–53). Brazil conspicuously adopted Comte's aphoristic "Order and Progress" phrase as its national motto; few accounts suggest that the country ever achieved either objective.

Physicists John Briggs and David Peat observe that "nature controlled by human thought is the essence of the reductionist [i.e., positivist] dream. Against this trend rises the young science of chaos, wholeness, and change—a new insistence on the interrelationships of things, an awareness of the essential unpredictableness of nature and of the uncertainties in our scientific descriptions" (Briggs and Peat 1990, 201). These authors note that "it was not until the 1960's that [the prominent mathematician Henri] Poincaré's investigations [of iterated equations] were disinterred from old textbooks

and merged with new work on nonlinearity and feedback, entropy, and the inherent disequilibrium of orderly systems. These became the volatile elements of the new science of chaos and change—and have led to some stunning new perspectives into the mirror worlds of nature's wholeness" (28).

This "new science" was enabled both by increased computer memory and speed and by high-resolution graphics that visualized the results of iterated nonlinear computations in ways that made possible deep insights into the intrinsic nature of complex adaptive systems (stunning images are presented in Gleick 1988 and Wolfram 2002). This work yields quantitative proof of large-scale holistic order emerging (evolving) spontaneously from small scale complexity.

In an interconnected world, write Briggs and Peat, "even what appears on the surface as disorder contains a high degree of implicit correlation" (Briggs and Peat 1990, 127). These authors cite (quoting in part) the chemist and Nobelist Ilia Progogine for the proposition that

> the sudden appearance of order out of chaos is the rule rather than the exception. . . . For [Progogine], the idea of communication and information is intimately tied up with how random behavior leads to complex coupling of feedback and spontaneous order. . . . 'Today [writes Progogine], this seems to be a very, very simple thing, a nearly trivial thing. It's a law now that in the non-linear range, far-from-equilibrium gives rise to structure, brings order out of chaos. . . . The idea of simplicity is falling apart. Any direction you go in there's complexity.' (134–35, 138–39, 147)

Theories and proofs underlying these conclusions are daunting, but their essence is easily grasped. Basic patterns of stability, periodicity, and chaos are demonstrated numerically and graphically by Kiel and Elliott (1997, 19–29) using ordinary spreadsheet computational and graphing functions. A nontechnical description and illustration of nonlinear adaptation is presented in this article's penultimate section.

Economist and Nobelist Thomas Schelling employed an aspect of this new science when exploring

> the relation between the behavior characteristics of the individuals who comprise some social aggregate, and the characteristics of the aggregate . . . situations in which people's behavior or people's choices depend on the behavior or the choices or other people, [which] are the ones that usually don't permit any simple summation or extrapolation to the aggregates. To make that connection we usually have to look

> at the system of interaction between individuals and their environment. . . . And sometimes the results are surprising. Sometimes they are not easily guessed. (Schelling 2006, 13–14)

For example, a recent study of social media blogging by Guo et al. concludes that "at the micro level, highly divergent motivations, demographics, and so forth characterize these [computer-mediated communications technology] users. At the macro level, users as a collective community exhibit large-scale, exponential growth in a complex manner that challenges traditional analysis techniques. . . . Blog systems tend to be nonlinear, dynamic, and deterministic, as well as sensitive to initial conditions" (Guo et al. 2009, 102).

Schelling follows an adaptive systems approach when iterating simple behavioral rules in a checkerboard simulation illustrating the evolution of segregation and aggregation patterns in residential housing (Schelling 2006, 147–55). His investigation employs the evolutionary "cellular automata" technique pioneered in the 1950s by mathematician John von Neumann and later popularized in *Scientific American* by researcher John Conway. This technique has evolved to the point where "automata are sufficiently powerful that they can solve [through the iteration of simple rules] any problem that can be solved by a computer" (Miller and Page 2007, 179; see also Wolfram 2002, 1117). Schelling, like Simon and Hayek, was ahead of his time.

Hayek's Evolutionary Paradigm and Its Discontents

A passage from Darwin that inspired Hayek to extrapolate classical liberal principles from the theory of natural selection asserts that "there can be no doubt that a tribe including many members who, from possessing in a high degree the spirit of patriotism, fidelity, obedience, courage, and sympathy, were always ready to aid one another, and to sacrifice themselves for the common good would be victorious over most other tribes; and this would be natural selection [at the group level]" (Darwin 1981, 166).

Darwin's claim is a gentler version of G. W. F Hegel's (1977) influential philosophy regarding the evolution of the human "Spirit" from an inherent consciousness to a true philosophy of science. His philosophy embodies corresponding notions of freedom as well. Hegel argues that the *unified* individual consciousnesses (the "'I' that is 'We' and the 'We' that is 'I'") individuals are willing to die for are more likely to triumph over *individual* self-consciousnesses that are separate. Furthermore, "the individual who has not risked his life may well be recognized as a *person*, but he has not attained the truth of this recognition as an independent self-consciousness. Similarly, just as each stakes his own life, so each must seek the other's death, for it values the other no more than itself . . . [only through this process of mind and spirit can individuals] enjoy perfect freedom and independence" (Hegel 1977, ¶ 177, ¶ 187).

Hayek's explanatory theory for classical liberalism parallels these twined lines of thought: "Learning from experience, among men no less than among animals, is a process not primarily of reasoning but of the observance, spreading, transmission and development of practices which have prevailed because they were successful—often not because they conferred any recognizable benefit on the acting individual but because they increased the chances of survival of the group to which he belonged" (F. A. Hayek 1973, 18).

The ease with which Hayek's critics conclude that he blindly adopted group-selection theory is apparent. Yet his invocation of natural selection metaphors and analogies also foreshadowed modern theories regarding the spontaneous emergence of behaviors within complex adaptive biological, social, and economic systems.

Criticisms of Hayek

As if responding directly to Hayek, libertarian theorist Murray Rothbard imagines that pursuing a naturalistic, scientific foundation for classical liberalism is a feckless pursuit from the standpoint of political economy. According to Rothbard, "libertarianism [as distinct from classical liberalism] is strictly a *political* philosophy and confined to what the use of violence should be in social life" (Rothbard 1998a, 141). It is to be distinguished from Hayek's classical liberal belief that freedom for human spirit, rationality, and inventiveness is the most practical and efficient means for improving mankind's condition. Scientific data might support Hayek's position, but as Rothbard claims, it "cannot establish that political philosophy. Political judgments are necessarily value judgments, political philosophy is therefore necessarily *ethical* and hence a positive ethical system must be set forth to establish the case for individual liberty" (Rothbard 1998b, xlvii).

Hayek's theory itself is vulnerable to criticism as being an unacknowledged work of moral political philosophy rather than an exercise in applied natural science. Criticism of this sort also can be leveled against many seminal works in science and political philosophy. Relatively few respected researchers candidly acknowledge that their methodologies are chosen to "get the desired result" (Rawls 1971, 141), despite such proleptic candor often blunting later criticism.

Science historian Naomi Beck devotes a book-length critique to Hayek's Darwinian approach, beginning with his argument that individual liberty and free markets evolved as an evolutionary telos, arising as if by an invisible hand called group selection and vaguely implying an intelligent theistic design. Beck argues that Hayek

> was interested in the conditions under which the free market would yield desirable results, and turned to evolutionary theory in an effort to show how beneficial rules and institutions can

> arise via a process of natural selection. His theory of cultural and economic evolution can thus be understood as the final point of a long trajectory. It constituted, to Hayek, his most substantial contribution to the attack on socialism. . . . This bias in favor of capitalism led Hayek to reformulate the problem. His was not an attempt to explain an observed phenomenon—prosocial behavior—but to justify a political view. (Beck 2018, 9–10, 91)

Beck highlights other quirks among Hayek's voluminous writings, which she claims are consequences of his ignoring "contradictions and historical counterevidence that did not fit [his] narrative" (21). She notes, for example, that Hayek "employed a double standard with regard to the evolution of classical liberalism and socialism. He defended the former on the grounds that it grew spontaneously, but refused to recognize the latter as an authentic part of cultural development. . . . If his aim was to debunk socialism with the help of evolutionary arguments, he failed" (9). Drawing upon a critique by the economist Viktor Vanberg, Beck also notes that "Hayek's argument assumes a tacit and unexplained shift from the notion that behavioral regularities emerge and prevail because they benefit the individual, to the quite different notion that rules come to be observed because they benefit the group" (100). Darwin's theory of group selection similarly implies that individuals by nature are privately selfish yet publicly altruistic. Beck does not explore in depth other weaknesses of Darwin's group-selection claim.

Hayek can be faulted on other grounds as well. He fails, for example, to address the evolutionary emergence of entitlement-seeking social factions. Darwin, by contrast, recognizes that his group-selection theory can produce undesirable outcomes as well as felicific ones. For example, in a July 26, 1872, letter to Heinrich Fick, Darwin expresses concern that the British labor movement could adversely affect mankind's evolutionary development: "I fear that Cooperative Societies, which many look at as the main hope for the future, likewise exclude competition. This seems to me a great evil for the future progress of mankind" (Weikart 1995, 611). Science historian Richard Weikart writes that this passage "is the strongest piece of evidence of which I am aware that Darwin himself believed that his biological theory lent support to individualist economic competition and laissez-faire economics" (609).

Darwin's concern here parallels French social observer Alexis de Tocqueville's earlier speculation regarding America's unique social associations: "Instead of imagining that the citizens of new societies are going to end up living in common, I am afraid indeed that they will finally end up by forming nothing more than very small cliques" (Tocqueville 2010, 4, 1069). When facing a contemporary instance of group solidarities based upon ascriptive

characteristics, Darwin similarly envisions cooperative actions (i.e., competition for property rights in scarce economic resources) being detrimental at both social and biological levels.

Among humans, evolutionary change along this line is political and cultural rather than biological. Political scientist William Voegeli dismisses the survival aspect of cooperative redistributive schemes on grounds that "there are no clear . . . [examples of] groups that have acquired significant, durable social and economic advantages by feeling sorry for themselves, or by inducing [through shaming] other, more powerful groups to feel sorry for and guilty about them. What such groups secure, instead, is the 'advantage' of being dependent on the kindness of strangers, an advantage that debilitates individuals struggling to build lives and communities on sturdier foundations" (Voegeli 2014, 117; see also Mac Donald 2024 and Montanye 2016).

Hayek downplays Darwin's "survival of the fittest" conception of evolution (Darwin appropriated this familiar phrase from the social thinker Herbert Spencer), advancing instead a social-cooperation perspective. Hayek argues, for example, that the state has an affirmative duty to ensure the provision of basic necessities, including "a minimum of food, shelter, and clothing, sufficient to preserve health and the capacity to work" (F. A. Hayek 1944, 133). He subsequently asserts that "the amount of relief now given in a comparatively wealthy society should be more than is absolutely necessary to keep alive and in health. . . . Up to this point the justification for the whole apparatus of 'social security' can probably be accepted by most consistent defenders of liberty" (F. A. Hayek 2011, 285–86). Hayek aptly characterizes himself as being an "unrepentant Whig"; that is, a progressive-lite social reformer.

Darwin and Hayek both view nature as continuously, albeit slowly, tailoring organisms to discrete ecological niches, their essential difference being that Hayek imagines classical liberalism as an evolutionary end point. Darwin writes that "natural selection can act only by taking advantage of slight successive variations; she can never take a leap, but must advance by the shortest and slowest steps . . . by that old canon in natural history of 'Natura non facit saltum'" (Darwin 1859, 194). By contrast, the theory of dynamic adaptive systems posits that emergent phenomena are intrinsically unstable and prone to jumping unpredictably among an indefinitely large number of semistable states. Evidence from paleontology indicates that biological evolution similarly progresses in spurts, dubbed "punctuated equilibria." Physicist Stephen Wolfram explains that

> many of the most obvious examples of complexity in biological systems actually have very little to do with adaptation or natural selection. And instead what I suspect is that they are mainly just another consequence of the very basic phenomenon: . . .

> that in almost any kind of system, many choices of underlying rules inevitably lead to behavior of great complexity. . . . In most cases I strongly suspect that it is comparatively coarse features that tend to determine the success of an organism—not all the details of any complex behavior that may occur. (Wolfram 2002, 383, 388).

Wolfram imagines evolution as a rule-based phenomenon instead of the linear statistical phenomenon typically favored by biologists.

Hayek's group-selection approach also hinges implicitly upon a presumption of evolved human niceness (altruism) in the face of resource scarcity, a presumption that until recently was rejected widely by evolutionists and behaviorists. Human beings appear instead to be inherently self-interested creatures whose superficial niceness (e.g., group cooperation) actually represents the pragmatic pursuit of private utility. The prominent evolutionist Richard Dawkins explains that

> brought up as we have been on the 'good of the species' view of evolution, we naturally think first of liars and deceivers as belonging to a different species: predators, prey, parasites, and so on. However, we must expect lies and deceit, and selfish exploitation of communication to arise whenever the interests of the genes of different individuals diverge. This will include individuals of the same species. . . . We must even expect that children will deceive their parents, that husband will cheat on wives, and that brother will lie to brother. Even the belief that animal communication signals originally evolve to foster mutual benefits, and that afterwards become exploited by malevolent parties, is too simple. It may well be that all animal communication contains elements of deception right from the start, because all animal interactions involve at least some conflict of interest. (Dawkins 1989, 65)

Biologist Richard Alexander adds that

> we gain by thinking we're right, and by convincing our allies and our enemies, because of the motivation it gives us. People often seem to like this aspect of self-deception: it provides an excuse or a rationale for sinking deeper into otherwise self-deception about motives and for justifying acts that could not otherwise be justified. . . . No other species has accomplished this peculiar evolutionary feat, which has led to an unprecedented level of group-against-group within-species competition. It is this competition that draws us toward strange and ominous consequences. (Alexander 1987, 123, 228)

Dawkins (an avowed socialist) concludes (contra group-selection theory, but supportive of its prediction) that "human superniceness ['universal altruism'] is a perversion of Darwinism, because, in a wild population, it would be removed by natural selection. . . . Let's put it even more bluntly. From a rational choice point of view, or from a Darwinian point of view, human superniceness is just plain dumb. But it is the kind of dumb that should be encouraged" (Dawkins 2017, 276–277).

Alexander similarly finds "no evidence for even a core of [inherently super-nice] morality. Rather it appears that our judgments about it are always cost-benefit decisions (including conscious and subconscious acts as a result of conscience) made in relation to our own personal history of lessons of the structure of our society" (Alexander 1987, 118).

On a wholly different level, the philosopher and social ethicist Graham Walker takes issue with Hayek's evolutionary approach to social morality and ethics, complementing Beck's criticisms in part:

> Hayek does not come to the field of ethics in the usual manner of a moral philosopher trying to account for the experiential phenomenon of "oughtness." Instead, he is a social scientist. As such, his first concern is the phenomenon of social order. What he is trying to account for is not "oughtness," but rather the phenomenon of spontaneous order in society; his attempt to account for this phenomenon sets the analytical paradigm by which he interprets all related phenomena. . . . His theories and conclusions may teach us a great deal about social ethics in the sense of the values, rules and patterns essential for economic relationships and social order. But they appear to fall short of their pretension to account for human moral experience, values and ethics in their entirety. His approach might plausibly be held to account for the origin and nature of outward "economic" values and rules of conduct, but its plausibility diminishes significantly when applied to deeper levels of normative morality. (Walker 1986, 48, 53)

Walker, like Beck, charges Hayek with backing into his evolutionary approach simply to support his preference for individual liberty, free markets, and spontaneous order and his correlative disdain for socialism.

Progressive economist and Nobelist Joseph Stiglitz (2024) mocks a classic F. A. Hayek (1944) work by substituting the word "freedom" for the word "serfdom." Stiglitz's moralistic cri de coeur argues that Hayek's classical liberalism is exactly wrong; that is, that the concept of "freedom" must be redefined by emphasizing what people are *able* to do (given limited resources) rather than what they nominally are *permitted* to do. Ergo, social entitlements must be expanded beyond the levels advocated by the Whiggish

Hayek. Stiglitz asserts that classical liberal principles actually invite twenty-first century fascism and yet, as if following the philosopher Rousseau (1913, 46), he paradoxically concludes that a "good society" perforce coerces its citizens to be "free." His ostensible "key insight" is that "mild coercion—forcing someone to do something that he of his own volition would not do—can, in some instances, enhance everyone's freedom, even the freedom of those being coerced" (Stiglitz 2024, xvi–xvii). The author thus echoes the radical utilitarians' desideratum of engineering "meaningful freedom to the most people" (215). Progressive intellectual and political elites applaud Stiglitz's approach, as (the author claims) do some "conservatives." Libertarians and classical liberals, by contrast, will incline toward dismissing Stiglitz's moral view and rhetorical argument as being both nonsense upon stilts and as ironically supporting a case for licensing progressive public intellectuals and heavily taxing their work product.

Support for Hayek

Support for Hayek's naturalistic argument falls into three broad categories: (i) generic; (ii) specific; and (iii) scientific. The first two categories are addressed in this brief section, the third in the next section.

Generically, political scientist Larry Arnhart notes that

> the new Darwinian naturalism in political theory challenges the dichotomies that have traditionally separated the social sciences from the natural sciences. There is no absolute gap between is and ought if human morality is founded on a natural moral sense. There is no absolute gap between nature and freedom if human freedom expresses a natural human capacity for deliberate choice. And there is no absolute gap between nature and nurture if habituation and learning fulfill the natural propensities of human beings. If the new Darwinian naturalists succeed in defending these conclusions, the science of social and political order could become once again—as it was for Aristotle, Hume, and Darwin—the science of human nature. (Arnhart 1998, 87)

The sociologist Robert Bellah notes that "even though, as is now widely believed, morality and religion are evolutionary emergents, evolution cannot tell us which one of them to follow" (Bellah 2011, 48). Hayek might therefore be excused for choosing to believe in the emergence of classical liberal principles over the similarly spontaneous emergence of socialism, dictatorship, etc.

More specifically in support of Hayek, economist Michael Munger disparages Beck's analysis on grounds that she interprets Hayek's invocation of Darwinian evolution too literally, claiming that

> she decisively proves that Hayek failed to use the biological metaphor of evolution correctly, when as . . . others have already shown, Hayek never pretended to use 'evolution' in its biological sense. . . . As Hayek . . . put it: 'The central aim of all study of society must be to construct a universal theory of all mankind, understood as a scheme of the necessary development of humanity according to recognizable laws.' Now, this would be an odd view of evolution by natural selection. (Munger 2020, 5)

Hayek often disclaims directly (e.g., as quoted earlier) that his naturalistic theory turns narrowly upon Darwinian principles.

Economist Eric Beinhocker summarizes modern thinking about evolution by noting that "many biologists have come to view evolutionary systems as just one particular type, or subclass, of complex adaptive systems" (Beinhocker 2006, 18). He observes that

> there has been too much loose analogizing about how the economy might be like an evolutionary system. . . . [However,] while both biological and economic systems share the core algorithm of evolution and thus have some similarities, their realizations of evolution are in fact very different and must be understood in their individual contexts. . . . Saying [metaphorically] that economic systems are like biological systems does not tell us much that is scientifically useful. But saying that both economic and biological systems are subclasses of a more general and universal class of evolutionary systems tells us a lot. This is because researchers believe that there are general laws of evolutionary systems. . . . Beyond the basic machinery of the evolutionary algorithm, we would not expect any particular similarities between economic evolution and biological evolution. (12, 293)

Scientific Perspectives on Evolution

General laws of evolutionary systems can be considered in three lights: (i) biology, natural selection, and sociobiology; (ii) rational action via learned behavioral values and responses; and (iii) emergent evolutionary phenomena within complex adaptive systems.

Biology, Natural Selection, and Sociobiology

Recent discoveries regarding the spontaneous nature of adaptive biological, social, and economic systems weigh both in Hayek's favor and against it.

Dawkins's influential book *The Blind Watchmaker* (1996) is subtitled *Why the Evidence of Evolution Reveals a* [spontaneously ordered] *Universe without Design*. In an earlier work examining biological competition among "selfish genes," Dawkins argues that civilization's aggregate social institutions are products of mankind's genetic makeup. He describes this "long reach" of genetic consequences as an "extended phenotype" (Dawkins 1989, 234–66; see also Dawkins 1999). Environmental and other factors play a role, but fundamental human propensities are genetically predisposed.

Dawkins refutes Darwin's group-selection theory as "Panglossian" (1999, 50–51), while other evolutionists harshly denounce it as "heresy" (Nowak 2011, 83). Biologists, until recently, cleaved instead to explanatory behavioral theories built upon assumptions of "kin selection" and "inclusive fitness." Alexander asks, "How important is group selection in nature? The answer seems to be that biologists almost never have to invoke it to explain many if not most findings with respect to social behavior. Nevertheless, . . . humans are an excellent model for the kind of group selection Darwin envisioned" (Alexander 1987, 169). Excellent models regrettably can lead to flawed explanatory theories and erratic predictions. Alexander continues: "Each person is programmed by the history of natural selection to maximize the likelihood of survival of his/her genetic materials through reproduction and nepotism, both of which depend on the acquisition and redistribution of resources. More precisely, we are programmed to develop and respond to the proximate stimuli of particular environments in ways that *at least in the general past* would have accomplished this end" (108). It was during this period of theorizing by evolutionists that Hayek developed his explanatory theory partly along group-selection lines.

Group-selection theory was revived and rehabilitated decades after Hayek's initial theorizing. The distinguished biologist Edward O. Wilson, once an influential advocate for kin-selection theory, curtly dismissed at that time the possibility of socialistic human altruism existing outside the family: "Wonderful theory. Wrong species" (Pinker 2002, 296). He later apostatized, proselytizing instead for group-selection theory. The switch reflected his evolved view that

> the foundations of the general theory of inclusive fitness based on the assumption of kin selection have crumbled, while evidence for it has grown equivocal at best. The beautiful theory never worked well anyway, and now it has collapsed. . . . The perception of group selection as the main driving force of evolution fits well with a great deal of what is most typical—and perplexing—about human nature. . . . As soon as a cohesive group comes into existence, natural selection acting at the level of groups begins. . . . An iron rule exists in genetic social

> evolution. It is that selfish individuals beat altruistic individuals, while groups of altruists beat groups of selfish individuals. (E. O. Wilson 2012, 51, 290, 142, 243)

Wilson's "iron rule" (which echoes Darwin and Hegel) accepts the apparent contradiction between individual selfishness and group-level altruism.

A less noble explanation for group-selection theory's resurrection is political rather than scientific. Modern theorizing, "which makes no [formal] assumptions about whether individuals are cooperative or selfish" (Nowak 2011, 93), nevertheless affirms the radical utilitarians' "greatest good" political philosophy. It holds that altruism is an inherent human propensity which a moral society *ought* to wield prescriptively as an instrument for good. Inherent group-level altruism thus provides an ostensible scientific justification for Rousseau's and Stiglitz's vision of "forcing people to be free" (see also D. S. Wilson 2002, 2015; E. O. Wilson 2012; compare Montanye 2018).

Conversely, scientific candor compels Dawkins (an unabashedly progressive social thinker) to acknowledge that "one reason for the great appeal of group-selection theory is that it is thoroughly in tune with the moral and political ideals that most of us share. . . . The muddle in human ethics over the level at which altruism is desirable—family, nation, race, species, or all living things—is mirrored by a parallel muddle in biology over the level at which altruism is to be expected according to the theory of evolution" (Dawkins 1989, 9).

One conspicuous irony here is that group-selection theory, to which Hayek hitched his positive argument for classical liberalism, nowadays supports progressivism, communitarianism, socialism, and communism as well. A lesser irony is that Wilson grounds his scientific apostasy upon abstract mathematical models that amount to a faith-based religion that evangelizes for natural selection theory at the group level. He did so despite simultaneously chiding economists for being insufficiently "naturalistic" in their theorizing, drawing positive principles instead "from close descriptions, experiments, and statistical analyses" (E. O. Wilson 1998, 202).

The mathematician Steven Strogatz joins with old-school biologists in rejecting group-selection theory, arguing instead for a theory of spontaneous self-organization. Strogatz draws insight in part from observing the mating behavior of fireflies, which presented

> tractable instances of a complex, self-organizing system, where millions of interactions occur simultaneously—when everyone changes the state of everyone else. Virtually all major unsolved problems in science today have this intricate quality. . . . The booms and crashes of the stock market; the emergence of consciousness from the interplay of trillions of neurons in

> the brain; the origin of life from a meshwork of chemical reactions in the primordial soup. All these involve enormous numbers of players linked in complex webs. In every case, astonishing patterns emerge spontaneously. The richness of the world around us is due, in large part, to the miracle of self-organization. . . . In huge interconnected systems, where every player ultimately affects every other, our standard ways of thinking fall apart. That's what plagues us in economics when we try to anticipate the effects of a tax cut or a change in interest rates. (Strogatz 2003, 34)

Strogatz's view fits with modern efforts by mathematicians, biologists, economists, systems researchers, and others to discover the hidden order within complex evolutionary phenomena.

Beinhocker aptly summarizes the points made by biologists and other researchers:

> Evolution has steered us in a direction whereby we are naturally inclined to be cooperative to capture the riches of non-zero-sum gains. Nevertheless, it has also equipped us with a sensitivity to cheating, expectations of fairness, and a willingness to mete out punishment to those who have crossed the line. In effect, evolution has programmed into our mental software sophisticated, intuitive 'Nash equilibrium finders' and 'fairness detectors' that enable groups of humans to form coalitions that are at least reasonably stable and resistant to attack by free riders and cheaters. . . . Evidence from anthropological and cognitive scientists shows that a relatively small set of norms comes as standard equipment in human minds and is likely the product of our biological evolution. . . . The new views of economic evolution . . . have nothing in common with the old views of Social Darwinism. In fact they point in the opposite direction, noting that cooperation is as vital an ingredient in economic development as 'survival of the fittest' individualism. (Beinhocker 2006, 269, 369, 13)

He emphasizes his conclusion that "*the economy is ultimately a genetic reproduction strategy*" (317).

The Human Capacity for Learning and Rational Action

Hayek's thinking apparently was influenced not only by Darwin (and perhaps Hegel) but also by Jean-Baptiste Lamarck, who proposed a competing evolutionary theory governing the inheritability of acquired traits. The modern interpretation of Lamarckian evolution is that "once an innate capacity for learning by imitation is acquired, the transmission of abilities takes a new form—vastly superior to genetic transmission precisely because it

includes the transmission of acquired characters which genetic transmission does not" (Laurent and Nightingale 2001, 6). Dawkins termed this transmission medium "meme," identifying it as "a unit of cultural transmission, or a unit of *imitation*" (Dawkins 1989, 192). "Anything that spreads by imitation, as genes spread by bodily reproduction or by viral infection, is a meme. Their significance lies in the theoretical possibility of a true Darwinian selection of memes, to parallel the familiar selection of genes" (Dawkins 1998, 304).

Wolfram, by contrast, dismisses the significance of rationality and learning. He argues instead that "great complexity can arise in systems with extremely simple underlying rules, so that in the end nothing with rules even as elaborate as human intelligence—let alone beyond it—is needed to explain the kind of complexity we see in nature" (Wolfram 2002, 828).

Nevertheless, intelligence and adaptive evolution are not mutually exclusive. Despite human beings having evolved as the result of simple iterated rules related to survival and reproduction, Dawkins argues that "even if we look on the dark side and assume that individual man is fundamentally selfish, our conscious foresight—our capacity to simulate the future in imagination—could save us from the worst selfish excesses of the blind [genetic] replicators. . . . We have the power to defy the selfish genes of our birth and, if necessary, the selfish memes of our indoctrination" (Dawkins 1989, 200).

If so, then evolution need not be destiny. Hope springs eternal along these lines despite repeated failures to raise individuals permanently above their inherent nature via progressive policies that instead fuel selfishness and incivility in the long run (Montanye 2021).

The human capacity for rational action leads mainstream economists to dismiss Darwin's group-selection claim and by implication Hayek's reliance upon it. Economist and Nobelist Gary Becker concludes that "models of group selection are unnecessary since [quasi-]altruistic [and by implication moral, ethical, and religious] behavior can be selected as a consequence of individual rationality" (Becker 1976, 284). From Becker's positive economics perspective, human behavior (as the means for increased survival value) is explicable solely in terms of individual utility maximization in response to changing prices (i.e., costs), which, in the face of assumed inherent and unchanging tastes and preferences (Stigler and Becker 1977), conduces to increased survival value. Economist Mancur Olson explains why rationality is key:

> From the logic of the matter, we could expect that in small groups a generally peaceful order will normally emerge by voluntary agreement but that in large populations it will not. The key to the matter is that each individual bears the full

> costs or risks of anything he or she does to help establish a peaceful order or to provide a public good but receives only a share of the benefits. . . . Moreover, when there are only a few [individuals], the welfare of each noticeably depends on whether each of the others acts in a group-oriented way. (Olson 1993, 567; see also Olson 1965)

A handful of moral philosophers—most notably David Gauthier (1986, 1990), Max Hocutt (2000), Richard Joyce (2001, 2006), and Robert Nozick (1974)—reach similar conclusions. By comparison, economist David Rose protests that "economists throughout much of the twentieth century have tried to model moral behavior in general, and trust in particular, as nothing more than an exercise in in the rational pursuit of enlightened self-interest. While this approach has produced sharp models, many have correctly pointed out that it robs the words *morality* and *trust* of their essential meaning" (Rose 2011, 7).

Rose argues, from behind a Rawlsian veil of ignorance and a conditional "self-conscious exercise in 'what if' reasoning," that "if a society's sole objective is to maximize general prosperity, and if it could choose its own moral beliefs . . . such a society would choose to have as many of its people as possible abide by the moral foundation" (206, 142). The extent to which that "choice" would entail coercion (à la Rousseau and Stiglitz) is unclear.

The value that classical liberals nowadays ascribe to individual freedom and free markets did not originate either through biological evolution or in the writings of John Locke and James Madison. Long before classical liberal principles became canonical, St. Paul, writing in the first century, asked, "For why should my liberty be determined by another man's scruples?" (1 Cor. 10:29). Justice Louis Brandeis's oft quoted dissent in *Olmstead v. United States* addressed this rhetorical inquiry:

> The makers of our Constitution undertook to secure conditions favorable to the pursuit of happiness. They recognized the significance of man's spiritual nature, of his feelings, and of his intellect. They knew that only a part of the pain, pleasure and satisfactions of life are to be found in material things. They sought to protect Americans in their beliefs, their thoughts, their emotions and their sensations. They conferred, as against the Government, the right to be let alone—the most comprehensive of rights, and the right most valued by civilized men. To protect that right, every unjustifiable intrusion by the Government upon the privacy of the individual, whatever the means employed, must be deemed a violation of the Fourth Amendment ["The right of the people to be secure in their persons"]. . . . Experience should teach us to be most on our guard to protect liberty when the

> Government's purposes are beneficent. Men born to freedom are naturally alert to repel invasion of their liberty by evil-minded rulers. The greatest dangers to liberty lurk in insidious encroachment by men of zeal, well meaning but without understanding. (277 U.S. 438, 479–480 (1928))

Consider in this context the phenomenon of infants in their "terrible twos" phase, when the most frequently used word is "No!" Parents generally act according to their children's interests and necessities, a fact that children often cannot appreciate. However, children do appear to recognize that even well-meaning parents encroach occasionally upon their children's liberty by pursuing unrelated parental interests, thereby instilling by example an indelible sense of caution and healthy cynicism regarding authority. Thus, the human propensity for classical liberal principles likely emerges partly as a learned response to arbitrary authority, dictatorship, and coercion. The evolved capacity for learning encompasses not only personal experience but also teaching, mimicry, social conditioning, and conceptual abstractions.

Classical liberal values also appear likely to emerge from individuals coming to grips with their own inherently flawed nature (call it "original sin"). As every freshman psychology student learns, individuals "project" (attribute) their own faults onto other individuals, groups, and institutions, where those faults are more easily criticized.

In sum, the simplest iterated rule in the human playbook appears to be an inherent propensity for survival and reproduction, without which the human species would have petered out and become extinct long ago. The inherent human capacity for learning and rational action evolved to serve this underlying rule, giving rise to spontaneous cooperation among other beneficial behaviors.

Evolution within Complex Adaptive Systems

Historian David Day records how "over the long term, the history of the world has been the history of wave after wave of people intruding on the lands of others" (Day 2008, 3). Historian Carroll Quigley's evolutionary study of civilizations notes the tradition of dividing historical waves into discrete periods, where "the clearest case to be found is our Western civilization" (Quigley 1979, 127–66). Hegelian historicists in particular divide history into discrete stages that presumably are determined by immutable laws and cycles.

Apropos of Hayek's evolutionary thesis, Olson divides civilization's evolution into two initial periods, noting that classically liberal antique societies emerged naturally, only to become islands of freedom and civility within a sea of "mobile bandits." Nasty and brutish marauders ultimately tended, for efficiency reasons, to become "stationary bandits" (i.e., governments and gangs) that conquer and occupy liberal populations rather than plundering

them before moving on. In both cases of banditry, "the strong do what they can and the weak suffer what they must" (Thucydides 5.89.1). They continue doing so notwithstanding moralistic scoldings by such nominally peace-loving institutions as the Vatican and the United Nations, and paradoxically by the United States. Conflict between any pair of cooperative Darwinian groups tends to produce (at best) one winner and one loser, along with wanton destruction and death on both sides (see, for example, Thucydides 3.80). This is inherent human nature in the raw and hardly an obvious prelude to classical liberalism's emergence.

Chaos theory, by comparison, interprets the historical shifts that have occurred throughout history as evolutionary bifurcations occurring within nonlinear complex adaptive social systems. Consider that Olson's antique civilizations split first between classical liberals and bandits; bandits then split between marauders and stationary predators; stationary predators split between dictatorships and democracies; democracies split between classical liberal and conservative societies and then into progressive and apartheid societies; progressives split into today's interest group liberals; and so on. This process culminated in what can be described as a full-fledged chaotic state that is the inevitable result of adaptive system behavior. Chaos is a prevailing characteristic of all highly evolved civilizations, in which social and economic outcomes are intrinsically unstable, unpredictable, and irreversible.

The prominent political scientist Theodore Lowi observes bifurcation and irreversibility in America's shift from classical liberalism to progressive "interest group liberalism." Progressivism, which Lowi dubs "the second republic of the United States . . . sought to build a modern state upon good intentions and the support of organized privilege" (Lowi 1979, i), an arrangement that is akin to Darwin's evolving "cooperative societies." According to Lowi, "only a radical, organized constitutional revolt will succeed now where once a sustained intellectual attack might have been sufficient" (91). To wit, attempted conservative constitutional revolutions, like those championed by Presidents Reagan and Trump, became overwhelmed by prevailing evolutionary currents. Bifurcations are irreversible once they occur, unless the underlying system somehow becomes reset to a different behavioral state, at which point evolution's ratcheting process begins anew. However, a full reset cannot guarantee a "conservative" return to old ways: witness that dinosaurs did not reemerge following the Cretaceous period's mass extinction.

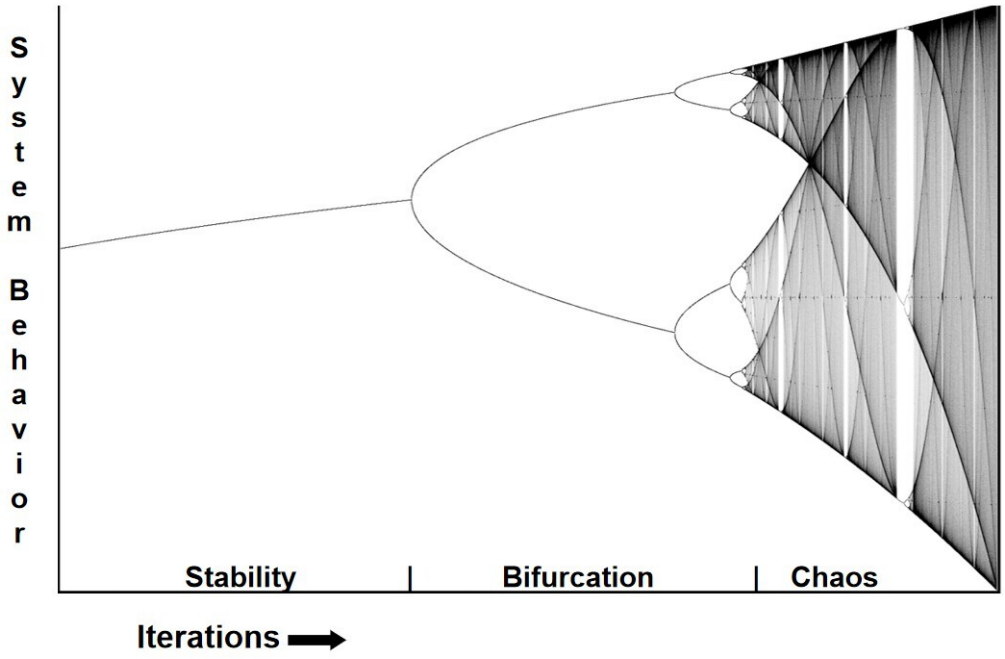
Evolution's underlying dynamics nevertheless are such that past phenomena can and do reappear randomly. Previous choices constrain the range of future possibilities, but any outcome is possible within that range (analogies to quantum physics' decoupling of causes and effects are apposite to this understanding; analogies to alternate universes are not).

The path from social stability to chaos is difficult to model quantitatively, although, like the Supreme Court's view of obscenity, we might profess to know it when we see it. Political scientist Thad Brown explains that "crisp illustrations of chaos in politics . . . are rare precisely because politics is defined and affected by interactions among individuals and groups, among groups, and so on. Political reality is often shaped by larger metapolitical environments. Thus, the dynamics and interactions that are the source of political chaos may obscure its presence" (Brown 1997, 135).

Dynamic social bifurcations are triggered by a variety of large and small events that generate feedback within nonlinear systems. Meteorologists claim (only half facetiously) that a butterfly's wings flapping in South America can trigger monsoons in Asia; in other words, no potential trigger is insignificant at the margin between stability and chaos. Social, political, and economic triggers effect evolution both directly and also by altering incentives and expectations. Potential triggers include, for example, "scientific discoveries, inventions, technological and social innovations, and great persons who appear at the right time and place in history" (De Greene 1997, 277). The *disappearance* of single individuals at the right place and time—a leader like Julius Caesar, a royal aristocrat like Archduke Ferdinand, or an ordinary individual like George Floyd—also trigger bifurcations. Other potential triggers include elections, wars, rebellions and revolutions, terrorist attacks, natural disasters and other crises, environmental changes, influential writings, flouted norms and taboos, inflations and recessions, political policy shifts, unpopular judicial verdicts, entrepreneurial successes, changing judicial interpretations of statutory and constitutional law, redefined word meanings, whistle-blowing, misinformation and disinformation, diverging wealth distributions, shifting demographics, market and government failures, rational expectations, the arts, and of course rent- and entitlement-seeking by "cooperative societies."

Bifurcations within complex adaptive systems are illustrated in figure 1 below.

Figure 1. Transition of a nonlinear adaptive system from stability to chaos



Source: Stack Overflow (2014).

The above illustration (for which I provided the descriptive labels) plots the repeated iteration of a nonlinear logistic function having the general form $y_{i+1} = \mathrm{k}y_{\mathrm{i}}(1 - y_i)$, where every behavioral state (y_i) is multiplied by a feedback parameter (k) that increases with each iteration and "renormalized" ($1 - y_i$) to a value between 0 and 1.0 for illustrative convenience. In simple terms, a system's future behavioral state is the product of its current state as modified by feedback. When the feedback parameter is low, the function can settle into a steady state, as demonstrated by Kiel and Elliott (1997, 19–29). Otherwise, bifurcations eventually occur as the number of iterations increases and the feedback parameter becomes relatively large. Orderly bifurcations continue to the point where system behavior suddenly becomes unpredictably chaotic.

At the point where chaotic behavior begins, the simple underlying behavioral rule (equation) continues operating, although it cannot be reconstructed by analyzing current behavioral patterns. Searching for patterns becomes a feckless endeavor because the system has become irreducible, making the next behavioral state unknowable. Irreducibility is reached when data requirements and computational limitations become so great that complex adaptive systems cannot be simulated faster than they actually unfold in real time; that is, "no computer can ever be made large enough to track an

irreversible system." Therefore, "complex systems—both chaotic and orderly ones—are ultimately unanalyzable, irreducible into parts, because the parts are constantly being folded [nonlinearly] into each other by iterations and feedback" (Briggs and Peat 1990, 147). The inability to discover the simple rules that underlie complex nonlinear behavior explains why economists' equilibrium forecasting models often fail and also why social policies generate wildly unintended consequences. Irreducibility makes the structure of an optimal behavioral state unknowable as well as unpredictable. Lowi's disheartening "interest group liberalism" explanation resonates: "There is no substance. Neither is there procedure. There is only process" (Lowi 1979, 68).

In sum, complexity and chaos emerge whenever an adaptive system "feeds back on itself to change the way it is developing" (Gribbin 2004, 255). Feedback—for example, changing economic incentives and expectations—is key to making nonlinear systems spontaneously self-organizing, with negative feedback performing a regulating (equilibrating) function (e.g., economics' "law of diminishing returns"), while positive feedback enables growth while also driving adaptive systems toward disequilibrium, uncertainty, bifurcation, and chaos. Whereas a linear system can be modeled as the algebraic sum of its parts, the emergent outputs of a nonlinear adaptive system can be unpredictably greater or less than that sum. "Emergence" here is the "phenomenon whereby well-formulated aggregate behavior arises [spontaneously] from localized individual behavior [e.g., Schelling's checkerboard automata described earlier]. . . . The edge of chaos captures the essence of all interesting adaptive systems as they evolve to this boundary between stable order and unstable chaos" (Miller and Page 2007, 46). Science writer John Gribbin notes that

> equilibrium itself is of no intrinsic interest, because nothing happens there. Thanks to feedback in particular, economies are actually self-organizing systems on the edge of chaos, with all that that implies. . . . Over an extremely wide range of possibilities, whatever condition you start out with and whatever shocks you apply to the living system (external or internal, or both), you arrive at the self-organized critical state on the edge of chaos, where even a small trigger can, on occasion, produce a very large change in the system as a whole. Life really is like that. (Gribbin 2004, 111, 161, 211)

Mises similarly dismisses the significance of equilibrium conditions as being

> merely a tool for our thinking. It is not the description of a possible and realizable state of affairs. . . . [Instead, it is] an evenly rotating economy [in which] there is no choosing and the future is not uncertain as it does not differ from the present known state. Such a rigid system is not peopled with living

> men making choices and liable to error; it is a world of soulless unthinking automatons; it is not a human society, it is an ant hill. (Mises 1998, 249)

Beinhocker notes that "markets win over command and control, not because of their *efficiency* at resource allocation in equilibrium, but because of their *effectiveness* at innovation in disequilibrium" (Beinhocker 2006, 294).

Summary and Conclusions

Evolution has become a universal concept for explaining a wide range of scientific and social phenomena. Classical liberalism, as Hayek and Olson (among others) describe it, might well have emerged during a stage of civilization's development. The underlying evolutionary rule, however, continues to be about survival and reproduction, as facilitated by the evolved human capacity for rationality and learning. Iteration of simple underlying rules over millennia of human existence has caused a succession of social and economic bifurcations, first between classical liberalism and banditry, then successively into more complex social and institutional forms.

Evolution by natural selection cannot "prove" (as Hayek hoped to do, and as today's progressives imagine) the objective superiority of any evolved or confected social system. Underlying rules directing evolution—even the rule of survival and reproduction—must be inferred because life's chaotic state is irreducible. The apparent superiority of individual liberty, free markets, and spontaneous order must be adduced from experience. The chaotic aspect of adaptive evolution often leads toward the enslavement of ordinary individuals through the emergence of illiberal social rules and norms.

The evolved human capacity for rationality, learning, cooperation, and deception affects biological and social evolution, as do conscious attempts to rise above humanity's inherently selfish nature. Social optimality at the edge of chaos appears most likely to be achieved and sustained by allowing free play for the simple rules that are hallmarks of classical liberalism. These include "self-ownership, or autonomy; first possession; voluntary exchange; protection against aggression; limited privilege for cases of necessity; and taking of property for public use on payment of just compensation" (Epstein 1995, 53). These rules are rationally pragmatic rather than provably naturalistic. They are preferred because they are known to be the best means yet discovered for facilitating peace, prosperity, and human flourishing. They serve effectively as spontaneous bulwarks against the chaotic uncertainties that are natural consequences of free and innovative societies—uncertainties that otherwise cannot be hedged (see Knight 1971).

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