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Review Article

David Sloan Wilson* and Dennis J. Snower

Rethinking the Theoretical Foundation of Economics I: The Multilevel Paradigm

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Abstract: This article is the first of a series that offers a new paradigm for economics, the “multilevel paradigm,” using generalized Darwinism as its theoretical framework. Generalized Darwinism refers to all processes that combine the ingredients of variation, selection, and replication – not just genetic evolution – making it relevant to the cultural evolution of economic systems that are embedded in political, social, and environmental systems. We contrast the multilevel paradigm with the neoclassical paradigm and other schools of economic thought. The multilevel paradigm, like the neoclassical paradigm, provides an integrative framework for micro- and macro-economics. It also incorporates the meso level, comprising groups of various sizes, linking micro and macro. Other schools of economic thought are not fully integrative in this sense, constituting instead a form of diffuse pluralism. In the integrative framework of the multilevel paradigm, many important ideas that are currently on the periphery of economics are brought toward the core.

Keywords: multilevel paradigm, economic methodology, generalized Darwinism, diffuse pluralism, integrative framework

1 Introduction

Economics is a diverse field of inquiry, with many schools of thought dating back to the eighteenth century. For the last 80 years, however, it has been centered upon a theoretical edifice that originated in a nineteenth-century effort to create “a physics of social behavior” (Beinhocker, 2006; Hodgson & Knudsen, 2010, Norman, 2018), which is now known as neoclassical economics.

Terms such as “orthodox,” “mainstream,” and “conventional” are used to identify the central status of neoclassical economics, compared to a constellation of other schools of thought. Of these, behavioral economics is the most prominent and extends the neoclassical core in various directions (e.g., heuristics and biases, social preferences). Others, such as complexity, ecological, evolutionary, historical, identity, institutional, and neuroeconomics, vary in their compatibility with neoclassical economics, with the most disparate given the label “heterodox.”¹

What accounts for the special status of the neoclassical paradigm? In large part, because it provides an *integrative framework* of ideas that connects micro- and macroeconomics through a set of simple assumptions. Other schools cover various aspects of economics (e.g., neural mechanisms, complex dynamics, the importance of institutions, norms and social identity, and the need to study economic systems as embedded within political and environmental systems), which are undeniably relevant to economics. However, they are difficult to incorporate into the formal structure of the neoclassical paradigm or even to relate to each other (e.g., How does neuroeconomics relate to institutional or ecological economics?). As a result, they become a kind of *diffuse pluralism*, at odds with the neoclassical paradigm but not forming an alternative integrative framework of their own.

Diffuse pluralism also afflicts other disciplines within the human social sciences, such as anthropology, sociology, and political science. Many schools of thought coexist without being integrated with each other, like islands of an archipelago with little communication among islands. There is no integrative framework comparable to the neoclassical paradigm.

This is one reason why many economists are proud of their profession as different from other branches of the

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¹ Following Wikipedia (https://en.wikipedia.org/wiki/Heterodox_economics), we define orthodox economics as centered upon a “rationality-individualism-equilibrium nexus” and heterodox economics as centered upon a “institutions-history-social structure nexus.” Within each label, there is a diversity of meanings that are often poorly related to each other. See the study by Hodgson (2019a) for a book-length account.

human social sciences. For example, in an article titled “Economics as Universal Science,” Heilbroner (2004) writes: “Its formal mode of argument, mathematical apparatus, spare language, and rigorous logic have made it the model for the ‘softer’ social sciences.” This is also why the neoclassical paradigm has been imported into the other social scientific disciplines (e.g., Becker, 1976) – even as far afield as the sociology of religion (e.g., Stark & Bainbridge, 1987; discussed in Wilson, 2002) – to provide the integrative framework that they previously lacked. The application of the neoclassical paradigm to other disciplines has given rise to a movement called “economic imperialism” (Lazear, 2000, originally intended as a critique but subsequently welcomed by its many adherents in the economics profession) and “the economics of everything,” popularized in books such as Harford (2005) and Levitt and Dubner (2005).

In hindsight, the triumphalism of the neoclassical paradigm requires a sober re-assessment. There is a widespread agreement, minimally, that the paradigm has not dealt constructively with our current economic, political, social, and environmental crises. Quite possibly, it has been a contributing factor. If the neoclassical paradigm is found wanting within the economics profession, it does not provide a role model for the other social science disciplines.

What’s needed is *another paradigm*, which goes beyond diffuse pluralism by providing a coherent integrative framework of its own. We argue that there is one clear candidate for such an integrative framework: Darwin’s theory of evolution.

The biological sciences provide a model of a diverse set of topics unified by a single theoretical framework, capable of integrating functional, historical, mechanistic, and developmental perspectives (Tinbergen, 1963; discussed in Wilson, 2019, ch. 2). The explanatory scope of Darwin’s theory was obvious from the beginning, prompting him to end *On the Origin of Species* with the words “There is grandeur in this view of life.” Fifty years ago, the geneticist Theodosius Dobzhansky (1973) declared that “nothing in biology makes sense except in the light of evolution.” Since then, the amount of information that needs to be organized within the biological sciences has increased by orders of magnitude, but evolutionary theory remains the unchallenged explanatory framework. The only other framework that might be conceived as a challenger is complex systems theory, but these are better understood as complementary rather than in competition with each other. In other words, evolutionary theory requires knowledge of complex systems theory to understand how complex living systems evolve in complex physical environments. And complex systems theorists cannot understand the nature of complex living systems without evolutionary theory.

Why does evolutionary theory not already serve as an integrative framework for economics? The Norwegian–American economist Thorstein Veblen called for it in 1898, and a school of thought called Evolutionary Economics was launched with the publication of Richard Nelson and Sidney Winter’s “An Evolutionary Theory of Economic Change” in 1982. We will discuss these early contributions in more detail later. For now, suffice it to say that two major factors prevented the development of an evolutionary paradigm for economics until recently.

First, even though evolutionary theory has proven its explanatory scope within the biological sciences, it was largely restricted to the study of genetic evolution for most of the twentieth century, as if the only way that traits are replicated is through genes. It was not until the 1960s that evolutionary thinkers began to go back to basics by defining Darwinian evolution as Darwin did – any process that combines the trio of variation, selection, and replication – no matter what the underlying mechanisms (e.g., Campbell, 1960, 1974; Hodgson & Knudsen, 2010; Jablonka & Lamb, 2006; Plotkin, 1994). This is called *generalized Darwinism*. When Nelson and Winter wrote their book, they had little from evolutionary science to draw upon. That situation has now changed, with a burgeoning literature on human cultural evolution of relevance to economics (e.g., Aldrich et al., 2008; Beinhocker, 2006, 2011; Boschma & Martin, 2010; Bowles & Gintis, 2011; Breslin, 2011; Brooks et al., 2018; Buenstorf, 2006; Essletzbichler & Rigby, 2010; Frank, 2011; Gintis et al., 2006; Gowdy, 2021; Henrich, 2004, 2015, 2020; Henrich et al., 2005; Hodgson, 2008, 2013; Kolodny et al., 2018; Laland, 2017; Levit et al., 2011; Muthukrishna, 2020; Reydon & Scholz, 2015; Richerson & Boyd, 2005; Stoelhorst, 2008a,b; Turchin, 2005, 2015, 2016; Wilson, 2019; Wilson et al., 2023).²

Second, nearly all academic disciplines, including biology, economics, and the other social sciences, were influenced by a rising tide of reductionism during the middle of the twentieth century. In biology, this trend not only attempted to reduce all things social to individual interactions but also all things individual to cellular, genetic, and molecular interactions (e.g., the concept of selfish genes; Agren, 2021; Dawkins, 1976; see also Crick, 1995).

In neoclassical economics, the bottom rung of reductionism is a conception of the individual person as a rational actor, often referred to as *Homo economicus*.

² Two collections of articles are a special issue of the *Journal of Economic and Behavior Organization* titled “Evolution as a General Theoretical Framework for Economics and Public Policy” (Wilson et al., 2013b) and an edited volume titled “Complexity and Evolution: Toward a New Synthesis for Economics” (Wilson & Kirman, 2016).

Behavioral economics began as a critique of the neoclassical paradigm and an attempt to base economics on fallible “Humans,” not infallible “Econs” (Thaler & Sunstein, 2008), without departing from neoclassical economics in its individualistic focus.

Just as the tide of reductionism and individualism swept in during the middle of the twentieth century, it is sweeping out in the present, in favor of more systemic and holistic perspectives across academic disciplines. This includes a lively interest among economists in the complexity theory (Arthur, 2021; Beinhocker, 2006; Wilson & Kirman, 2016). One of evolutionary theory’s contributions to this holistic trend is *multilevel selection (MLS) theory*, which explains how adaptations can evolve at any level of a multi-tier hierarchy of units, such as from genes to ecosystems in biological systems and from individuals to global governance in human social systems. Crucially, MLS theory can identify the *absence* of functional organization at any given scale or context and how to improve the functionality of our economies, societies, and relationship with the earth. It is therefore “shovel ready” for practical applications, despite being new as an economic paradigm, as we will show throughout this series.

In an article titled “Rethinking the Theoretical Foundation of Sociobiology,” Wilson and Wilson (2007) articulated the multilevel paradigm for the study of social behavior in all species. Our series of articles can be seen as an extension of this framework for the topic area of economics. Similar rethinking efforts are needed for all branches of the human behavioral and social sciences and are in progress to varying degrees.³

In the first article of this series, we will get straight to work describing the multilevel paradigm in terms that can be applied to all branches of the social sciences. This requires a short review of basic evolutionary principles and examples from biology that might seem far removed from economics. Rest assured that there is a deep connection, just as there is between neoclassical economics and its roots in Newtonian physics. We will increasingly focus on economics per se in subsequent parts of the series.

The multilevel paradigm recognizes from the beginning that economic processes must be studied in conjunction with political, social, and environmental processes (the concept of an embedded economy). For this, a single theoretical framework that can be applied across all disciplines is indispensable. Accordingly, we have written this

series of articles with three audiences in mind: (1) neoclassical economists; (2) economists who identify with other schools of thought within the economics profession; and (3) the richly transdisciplinary community of scientists and scholars who are contributing to the multilevel paradigm. This requires writing in an accessible style and avoiding the jargon of any particular discipline.

2 A Whirlwind Tour of Basic Evolutionary Principles

The root difference between a nonliving physical system and a living system is *functional organization*. A nonliving physical system can be very complex but is not designed to *do* anything – unless it is an artifact of an organism such as a human, a dam-building beaver, or a nest-building bird.⁴ In contrast, organisms, with the help of their artifacts, are designed to *do* something, namely, to survive and reproduce in their environments. The adaptive design of organisms might or might not include conscious intentions. Even bacteria and plants, without any nervous systems at all, have the sensory and information processing abilities to keep them alive in an unbroken chain stretching back to the origin of life.⁵

2.1 The Analysis of Functional Organization

The study of functionally organized units not only enables but also demands a certain style of analysis. To see this, imagine being assigned the task of analyzing two objects: a snowflake and a fruit fly. The snowflake has plenty of structure that arose from the process of ice crystallization. Since it is not designed to do anything, however, the only way to analyze it is in physical terms. In contrast, the fruit fly has been designed by natural selection to survive and reproduce in its environment. While the fly remains a physical object that can be studied in physical terms (called proximate causation), it can also be analyzed in functional

³ Wilson (2019) provides a general overview of “completing the Darwinian revolution.” Wilson et al. (2023) relate the multilevel paradigm to complex systems science and engineering, economics and business, clinical psychology, and global governance.

⁴ A bird nest is clearly designed to contain and raise nestling birds, a beaver dam is clearly designed to retain water, and a human implement such as a can opener is clearly designed for the function of opening cans. These physical objects can therefore be analyzed in the same way as an organism, which is designed by natural selection to survive and reproduce in its environment.

⁵ Cognition in plants has become a lively area of scientific research (e.g., Gagliano, 2014).

terms (called ultimate causation; Mayr, 1961, Wilson, 1988). From a functional standpoint, the whole organism becomes the anchor of analysis. Everything below the level of the organism – its organs, cells, and molecules – can be analyzed in terms of their contribution to the functioning of the whole. Everything above the level of the organism – such as fly populations and multispecies ecosystems that include the fly – can be analyzed as a complex system composed of agents following their respective adaptive strategies.

The distinction between what takes place below and above the level of the whole organism is crucial. Two meanings of the key phrase “Complex Adaptive System (CAS)” need to be distinguished: A complex system that is adaptive *as a system* (CAS1) and a complex system *composed of agents following their respective adaptive strategies* (CAS2) (Wilson, 2016; Wilson & Madhavan, 2020). A fruit fly qualifies as CAS1. A population of fruit flies or an ecosystem that includes fruit flies qualifies as CAS2. The most important point to keep in mind is that, except under special conditions discussed below, *CAS2 systems do not self-organize into CAS1 systems*.⁶

Before outlining these special conditions, it is important to stress how often they *fail* to occur in both natural and human systems. Consider the following examples from nature (human-related examples will be provided later):

- Natural selection might increase the reproductive rate of individual fruit flies, resulting in population dynamics that become chaotic (Philippi et al., 1987).
- In many species, infanticide – killing the babies of others to have one’s own babies – is a major source of infant mortality, disrupting the social life of groups and diminishing the population size of the species (Van Schaik & Janson, 2000).
- In many species of migratory birds, females experience higher mortality than males during migration and on the wintering grounds because the males claim the best habitats for themselves. This benefits the males but at the expense of females and contributes to the decline of the bird populations (Greenberg et al., 2005).
- When beavers move into an area, they transform the ecosystem in ways that are best understood as increasing the fitness of beavers. Collateral effects on other species (biodiversity) and changes to ecosystem processes such as nutrient cycling are mostly byproducts of the adaptive strategies of a single keystone species (Bailey et al., 2004).

In economic terms, the fitness-enhancing activities of organisms can produce negative externalities for populations and communities, which are harmful to other organisms and even the focal organism over the long term. There is no regulatory system to compensate for negative externalities. The larger system (a single-species population or a multispecies community) simply fails to qualify as a functionally organized unit – a CAS2 system rather than a CAS1 system. As Strassman and Queller (2010, p. 614) put it: “The organism is the frontier of the adapted world; inside it there is harmony and teamwork, outside it there is conflict and confusion.”

This calls the very concept of a balance of nature into question – and, as we shall see, the economic concept of the invisible hand.⁷ Evolutionary ecologists have largely abandoned the notion that nature, left to itself, strikes some kind of harmonious balance (Bodkin, 1990). Instead, natural biological systems are frequently out of equilibrium or can settle into one of many locally stable equilibria (basins of attraction), most of which are not globally social optima. The word “ecological regime” is used to describe a stable assemblage of species (e.g., Biggs et al., 2009), a term that aptly invokes what we already know about human political regimes. In human life, the word “regime” implies a degree of stability but says nothing about how well the regime functions for the benefit of its citizenry, as opposed to the benefit of its elites. Human regimes span the range from despotic to inclusive (Acemoglu & Robinson, 2012). Biological regimes are no different.

To summarize, because the individual fruit fly is a functionally organized unit (in economic terms, taking into account the externalities operating among its components), it becomes an anchor of analysis, governing how we study everything below the level of the individual (its organs, cell, etc.) and everything above the level of the individual (populations, ecosystems, etc.), although in different ways. We could make the same points for a human-made implement such as a Swiss watch or an animal construction such as a bird nest or a beaver dam. Strictly speaking, these constructions are not living systems, but they are extensions of living systems – what Richard Dawkins (1982) called an extended phenotype – and therefore qualify for functional analysis. Knowing that a watch is designed for the purpose of keeping time, you would study its parts in terms of their contribution to the whole. You might also study watches as part of larger systems, such as the watch industry in Switzerland or the whole Swiss economy, but you would not necessarily

⁶ The fact that the evolution of higher-level adaptations requires a process of higher-level selection and tends to be undermined by lower-level selection was forcefully asserted by Williams (1966) in his book *Adaptation and Natural Selection*.

⁷ Both concepts can be traced historically to the pre-Darwinian Christian cosmology of harmony at all scales (Gowdy et al., 2013).

assume that those larger systems run with the precision of a Swiss watch. A single watch is a CAS1 system. The watch industry of Switzerland and the whole Swiss economy are CAS2 systems.

Another basic point about the study of functionally organized units is that they are seldom *entirely* functionally organized. This is true for a human social group as much as for a biological unit such as a fruit fly or a human artifact such as a watch. Evolution – including technological evolution – is a historical process, resulting in adaptations that are more like Rube Goldberg devices or what a tinkerer would assemble from spare parts, rather than what an engineer would produce on a drawing board (Jacob, 1977). Adaptations have byproducts that themselves have no function, such as the color of blood or the triangular spaces (spandrels) that are formed when arches are placed next to each other (Gould & Lewontin, 1979). Some traits evolve by chance (e.g., genetic or cultural drift) rather than by contributing to survival and reproduction. Any given trait is part of a developmental system and cannot be analyzed in isolation.⁸

Another important reason for departures from functional organization is called evolutionary mismatch (Giphart & Van Vugt, 2018; Lloyd et al., 2014). As an example from nature, many species of aquatic insects evolved to use reflected light as a cue to find bodies of water when they are in flight. This results in a fatal attraction to man-made reflective surfaces such as glass buildings and solar panels (Horvath et al., 2010). An adaptation to an earlier environment has become maladaptive in the present environment and only subsequent evolution or a human intervention can remedy the situation. Evolutionary mismatches abound in human life, and our impact on the planet has created mismatches for nearly every species on the earth. In the socio-economic sphere, the unhealthy predilection for sugary drinks and dysfunctional attraction to digital cues emitted by one's smartphone are examples of evolutionary mismatch.

2.2 Multilevel Functional Organization

At first glance, our discussion of functional organization thus far might seem to support individualism, which treats the individual organism as a fundamental unit of analysis.

But this is true only insofar as the individual is the unit of selection. This point is easily understood with regard to biological examples. Imagine repeating the example of the fruit fly with a social insect species such as honeybees. The individual bee is an impressive unit of functional organization in some respects (Chittka, 2022), but in other respects, it is more like a cell participating in the functional organization of a multicellular organism (Seeley, 1995, 2010). This is due to the fact that many traits in honeybees evolved on the strength of causing hives to survive and reproduce better than other hives, as opposed to individual bees surviving and reproducing better than other bees within the hive. Insofar as the hive becomes the unit of selection, it becomes the anchor of functional analysis (Gordon, 2010; Holldobler & Wilson, 2009).

Cancer can be used to make the same point (Aktipis, 2020). Cancer is the process of natural selection among cells within multicellular organisms. A cell that proliferates at the expense of neighboring cells is adaptive in the evolutionary sense of the word. Since evolution has no foresight, the fact that cancer cells eventually bring about their own demise is only to be expected – like fruit flies that destabilize their population dynamics with their high reproductive rates. With honeybees, we need to go above the level of the individual organism to find the unit of functional organization. With cancer, we need to go below the level of the individual organism to find the unit of functional organization.

The key to identifying units of functional organization in nature is by making a nested series of relative fitness comparisons. Genes that outcompete other genes within the same organism become like cancers. Genes that cooperate with other genes within the same organism to outcompete other organisms lead to functionally organized individuals, who often behave cancerously toward other individuals. Individuals (and their genes) that cooperate with other individuals in their social groups to outcompete other social groups become part of functionally organized units that are larger than themselves, but these groups often compete harmfully with other groups. Even whole ecosystems can become functionally organized if they are selected as units. For example, when multicellular organisms differentially survive and reproduce, their microbiomes are being selected along with their genes. The degree to which our genes interact with ecosystems composed of trillions of microorganisms comprising thousands of species is only in the process of being discovered (Koskella & Bergelson, 2020; van Vliet & Doebeli, 2019; Yong, 2006). In economic terms, the level of selection determines the level at which externalities among the interacting components are taken into account.

⁸ For example, the selection of docility in domesticated animals results in a whole suite of other traits called the domestication syndrome, which also exists in humans as a self-domesticated species (Dugatkin & Trut, 2017; Hare & Woods, 2020; Wrangham, 2019).

This nested series of fitness comparisons is called *multilevel selection (MLS) theory* (Hertler et al., 2020; Sober & Wilson, 1998; Wade, 2016; Wilson & Wilson, 2007; Wilson, 2015; Wilson & Sober, 1994). Its history begins with Darwin, who realized that prosocial behaviors are selectively disadvantageous within groups and require a process of between-group selection to evolve (Sober, 2010). The early literature focused on two-level selection; between individuals within groups and between groups in a multigroup population. This was called group selection and extending the same logic both downward (e.g., selection among genes within individuals) and upward (e.g., selection among groups of groups and among multispecies ecosystems) came later. Hence, MLS theory is a straightforward generalization of group selection theory.

The importance of between-group selection as an evolutionary force, compared to within-group selection, was widely rejected in the 1960s, leading to the view that almost all adaptations must be understood as enhancing the fitness of individuals and their selfish genes (Dawkins, 1976; Williams, 1966; see Agren, 2021 for a recent review⁹). At the time, this was celebrated as a great intellectual achievement. In retrospect, it can be seen as merely the advent of reductionism and individualism, coinciding with similar trends in economics, the human social sciences, and (to a large degree) in the everyday life of Western societies.

Today, there is widespread acknowledgment that MLS theory's nested series of fitness comparisons is a fully legitimate accounting method for evolutionary change (e.g., Birch, 2017; Birch & Okasha, 2014; Okasha, 2006; Wilson, 2015, ch 3). In addition, theories of social evolution that were proposed as alternatives to group selection, such as inclusive fitness theory, selfish gene theory, and evolutionary game theory, are now seen as different ways of accounting for the same causal processes, rather than invoking different causal processes. This became apparent as early as the 1970s, when W.D. Hamilton, the originator of inclusive fitness theory, encountered the multilevel framework of George Price, which partitions selection into within- and between-group components (Hamilton, 1975), a story well told for a general audience by Harman (2010).

Despite this complex history, we are on safe ground by identifying these common denominators, which all theories of social evolution must include to remain biologically realistic:

- Nearly all evolving populations are metapopulations, which are subdivided into groups of various sizes and durations.
- As a basic matter of tradeoffs, prosocial agents are by their nature vulnerable to exploitation by more self-serving agents in their immediate vicinity.
- Therefore, fitness differentials favoring prosociality at larger scales are required to counterbalance the negative fitness differentials at smaller scales.

The assumptions of *n*-person evolutionary game theory can be used to make these points with mathematical rigor (Maynard Smith, 1982; interpreted from a MLS perspective by Sober & Wilson, 1998; Wilson & Sober, 1994; see Traulsen & Glynatsi, 2023 for a recent review). Before continuing, it is important to clarify the distinction between classical game theory and evolutionary game theory, along with terminological differences. In the classical game theory, strategies are chosen by rational actors to maximize their absolute personal utilities.¹⁰ A distinction is made between noncooperative games, where individuals choose their strategies independently (such as the prisoner's dilemma game), and cooperative games, which involve coalition formation by group members (e.g., Osborne & Rubinstein, 1994). In the evolutionary game theory, the agents are programmed to employ different strategies, such as ALL-DEFECT or TIT-FOR-TAT, and no assumptions are made about their mental abilities. A strategy such as ALL-DEFECT is called selfish because it gains at the expense of its partner, and a strategy such as TIT-FOR-TAT is called cooperative because it helps its partner – even though the prisoner's dilemma is called a noncooperative game in the classical game theory.¹¹ In the evolutionary game theory, TIT-FOR-TAT may emerge as a winning cooperative strategy since it leads to strategy survival, whereas in the classical game theory, it may emerge as a winning noncooperative strategy because it is chosen by rational actors to maximize individual gain noncooperatively in an infinitely repeated game.

¹⁰ In absolute utility (or fitness) maximization, organisms are assumed to maximize their absolute utility (or fitness), without reference to the utility (or fitness) of competing organisms. In relative utility (or fitness) maximization, organisms are assumed to maximize their utility (or fitness), relative to competing organisms. As the economist Frank (2011) puts it, “life is graded on a curve.”

¹¹ Coalition formation can be studied within evolutionary game theory, but every trait associated with the rules of the game (e.g., membership, the formation of norms, third-party punishment) must emerge from a Darwinian process. These rules can be seen as altering the balance between levels of selection, suppressing within-group and enhancing between-group selection. See Section 3f of this article for more.

⁹ While inclusive fitness theory, selfish gene theory, and evolutionary game theory are often described as mutually compatible, there are tensions between them that are reviewed by Agren (2021).

With this terminological clarification in mind, we can show how evolutionary game theory illustrates the three common denominators of all theories of social evolution listed earlier. Evolution takes place in a large population subdivided into groups of size n (the first common denominator). Although n is allowed to vary in some models, it is treated as a constant in most models (e.g., two-person game theory) as a simplifying assumption. Within each group in Prisoner's Dilemma games, selfish strategies such as ALL-DEFECT (ALLD) have an advantage over cooperative strategies such as TIT-FOR-TAT (the second common denominator). TFT never beats its partner in within-group interactions. It only loses when paired with defecting strategies or draws when paired with prosocial strategies. To find the selective advantage of prosocial strategies, we must compare relative fitness at the level of the groups of size n . In the two-person evolutionary game theory, for example, pairs of TFT outproduce mixed TFT-ALLD pairs, which in turn outproduce pairs of ALLD (the third common denominator).

N-person evolutionary game theory is a tinker-toy model of social evolution in large populations subdivided into ephemeral groups of size n . A diversity of models is required to explore the diversity of metapopulation structures in the natural world (Hertler et al., 2020; Wade, 2016): groups of longer duration; groups composed of genealogical relatives; groups that form on the basis of partner choice; groups where all members disperse at periodic intervals; groups that reproduce by fissioning; groups where most of the dispersal is between neighboring groups; group where only one sex disperses; groups with fuzzy boundaries; groups that compete indirectly; and groups that compete by direct warfare. Every set of assumptions alters the outcome of multilevel selection in important ways but does not alter the basic fact of multilevel selection. It is on this basis that Wilson and Wilson (2007) wrote their article titled "Rethinking the Theoretical Foundation of Sociobiology," which ended with the words "Selfishness beats altruism within groups. Altruistic groups beat selfish groups. Everything else is commentary."

2.3 Human Evolution from a MLS Perspective

Unlike individualism, which by its name singles out the individual as the anchor of analysis, MLS theory recognizes that functional organization can evolve – or fail to evolve – at any level of a multitier hierarchy of units. Hopefully, the reader is beginning to appreciate how these foundational ideas might provide a new core for the study of economic systems, along with all other human cultural constructions. To proceed further, it is necessary to explain how our

species evolved the capacity to create such cultural constructions in the first place. The key is to appreciate that before we could become *cultural*, we needed to become *cooperative*.

Despite sharing 98% of our genes with chimpanzees, there is a night-and-day difference in the degree of cooperation.¹² Chimpanzee communities exhibit a little cooperation and a lot of disruptive competition. Naked aggression is over 100 times greater than in small-scale human societies. Even cooperation typically takes the form of alliances competing in a disruptive fashion against other alliances within the same community. The main context for community-wide cooperation is solidarity against other chimpanzee communities (Boehm, 1993, 1999, 2011; Wrangham, 2019). In laboratory experiments, chimpanzees are so disinterested in each other's welfare that, when given a choice between a reward for themselves versus the same reward for themselves plus a reward for another chimpanzee (similar to behavioral economics experiments performed on humans), they are indifferent to the choice (Silk et al., 2005).

Something happened during the evolution of our species that resulted in a quantum jump of cooperativity. That "something" was in large part social control, meaning the capacity of members to reward the prosocial behaviors and punish the antisocial behaviors of other members. Our distant ancestors found ways of suppressing bullying and other forms of disruptive self-serving behaviors within small groups (Boehm, 1993, 1999, 2011). Increasingly, this is being studied as a form of self-domestication, similar to the domestication of our animal companions (Hare & Woods, 2020; Wrangham, 2019).

In terms of the MLS theory, social control suppressed disruptive within-group selection, making between-group selection the primary evolutionary force – although only at the scale of very small groups. At this point in human evolution, there was no context for the evolution of cooperation at larger scales. This is called a major evolutionary transition (MET), and it is similar to other transitions in the history of life, such as nucleated cells as cooperating bacterial cells, multicellular organisms as cooperating nucleated cells, and even the origin of life as cooperating molecular reactions (Maynard Smith & Szathmáry, 1995, 1999; Szathmáry, 2015).¹³

¹² In general, most animal social groups exhibit a mixture of cooperative traits, which evolved by between-group selection, and disruptively selfish traits, which evolved by within-group selection. Only a small subset of animal social groups evolved to be sufficiently cooperative to deserve terms such as "ultrasocial," "eusocial," or "superorganism."

¹³ See the study by Carmel et al. (2023) for an introduction to a special issue on human evolution as a major evolutionary transition.

To say that between-group selection at the scale of small groups was a strong force in human evolution does not imply that within-group selection was entirely suppressed. Even multicellular organisms are afflicted with cancer after billions of years. Human social control mechanisms are like an immune system that protects against “cancerous” self-serving behaviors – always vigilant, often challenged, and sometimes overwhelmed.

A corollary is that part of the human behavioral repertoire is to operate in “cancer” mode in addition to “solid citizen” mode depending on the context. Because individuals operate in multiple group contexts, they can even operate in both modes simultaneously.

Despite these complexities, group selection during our genetic evolution resulted in an increase of cooperativity in all its forms, both mental and physical. Physical forms of cooperation included hunting, gathering, childcare, modification of the physical environment, defense against predators, and offense and defense against other human groups. Mental forms of cooperation included perception, memory, decision-making, the formation of norms enforced by punishment, and a capacity for symbolic thought vastly greater than any other species (Deacon, 1998; Jablonka & Lamb, 2006).

The degree to which cooperative social interactions have become embedded in our brains and bodies as individuals is only beginning to be appreciated by psychologists, neuroscientists, and health scientists (Beckes & Coan, 2011; Coan & Sbarra, 2015; Gross & Medina-devilliers, 2020; Shteynberg et al., 2020; Wilson & Coan, 2021). Consider that our ancestors *never* lived alone. They *always* lived in small and for the most part highly cooperative groups – even when those groups were warring against other human groups. This means that individuals always had social resources to draw upon in addition to their own resources. In a food shortage, for example, individuals could rely on food provided by others in addition to their own fat stores. The human brain and body evolved to integrate both personal and social resources in making their myriad tradeoff decisions, such as what to remember, what to pay attention to, or how much energy to allocate to one’s immune system. Most of these tradeoff decisions take place beneath our conscious awareness, similar to the unconscious regulation of our breathing and heartbeats (Sterling, 2020).

It follows that to live as an isolated individual in modern times is one of the biggest evolutionary mismatches imaginable. Our brains and bodies react to the absence of social resources as an emergency situation. Our minds struggle to regulate our thoughts, emotions, and behaviors without the social reinforcement that comes naturally in small cooperative groups, at least when they are appropriately structured. The single most therapeutic

action that can be taken by isolated individuals is not to seek therapy as individuals but to seek membership in small and appropriately structured groups with meaningful objectives (Wilson & Coan, 2021).

This means that modeling individuals as if they are atoms in large-scale anonymous systems is inappropriate for virtually all circumstances. After all, humans are social creatures, and most economic transactions are not anonymous. Even for those transactions that are anonymous, the interactions are nearly always shaped by social norms and values. Given that such anonymous, large-scale systems are fantasy, models featuring economic interactions that are socially embedded and adapted to their environment are a more natural starting point for many economic problems. The challenge is to do so in a tractable model, which is what the MLS framework offers.

To summarize, while the neoclassical paradigm begins with the portrayal of human individuals as autonomous units and must work to incorporate anything social, the MLS theory begins with a conception of the human individual as inherently part of cooperative groupings. The multilevel paradigm does not imply that individuals lack agency within cooperative groups. On the contrary, since bullying and other forms of disruptive self-serving behavior are the greatest threat to cooperative enterprises, group members must always be ready to assert their own rights. Hunter–gatherer egalitarianism is a combination of stubborn independence and communal values. Members take an active role in deciding what “we” should do, abide by the norms that are created, and punish those who do not. The very same members can be quick to game the system when opportunities allow.

Nowhere is the communal nature of human society more on display than our capacity for cultural evolution. Other species have cultural traditions, including the so-called lower animals such as fish and birds in addition to the so-called higher primates (Laland, 2017; Whiten, 2021). But only humans are cooperative enough to maintain an inventory of symbols with shared meaning and to transmit the inventory in a cumulative fashion across generations.¹⁴

Once the human capacity for symbolic thought was sufficiently developed, it resulted in a new process of evolution – cultural evolution – that evolved by genetic evolution and has been coevolving with it ever since. This is called dual inheritance theory (Boyd & Richerson, 1985; Richerson & Boyd, 2005; Richerson, 2017).

¹⁴ It is not important for our framework to regard humans as unique with respect to a capacity for symbolic thought. Instead, we predict that if and when similar capacities are discovered in other species, a high degree of cooperation will be a prerequisite in all cases.

Genetic evolution is so slow relative to cultural evolution, which – with the exception of genetic engineering – we can ignore it from a public policy perspective, focusing exclusively on cultural evolution. In this regard, however, a comprehensive knowledge of genetically evolved mechanisms of cultural transmission is desirable. It is sobering to reflect that every cultural adaptation worth wanting, including those winnowed from the past and those that we bring about in the present, must somehow be replicated in the minds of others, including children during their development. Conscious attempts to manage economic systems must include the entire culture, not just the institutions and market processes that are the typical targets of economic policy. We will develop this conception of an embedded economy in part III of this series.

Because cultural evolution is much faster than genetic evolution, it enabled our ancestors to spread throughout the planet, adapting to all climatic zones and dozens of ecological niches. Then the ability to produce our own resources (agriculture) and access previously untapped sources of energy (fossil fuels) led to an increase in the scale of human society, leading to the megasocieties of today.¹⁵

Of course, symbolic thought can operate on behalf of disruptive lower-level selection in addition to higher-level selection. Human cultural evolution is a multilevel process, no less than genetic evolution. Cooperation at any given scale is vulnerable to disruption from within (the social equivalent of cancer) and itself can be disruptive at larger scales. Self-preservation is a good thing – until it becomes self-dealing. Helping family and friends is a good thing – until it becomes nepotism and cronyism. Growing a nation's economy is a good thing – until it overheats the earth. In this fashion, much that is called pathological and corrupt at higher scales is virtuous as smaller scales – merely a CAS2 system rather than a CAS1 system.

A new breed of historian is reinterpreting human history from a cultural MLS perspective (Henrich, 2015, 2020; Nunn, 2021; Turchin, 2005, 2015, 2016). As a striking example, Josiah Ober, professor of political science and classics at Stanford University, explicitly compares the Greek city states (poleis) to ant colonies and attributes the remarkable efflorescence of culture during Greece's classical period to the establishment of democratic governance within some poleis,

giving them an advantage in economic and military competition against other Greek poleis and adjacent empires (Ober, 2015; discussed by Wilson & Ober, 2021).

What took place in ancient times is also taking place in the present (Acemoglu & Robinson, 2012; Fukuyama, 2012; Putnam, 1992). The authors trained in the humanities and social sciences, especially the “New Institutional Economics” pioneered by Douglas North, are increasingly appreciating the value of MLS theory (Nunn, 2021). They are joined by authors such as Henrich (2015, 2020), Muthukrishna et al. (2021), and, Turchin (2005, 2015, 2016, 2023) whose primary training are in evolutionary science.

3 The Role of Evolutionary Thinking in Economics Thus Far

The framework outlined in section 2, which is already “core” within evolutionary biology, can be applied to any branch of the human social sciences. Applying it to economics requires rethinking the very definition of economics in relation to other branches of the social sciences and coupled human and natural systems. Most of this work will be tackled in the subsequent articles of our series. For the remainder of this article, we will briefly revisit previous evolutionary approaches to economics and end with a comment on the need to go beyond diffuse pluralism.

Previous evolutionary perspectives in economics include Adam Smith who influenced Darwin's thought, Veblen's 1898 article “Why is Economics Not an Evolutionary Science?”, Joseph Schumpeter's concept of creative destruction, Milton Friedman's “as if” justification of the assumptions of *Homo economicus*, Friedrich Hayek's concept of an extended order, Nelson and Winter's (1982) *An Evolutionary Theory of Economic Change*, evolutionary game theory models (which we have already briefly covered), and Ostrom's (1990) *Governing The Commons: The Evolution of Institutions for Collective Action*. Our goal is not to review the large literature on each of these perspectives, but to briefly show how they imported evolution into economics and how they relate to our current effort. First, however, we need to discuss the term “social Darwinism.”

3.1 Social Darwinism

Social Darwinism is not a recognized school of thought within economics. Instead, it is a pejorative term that is used to describe the moral acceptance of a ruthlessly competitive world. In the United States, for example, it is

¹⁵ Recent research in archeology and paleoanthropology suggests that some hunter-gatherer societies achieved a large scale before the advent of agriculture and that agriculture evolved in the context of large-scale hunter-gatherer societies (Graeber & Wengrow, 2021). These new discoveries require an MLS account, no less than the previous understanding of agriculture as the start of large-scale societies.

common for progressives to label the laissez-faire policies of conservatives social Darwinism, even though conservatives would not dream of invoking Darwin on behalf of their policies. Instead, conservatives invoke the neoclassical economic paradigm, which furnishes a separate justification of laissez faire.

Conversely, progressive social reformers such as William James and John Dewey, who were genuinely inspired by Darwin, are never called social Darwinists. Darwin himself argued against eugenics and regarded prosociality as the most important aspect of what it means to be human (Loye, 2000, Richards, 1987).

A scholarly analysis of the term reveals that it has always been used in this pejorative fashion, all the way back to its first recorded use by socialists to critique the conservative policies of their day (Hodgson, 2004). For now, suffice it to say that any important idea can be used as both a tool and a weapon, and evolutionary theory is no different than other ideas in this regard. The term “social Darwinism” is so tainted by its pejorative meaning that it probably should not be used at all in scholarly discussion. From a modern intellectual perspective, if any position qualifies as a justification for ruthless competition, it is the neoclassical paradigm. The multilevel paradigm is all about competition in the service of cooperation, equity, and inclusion at multiple scales and in multiple contexts. For a more comprehensive discussion of social Darwinism, see Hodgson (2004), Richards (2013), and Wilson and Johnson (2016).

3.2 Smith

In his authoritative biography of Adam Smith, Norman (2018, p. 168) writes: “But Smith’s science of man is not merely a theory of evolution: it is almost certainly a core part of the theory of evolution. There is a specific reason to think that Smith’s writing exercised a strong indirect influence on Charles Darwin himself (p. 168).” According to Norman, it is an oversimplification to regard Smith as the father of neoclassical economics. His emphasis on morality, norms, institutions, and the disruptive potential of self-interest are indeed in accord with the multilevel paradigm. Here is Norman’s assessment of modern economics (p. 323).

As an ideology, neoliberalism is dead. But the debate we need to have, the debate about what markets are and should be for, about the limitations of the idea of ‘market failure’ and the need to ensure effective competition, and about norms and culture and the role of the state, has been left by the wayside.

Economics itself needs to own up to its limitations. It is hard not to conclude that the profession itself would greatly benefit from a little less incumbency and a little more accountability and competition. Its claims to scientific status are in disarray, with leading economists unable to agree even on whether it can or should be used to make predictions, let alone relied upon to make them correctly. In Friedmanite fashion, it has long been overly preoccupied with its own models rather than with the real-world phenomena they are supposed to represent. It is still struggling to tackle even such basic theoretical issues as how human preferences should be modelled or aggregated. It encourages politicians to persist in the responsibility-abrogating technocratic fantasy that economics trumps politics and can itself solve issues of justice, fairness, and social welfare... We need a new master narrative for our times.

Norman’s term “master narrative” is roughly comparable to our term “integrated framework.” Norman does not speak for all economists, many of whom are still intent on defending the neoclassical paradigm. The important point is that the multilevel paradigm can find support, not only from new developments in evolutionary science but also from the scholarly study of economic history dating back to its founders.

3.3 Veblen

Veblen’s (1898) article titled “Why is Economics not an Evolutionary Science?” critiqued the neoclassical paradigm in its infancy. His incredulous description of a “physics of social behavior” is still widely quoted:

The hedonistic conception of man is that of a lightning calculator of pleasures and pains, who oscillates like a homogeneous globule of desire of happiness under the impulse of stimuli that shift him about the area, but leave him intact. He is an isolated definitive human datum, in stable equilibrium except for the buffets of the impinging forces that displace him in one direction or another... Spiritually, the hedonistic man is not a prime mover. He is not the seat of a process of living, except in the sense that he is subject to a series of permutations enforced upon him by circumstances external and alien to him (pp. 389–390).

Veblen also commented on economics as an encapsulated discipline and the need to become more transdisciplinary:

It may be taken as the consensus of those men who are doing the serious work of modern anthropology, ethnology, psychology, as well as of those in the biological sciences proper, that economics is helplessly behind the times, and unable to handle its subject matter in a way to entitle it to standing as a modern science (p. 373).

Veblen’s own perspective is highly consistent with the modern multilevel paradigm:

The economic history of the individual is a cumulative process of adaptation of means to ends that cumulatively change as the process goes on, both the agent and his environment being at any point the outcome of the past process. His methods of life today are enforced upon him by his habits of life carried over from yesterday and by the circumstances left as by mechanical residue of the life of yesterday (p. 391).

The fact that Veblen's article is so relevant and quotable, 125 years after it was written, can be used to make three points. First, the physics-based and evolution-based paradigms were different integrative frameworks from the beginning. Each one requires assumptions that would never be made from the perspective of the other. Founding assumptions can be difficult to change, especially when they are tied together into an interlocking framework. There is a sense in which the concept of "punctuated equilibrium" describing noncontinuous change in genetic evolution (Gould, 2009) also applies to the transition from the neoclassical paradigm to the multilevel paradigm (Baumgartner et al., 2009).

Second, Veblen's article is an example of how Darwin's theory functioned in a synthetic transdisciplinary capacity from the very beginning, without mathematical formalisms. Mathematical models have their place within evolutionary theory, of course, but in a different way than in neoclassical economics, a point to which we will return in part III of the series.

Third, Veblen's article shows how evolutionary thinkers reasoned before the advent of genetics (see also Hodgson, 2008). With a broad and mechanism-free concept of inheritance, Veblen could speculate about human cultural evolution in ways that were eclipsed by the nearly exclusive focus on Mendelian genetics with the advent of the so-called modern synthesis. This has led to a 50-year hiatus in the formal study of cultural evolution within evolutionary biology. During this period, evolution-minded economists who wanted to follow in Veblen's footsteps had little from evolutionary biology to draw upon.

3.4 Schumpeter, Friedman, and Hayek

Schumpeter's (1942, p. 83) concept of creative destruction relied upon biological imagery:

The opening up of new markets, foreign or domestic, and the organizational development from the craft shop and factory to such concerns as U.S. Steel illustrate the same process of industrial mutation—if I may use the biological term—that incessantly revolutionizes the economic structure from within, incessantly destroying the old one, incessantly creating the new one. This process of Creative Destruction is the essential fact about capitalism. It is what capitalism consists in and what every capitalist concern has got to live in.

While this description does describe a variation/selection/replication process, it assumes that cultural evolution takes place entirely at the level of the firm and does not take place either at lower levels (within the firm) or higher levels (firms embedded in larger cultural ecosystems). Hence, the disruptive aspects of selection acting at multiple levels is lacking. While subsequent work has included internal firm dynamics into innovation models (e.g., Aghion et al., 2015), it is difficult to implement a full Schumpeterian model with multiple levels of analysis. Also, the concept of creative destruction remained largely encapsulated within the profession and did not lead to greater transdisciplinary.

The two economists most closely associated with Libertarianism are Milton Friedman and Friedrich Hayek, who wielded their influence through the Mont Pelerin Society (Jones, 2012). Ironically, they disagreed with each other on foundational theoretical issues, a fact that was overlooked because their respective frameworks seemed to converge upon the same laissez-faire approach to economic policy.

Friedman, of course, was both a theorist and a popularizer of the neoclassical paradigm, but even he had to rely upon an evolutionary argument. In his classic article on positive economics, Friedman (1953) acknowledged that the assumptions of *Homo economicus* were absurd (quoting Veblen) but argued that evolution operating on different time scales (genetic evolution, cultural evolution, and individual learning) made people and firms behave as if the assumptions were true. This would be regarded as "just-so" storytelling by serious evolutionary thinkers (Gould & Lewontin, 1979; Wilson, 2012). Friedman also claimed that the predictive ability of neoclassical models justifies their assumptions; an argument that is undermined whenever the models have poor predictive capacity in many areas. For example, the rational actor model is contradicted by behavioral evidence of loss aversion (Kahneman & Tversky, 1979); the neoclassical assumption that financial markets are efficient is called into question by the dynamics of financial crises (Reinhart & Rogoff, 2009); and neoclassical models of income inequality do not adequately capture power dynamics and institutional factors (Piketty, 2014).

Hayek (1988) took the absurdity of the rational actor model more seriously. If the wisdom of a market economy does not reside in any individual (an extended order), then it must have evolved by a process of group-level cultural evolution. This made Hayek a true pioneer of the multilevel paradigm, at a time when acceptance of group selection was at its nadir and the modern study of cultural evolution had not yet commenced within evolutionary biology (Hodgson, 1991; Zywicki, 2000).

The multilevel paradigm that we have outlined in this article can be regarded as an updating of Hayek, leading in a very different direction than what most people associate with either Hayek or Libertarianism as a political and economic philosophy (see Wilson, 2020; Wilson & Boettke, 2020 for a more thorough exploration of this theme). The economist Frank (2011) made a similar point in his book *The Darwin Economy*. Like us, Frank predicts that in the future, Darwin will eventually be regarded as the father of economics. Frank also describes some of his policy prescriptions as an enlightened form of libertarianism.

This illustrates an important general point: The multilevel paradigm does not fall neatly into any current political and economic ideology. It is not progressive, conservative, or libertarian. It is a new configuration of ideas that can appeal to people across the current political and economic spectrum.

3.5 Evolutionary Economics

Evolutionary economics became a recognized school of economic thought with the publication of Nelson and Winter's (1982) book "An Evolutionary Theory of Economic Change." This was the same decade that other terms such as "evolutionary psychology" and "evolutionary anthropology" were coined, signaling the need to rethink whole disciplines. However, a recent review of the field by Hodgson (2019b), including a bibliometric analysis (Hodgson & Lamburg, 2018), shows that evolutionary economics did not become the integrated transdisciplinary enterprise that we are calling for in our series of articles.

Hodgson reminds us that the word "evolution" has always had a broad range of meanings in the English language. Darwin's insight was to focus specifically on variation, selection, and replication as the engine of evolutionary change in the natural world. According to Hodgson, evolutionary economists do not restrict themselves to this tight definition but instead loosely share five "ontological basics" in common: 1) It is a world of change (in contrast to the orthodox focus on equilibrium); 2) the generation of novelty; 3) the complexity of economic systems; 4) human agents have limited cognitive capacities; 5) complex phenomena can emerge through self-organization or piecemeal iteration rather than comprehensive overall design.

None of these ontological basics require a commitment to Darwinian evolution per se, and evolutionary economists have drawn upon or distanced themselves from Darwinism to varying degrees. Hodgson and Lamburg's bibliometric

analysis of economic-related articles with the word "evolution" in the title or abstract reveals isolated clusters of topics without a central core. This returns us to our portrayal of diffuse pluralism as like an archipelago with many islands and little communication among islands. Not only are these clusters isolated from each other within the economics, business, and management professions, but they are also isolated from evolutionary perspectives in other disciplines, including evolutionary game theory (Hodgson & Huang, 2012). According to Hodgson, there is "an enduring disconnection of research gathered around Nelson and Winter from evolutionary anthropology, evolutionary psychology, work on the evolution of cooperation, and Darwin himself. Given that the core theory of Nelson-Winter-style evolutionary economics may benefit from further development, these lively, theoretically rich, and relevant evolutionary literature would be obvious places to turn for inspiration. So far, this has not happened to any great degree."¹⁶

While we acknowledge and draw upon important contributions of evolutionary economists, our series of articles can be considered an attempt to provide what Hodgson calls for.

3.6 Ostrom

Of all the Nobel laureates in economics, the one that comes closest to representing the multilevel paradigm is Elinor Ostrom. A political scientist by training, Ostrom is also arguably the greatest outlier ever chosen to receive the Nobel in economics. Her 1990 book *Governing the Commons: The Evolution of Institutions for Collective Action* used the word "evolution" informally,¹⁷ but her work has become widely known and discussed by evolutionary thinkers and she herself participated in the process (Ostrom, 2013; Wilson et al., 2013a).

Ostrom studied groups that utilize common-pool resources such as forests, pastures, fisheries, and the ground water. Cooperation in this context is to avoid overexploiting the resource, and cheating is to take more than one's share, resulting in what the ecologist Hardin (1968) dubbed the tragedy of the commons. Received economic solutions were to privatize the resource when possible and otherwise to impose top-down regulations.

By compiling a database of common-pool resource groups around the world, Ostrom showed that some were

¹⁶ Hodgson (2019b, pp. 17–18).

¹⁷ Personal communication to DSW.

Table 1: Generalizing Ostrom's core design principles for the efficacy of groups

Ostrom's principle	Generalized version	Function
1. Clearly defined boundaries	1. Shared identity and purpose	Defines group
2. Proportional equivalence of benefits and costs	2. Equitable distribution of costs and benefits	Ensures effectiveness within groups by balancing individual and collective interests
3. Collective choice arrangements	3. Fair and inclusive decision-making	
4. Monitoring	4. Monitoring agreed-upon behaviors	
5. Graduated sanctions	5. Graduated responding to helpful and unhelpful behaviors	
6. Conflict resolution mechanisms	6. Fast and fair conflict resolution	
7. Minimal recognition of rights to organize	7. Authority to self-govern (according to principles 1–6)	Appropriate relations with other groups, reflecting the same CDPs
8. Polycentric governance	8. Collaborative relations with other groups	

able to manage their resources on their own if they implemented certain core design principles (CDPs) shown in the first column of Table 1. This was the primary achievement that earned her the Nobel prize. Later, Wilson et al. (2013a) generalized the CDPs from a multilevel evolutionary perspective. In other words, the CDPs are needed for virtually all forms of cooperation, not just the management of common-pool resources.

Columns 2 and 3 of Table 1 list a generalized wording of the CDPs and how they relate to the MLS theory.

CDP1: For a group to function well, there must be a strong sense of identity and purpose. Members must know that it is a group; that the work of the group is valuable and worth doing; the specific objectives; who is a member; and so on. All functionally oriented groups can benefit from this clarity. Note that CDP1 is intrinsically value laden, in contrast to the orthodox view that economics can somehow be value free.

CDP2-6: These principles govern social interactions within the group, coordinating cooperative activities and suppressing behaviors that might benefit members at the expense of the common good defined by CDP1. CDP2 ensures that what members get from the group is proportional to what they contribute. CDP3 ensures that all members take part in decision-making, which protects against unfairness and makes use of everyone's knowledge. CDP4 monitors agreed-upon behaviors so that failures of coordination and lower-level advantage seeking can be detected. CDP5 brings behaviors back into alignment in a graduated fashion, starting out friendly and nonjudgmental and escalating only when necessary. Also, positive reinforcement of good behavior is as important as graduated sanctions against bad behavior. CDP6 resolves conflicts quickly and fairly since all parties in a dispute typically think that they have a reasonable point of view.

CDP7-8: These principles govern between-group relations. A group must have a degree of autonomy to manage its own affairs (CDP7), and relations among groups (CDP8) must reflect the same CDPs as relations among individuals within groups for cooperation and coordination at higher scales. In other words, the CDPs are scale independent – as relevant governing the relations among nations and giant corporations within the global village as relations among individuals within real villages.

The CDPs are called “core” because they are required for cooperation in all their forms. In addition, groups often need auxiliary design principles (ADPs) to accomplish their specific objectives. For the groups that need them, ADPs are as important as the CDPs. Also, the implementation of any given design principle can be highly contextual. Cookie cutter solutions would not do. Please see the study by Atkins et al. (2019) for an elaboration on these points oriented toward practical applications.

In addition to her work on the governance of single groups, Ostrom also developed a concept of polycentric governance with her husband Vincent and their associates to address multigroup interactions (McGinnis, 1999; Ostrom, 2010). The concept of polycentric governance notes that: 1) social life consists of many spheres of activity; 2) each sphere has an optimal scale; and 3) good governance requires determining the optimal scale for each sphere of activity and appropriately coordinating among the spheres. As with governance at the scale of single groups, the concept of polycentric governance maps nicely onto the multilevel paradigm at the scale of multigroup cultural ecosystems.

In part V of this series, we will show how a generalized version of the CDPs and polycentric governance can be used as a practical framework for formulating economic and social policy across all topic domains and scales.

4 Conclusion: Beyond Diffuse Pluralism

We end this article by stressing the contrast between an integrated framework of ideas and diffuse pluralism. The pride that many economists feel about their profession is not without merit. An integrated framework of ideas that makes sense of a broad range of topics is a great asset. Other branches of the human social sciences, such as anthropology, sociology, and political science, indeed lack such a framework. Their many schools of thought are like the islands of an archipelago, with little communication among islands.

The neoclassical paradigm has always had its critics, but a legitimate concern is that without an integrative framework, economics will become like the other branches of the human social sciences. We share this concern. Hence, our article is as much a critique of the so-called “heterodox” schools of economic thought as the neoclassical paradigm.

As examples, Akerlof (2007) and Akerlof and Kranton (2010) emphasize the importance of norms and social identity, while Hoff and Stiglitz (2016) develop a concept of “enculturated actors.” These authors are themselves critics of the neoclassical paradigm who credit behavioral economics with a degree of pluralism, especially by incorporating psychology, but stress the need to go further, consulting disciplines such as anthropology, sociology, history, and even literary criticism. We applaud this kind of transdisciplinarity and have learned from the specific contributions of these authors, but consulting disciplines that themselves lack an integrative framework do not provide a new integrative framework!

The prospect that evolutionary theory can provide an integrative framework for all the human-related disciplines was eclipsed by the modern synthesis and did not resurface until the 1970s. The development of complex systems science is just as new since it required the advent of widespread computing power. This accounts for why the combination of generalized Darwinism and complex systems science is new, providing a transdisciplinary integrative framework.

As soon as we enter the multilevel paradigm, much that has been relegated to the periphery of the economics profession becomes central. Economic processes become inextricably embedded within political, social, and environmental processes. Human nature is seen as inherently social and malleable. Norms, social identities, and enculturated selves are central features of all human societies. The need to suppress competition in some contexts and

accentuate it in other contexts is seen with much greater clarity. The concept of imperfect knowledge becomes more diverse. All these elements have been studied in isolation by economists, but now they cohere within the new integrative framework of generalized Darwinism.

We submit that if a paradigm shift takes place, by changing the way we *think*, it will change the way that we *act*. There will be a quantum jump of good governance at all scales, including the global scale, and further improvements will take place over the longer term as institutional and procedural shortcomings are addressed with the welfare of the whole earth system – the ultimate unit of selection – in mind.

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