Outlining a New Paradigm

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Bio-Sketch: Gus diZerega is an independent scholar and Director of the Tantalus Research Association. His book publications include *Persuasion, Power and Polity: A Theory of Democratic Self-Organization* (Hampton Press, 2000). He has also published many articles on complexity, spontaneous order, liberalism, liberty, environmentalism, and interfaith issues.

Abstract: Emergence is attracting growing interest in the sciences. This paper argues understanding emergence in social science requires different approaches than in the physical sciences. The argument makes use of contributions by Elizabeth Fox Keller, Thomas Kuhn, Jane Jacobs, Michael Polanyi, and F. A. Hayek. As a subset of emergent phenomena, spontaneous orders have complex relations with one another and with emergent processes in civil society and nature. This includes areas of conflict as well as the symbiosis usually discussed. Conflicts include commodification, alienation, inequalities of power, tensions with organizations within them and ecological and social degradation. This new paradigm promises to enrich the social sciences and their interrelation with the biological sciences.

Keywords: Alienation; commodification; cosmos; emergence; emergent order; Evelyn Fox Keller; Hayek; Jane Jacobs; John Kingdon; Jürgen Habermas; Michael Polanyi; Richard Cornuelle; R. J. Rummel; spontaneous order; taxis; Thomas Kuhn.

I: THE NATURE OF EMERGENCE

For some decades emergent orders have attracted growing interest across many disciplines, from physics to the social sciences. Emergent systems are nonlinear, meaning they do not arise through chains of causation. They are instead networks shaped by the back and forth influences of mutual causation. Each node in such a network influences and is influenced by other nodes through positive and negative feedback signals that, taken together, generate the order as a whole. The order is a kind of pattern in relationships rather than an arrangement of objects, which themselves might be individually mobile and transient. Objects come and go; the pattern remains.

Emergent perspectives constitute a third approach to existing scientific research strategies, which traditionally focused on what mathematician Warren Weaver (1948) described as either "simple" phenomena or those characterized by "disorganized complexity." Simple phenomena, Weaver wrote, possess two variables: changes in one are the result entirely or almost entirely of changes in the other. While other factors might also contribute, Weaver (1961, 57) states that "the behavior of the first quantity can be described with a useful degree of accuracy by taking into account only its dependence upon the second quantity, and by neglecting the minor influences of other factors." Centuries of research in the physical sciences focused on problems of this sort, leading to much of our modern technology.

Around the end of the nineteenth century this traditional approach was enriched by tools developed for analyzing disorganized complexity, phenomena with unmanageable numbers of variables interacting randomly with one another. In these cases statistical techniques could discover otherwise invisible enduring patterns. Probability theory and statistical mechanics opened up these phenomena to scientific exploration, and have generated many practical applications as well.

Successful as these approaches had proven, they did not address what Weaver termed problems of "*organized complexity*" a "middle region" of phenomena possessing too many variables to be studied by the reductive methods so successful with simple phenomena but critically differ-

ent from disorganized complexity that could be analyzed statistically. In organized complexity, predictable patterns arose from relationships among many variables that possessed their own organization and mutually influenced one another. As examples Weaver referred to how an organism's genetic constitution expresses itself as an adult or how the price of wheat is determined in the market.

As commonly encountered, emergent order usually applies to two of the phenomena Weaver (ibid.) describes. In certain kinds of open physical systems involving enormous numbers of simple elements existing far from equilibrium, advances in nonlinear mathematics showed how emergent patterns can still arise. Some researchers such as Albert-Laszlo Barabasi (2007) suggest all emergent phenomena can be understood this way. Approaches such as Barabasi's have identified important phenomena within organized complex systems. For example, power laws suggest that extremes of inequality emerge from the process of network formation rather than qualities unique to the patterns' elements. Formal equality can breed enormous inequality due to systemic features (Barabasi, 2003). In addition, adaptive systems apparently require most nodes within a network to have only a very few links with other nodes—as Stuart Kauffman put it, "somewhere in the single digits"—no matter how large the network (Kelly, 1994). These are important findings, but the strong sense of this claim remains a promissory note with strong arguments against it.

An alternative perspective is taken by Evelyn Fox Keller (2009a, 26), who argues systems accessible to analysis by statistical nonlinear thermodynamics are open to energetic input but not "generally open to material or informational input or output." She elaborates:

> Stripes, rolls, whirls, eddies are all phenomena indicative of complex nonlinear dynamics; they . . . share with organisms the property of being open, far from equilibrium, dissipative. But they still lack the properties that make organisms so insistently different from physical systems . . . function, agency, and purpose (Evelyn Fox Keller, 2009a, 27; cf. Kauffman, 2008, 72-8).

Emergence within the biological world and in society are examples of Weaver's "organized complexity" because they reflexively interact with one another, unlike colliding billiard balls. But unlike non-living complex systems, change is internal to living systems as well as generated by their openness to outside disturbances. As Keller put it[1]:

> We have learned that a science of self-organized complexity will have to take into account processes of self-assembly and self-organization in multilevel systems, operating on multiple spatial and temporal scales through multilevel feedback in which the internal structure and properties of the component elements are themselves responsive to the dynamics of the system (Keller, 2009a, 30).

Unlike non-living chemical phenomena such as Ilya Prigogine studied, in living cells systemic feedback serves to maintain the cellular system of which it is a part, creating a homeostatic order that does not approach equilibrium as long as life exists (Prigogine and Stengers, 1984). Prigogine's studies of nonliving dissipative structures required outside energy to continually be supplied.

In living systems Keller argues emergence takes two forms. Natural selection is the best known, but the *origin* of life cannot itself arise that way. Natural selection requires the existence of a stable cell subject to mutation. The cell must *already* exist. Keller (2009b, 9) calls the process that originates such a cell "internal selection" which "follows automatically from their contribution to the persistence of the system of which they are a part. … their existence is what lends the cell the stability for natural selection to operate." Natural selection arises out of this process as its effect, not its cause. Biological emergence can occur either through internal selection *or* from Darwinian natural selection.

Keller (2009b, 19) explains that in living organisms agency, function, and purpose, "seem clearly to require an order of complexity that goes beyond that which spontaneously emerges from complex interactions among simple elements." The study of organized complexity is the study of emergence in living systems, and apparently only in living systems.

Keller (2009b, 20-1) prefers the term "robustness" to "stability" when referring to living systems because they are always in motion. They are robust "with respect to the kinds of perturbations that are likely to be encountered."

Systems of organized complexity are adaptive. Elements internal to these systems react to changes in their environment, "interpreting" this information based on their local situation, and so reacting to feedback in positive or negative ways. This process appears to go all the way down to any form of life, as single cells have demonstrated an ability to remember and even anticipate repeated events (Saigusa *et al.*, 2008).

Another useful descriptive term is "complex adaptive systems." They are adaptive because they maintain their pattern of organized relationships by adjusting internally to environmental changes that would otherwise disrupt them. Organisms, communities of organisms, ecosystems, evolution, and social systems are examples of such systems.

In contrast to purely statistical approaches appropriate to complex nonliving systems, Keller (2009a, 30) emphasizes that "[r]ather than trying to transcend the particularities of the system through statistical averaging and placing one's confidence in the significant emerging patterns of maximum likelihood, we may find the secrets of biological organization residing precisely in the details that have been washed away." Significantly in terms of my argument to come, Keller cites a study by David Noble of the internet that shows "the best-performing topologies are precisely those with low likelihood" (Barabasi, 2003, 70-1).

From her perspective the most central research questions become, "first, how do new ways of persisting, new stable modes of organization – come about, and second, how are they integrated into existing forms?" (Keller, 2009a, 20-1). The relevance of Keller's framework for understanding emergent processes within society should be clear. Many emergent social processes are characterized by internal rather than natural selection. How then do social emergent systems come about and how are they integrated into other such orders in society and its environment?

COSMOS + TAXIS focuses on these kinds of questions. Other emergent orders, such as ecosystems, are important to us primarily for the light they can shed on social orders. If Keller's distinction holds, nonliving complex systems will be still less useful.

Connecting threads

In contrast to those arguing for a clear distinction between the social and natural sciences, this emergent paradigm encompasses social orders within a framework that includes biology. It arises from many converging threads of research, particularly over the past several decades (Keller, 2008). What follows are brief cameos of five scholars I regard as particularly important in helping constitute this paradigm, and in explaining why it is important in the social sciences: Evelyn Fox Keller, Thomas Kuhn, Jane Jacobs, F. A. Hayek, and Michael Polanyi.

Evelyn Fox Keller

Evelyn Fox Keller is more than an insightful observer of the increasing interest in self-organization and emergent order across disciplines. She has also made important contributions to this field in biology.

Ilya Prigogine's research on self-organization in far-from-equilibrium dissipative chemical structures inspired Keller, a physicist, to investigate how biological structure could emerge out of an undifferentiated beginning. As she put it, "[a]ll cells of a complex organism derive from the same initial cell and presumably, therefore, have the same genetic material" (Keller, 1985, 150). How, then, could the enormous differentiation of functions and structures arise that exists within so many organisms? Keller (ibid.) explains that it was mathematics rather than the biology of the time that gave her the needed insight. She had come across Alan Turing's then little known 1952 paper on morphogenesis, the generation of form. Turing showed mathematically how diffusing and interacting chemicals could generate form, in other words, how self-organization and structure could arise from out of an undifferentiated beginning. Applied mathematician Lee Segel then convinced her that slime molds were a good organism with which to research this question.

Slime molds challenge our sense of what it is to be an organism. Part of the time they exist as single-celled amoeba-like individuals crawling across a forest floor. At other times, when food becomes scarce, these individuals coalesce, forming a larger multi-celled organism able to detect food sources. If the organism is broken up into individual amoebae, they come together again to form a new one. Ultimately it crawls to a higher point, stops, raises a spoor stalk, and reproduces through emitting spores that again become single-celled amoebas. As amoebae they are the single-celled organisms mentioned above that are able to anticipate future events and remember past ones. Slime molds are independent individual cells and part of a larger differentiated organism (Bonner, 1980; Keller, 1985). How do they do this?

Until Keller's research scientists assumed slime molds formed under the influence of a "pacemaker cell" that served as a kind of leader. It differed somehow from the others and triggered their collective coming together. But such cells had never been identified.

Inspired by Turing's insight, Keller guessed slime mold cells might all be equal, and when conditions were right, simple rules followed by all cells triggered the larger aggregations. No pacemaker cell was necessary. In 1969 Keller and Segel published their research showing this was the case (Keller and Segel, 1969). Simple rules followed by independent individuals could generate complex adaptive patterns far beyond their ken. The resulting organism could adapt independently to its environment.

We know today that slime molds are hardly unique. The role of simple chemical signals in enabling social insects such as ants and termites to develop extraordinarily complex societies is now well established (Wilson, 2012). Keller's basic insights also easily translate into more complex versions of social phenomena in the human world.

Thomas Kuhn

Thomas Kuhn is not usually included in discussions of emergence, yet I think he is important in understanding how it occurs within social phenomena. In return, the concept of emergence solves a vexing difficulty many have had with Kuhn's argument.

Kuhn's (1962) *The Structure of Scientific Revolutions* challenged the popular idea that science proceeds largely through the gradual accumulation of facts, each a brick in the edifice of knowledge. Instead, major scientific advances result in new "paradigms" that are not part of the same intellectual world as the established paradigms they replace. The traditional model of science as gradually approaching Truth was mistaken.

Kuhn's argument took some time to shake up people's understanding of science, but by the 1970s it had inspired a multitude of books, collections of essays, and conferences (see Lakatos and Musgrave, 1970).

Central to Kuhn's approach was his distinction between "normal" and "revolutionary" science. Under normal circumstances scientists work within an established "paradigm," but as it is applied to exploring new questions, over time, unexpected problems eventually emerge. Sometimes these nonconforming findings are later resolved, and sometimes they persist as puzzling anomalies. At some point anomalies inconsistent with the reigning paradigm turn out to be clues leading some to develop an intellectual "revolution," resulting in a new paradigm. New questions open up that would have meant little or nothing under the older paradigm, and older questions are sometimes abandoned as useless or irrelevant.[2]

In a much challenged term, Kuhn (1962) argues that—strictly speaking—paradigms are "incommensurable." Consequently, science demonstrates no clear direction towards Truth. Kuhn directly challenges almost all scientists' image of scientific knowledge as a collective human effort gradually discovering Truth. As David Weinberger (2012) puts it, "if science exists within paradigms and if those paradigms can't understand one another, and if there is no Archimedean point from which to view them, then how can we tell if we're making progress?" There is obviously order and progress in science, but what kind? Kuhn himself had a difficult time explaining just what kind it was.

Incommensurability and Truth: a problem solved

At first take Kuhn's argument appears too strong. Scientific knowledge is obviously cumulative in the sense that things able to be done from within a Newtonian framework remain able to be done from within a relativistic or quantum perspective, while the latter paradigms enable things to be done regarded as impossible from a Newtonian perspective. Isn't being able to reliably do new things evidence we are expanding our knowledge of truth?

Further, individual scientists are often passionately motivated by their search for truth, and this passion is necessary for good science to be done (Polanyi, 1974). How do we harmonize individual scientists' pursuit of truth within a larger context where, if Kuhn is right, we have no solid reason to argue truth is being cumulatively approached?

If science does progress towards truth, once this direction is discovered, further advance could at least in principle be planned, and so made subject to organizational criteria of efficiency. It would be a march towards a goal which, if not itself yet known, can be understood as at the end of a clear path. But if science is not of this nature, what is it?

I think the confusion arises from the assumption that scientific method, to use a shorthand term, developed to discover Truth. It did not. It developed to discover a certain kind of knowledge which scientists hoped would lead them to truth.

Physicist John Ziman (1978) calls the knowledge scientific methods seek "reliable knowledge." Scientists privilege measurement, prediction, experiment, and to a lesser degree reason as tests potential scientific propositions must pass. These methods evolved as early scientists sought standards others would accept as valid for evaluating their work, while avoiding treading in realms where theologians sought to monopolize authority (Toulmin, 1992). The relative importance of these evaluative criteria changes between scientific disciplines and within a discipline over time. Compared to chemistry experiment is unimportant in astronomy. Prediction only recently became important in the study of evolution, as when the existence and geological location of the early fish/amphibian Tiktaalik was predicted before it was discovered. "Scientific method" is flexible in its details and biased towards finding what is universally reliable.

Ludwig Wittgenstein (1974, 370) states: "Tell me *how* you seek and I will tell you *what* you are seeking." The "how" by which science seeks knowledge carries within it a model

of the reality it assumes to be true. Such a reality is impersonal, material, and governed by physical "laws." The methods of science were devised to discover how knowledge of that kind could be revealed. As biologist Richard Lewontin approvingly observes:

> It is not that the methods and institutions of science somehow compel us to accept a material explanation of the phenomenal world, but, on the contrary, that we are forced by our a priori adherence to material causes to create an apparatus of investigation and a set of concepts that produce material explanations, no matter how counter-intuitive, no matter how mystifying to the uninitiated (Lewontin, 1997).

If knowledge claims cannot be tested by experiment, measurement, prediction and perhaps reason, science has nothing to say about them. For example, we are certain we are conscious and have inner subjective awareness. But consciousness has long been a problem for science because we cannot measure, predict, or experiment directly upon awareness in an inter-subjective way. Even in neuroscience we can at best find physical correlations. If awareness is basic to reality, science is ill-equipped to study it.

As a system science discovers reliable knowledge. When physics shifted from Newtonian to Quantum mechanics physics became more reliable, but that did not mean we necessarily got closer to Truth.

As individuals the best scientists seek truth. In doing so they rely on methods devised to provide reliable knowledge so that they can demonstrate their findings to others. These tools of inquiry may or may not ultimately give us truth, but they do enable scientists to acquire an ever greater fund of *reliable* knowledge.

Translating this to the present context, it implies that we are confident that our journal will contribute to humanity's fund of reliable knowledge and depend on our contributors' search for truth for this to happen.

Jane Jacobs

At a time when many believed cities could be planned and reorganized through directives chosen by experts, Jane Jacobs' studies of urban structure and the dynamics of cities, particularly within neighborhoods, raised a major challenge (Jacobs, 1961). Jacobs argues that cities are too complex to respond predictably to such planning. Focusing initially on neighborhoods (ibid.), she argues that cities constitute a kind of urban ecology, a spontaneous network of intricate relationships spanning many fields of knowledge and activity. Order emerges by residents independently adapting to one another rather than from following a master vision. Successful growth requires cultivating good initial conditions, and Jacobs argued such conditions were often the opposite of those favored by urban planners. Simultaneously these principles were being successfully applied in the development of Vancouver, BC, although at the time not attracting much attention elsewhere (diZerega and Hardwick, 2011).

Jacobs' analysis is an ecological one, emphasizing how people's networks of informal relationships generate stable patterns of urban life, without these patterns being intended by anyone and without their details being predictable or stable. For example, short blocks turn out to lessen the prevalence of crime, because by increasing valuable commercial locations, they attract more pedestrians and thereby generate more "eyes on the street." They also slow traffic. Commerce, vehicular and foot traffic, and public safety all influence one another. No one can predict what store or even what kind of store will locate where. Those decisions depend on local insight and dispersed knowledge of circumstances among urban residents. But prediction of broader patterns is possible.

Jacobs later pursued her approach farther. In *Cities and the Wealth of Nations* (Jacobs, 1984) she argues cities are spontaneous natural results of growing social complexity, whereas larger political boundaries are arbitrary with little relation to the underlying social ecology. Political power is often parasitic on the wealth and culture created by and within cities. Jacobs juxtaposes an ecological model of societal development to one based on hierarchies of rule, and argues for the greater importance of the former and the frequent unfortunate results arising out of the latter. Ultimately her research led her to consider the broad systemic issues (cf. Jacobs, 1994; 2004) to which we hope COSMOS+TAXIS will contribute.

There seems little similarity between slime molds, the history of science, and the structure of urban neighborhoods. But from an emergent order perspective there is.

In living systems emergent phenomena beyond the cellular must be due at least in part to communicative relations linking individuals. If emergent biological and social phenomena were cases of organized complexity, signals had to be passing between those involved, and those signals had to be able to go in both directions. Slime mold cells communicated chemically. So did the social insects.

Slime mold cells had no intention to form a multi-cellular organism. Ants and termites did not envision their com-

plex colonies. Neither did humans. Despite humankind's dramatic differences from these organisms, producers and consumers in a market need no more knowledge of markets to generate one than termites need knowledge of their colony. Each need only apply simple rules to guide its use of local information to generate something far beyond individual capacities.

It is here that F. A. Hayek and Michael Polanyi enter into our discussion.

Friedrich Hayek

By the late 1920s, F. A. Hayek had become the major theoretical critic of arguments for centrally planning a complex economy. Along with his one-time teacher Ludwig von Mises, his study of market processes led him to see markets as a decentralized coordination and discovery system, where feedback through prices signal the different financial costs of various means for pursuing different economic plans. By providing a common scale among divergent resources, prices serve as signals facilitating efficient resource use, at least in terms of the values reflected in those prices. Each individual uses price information, in combination with their knowledge of local conditions and personal insight, to determine which plans they believe are worth pursuing. Price signals generated by continuing processes of exchange make the market quicker and more adaptive in facilitating and reacting to changes than any centrally planned system. They are also able to handle vastly more information than any type of deliberate planning.

While they always agreed with regard to the weaknesses of central planning, the two economists (i.e. Hayek and von Mises) increasingly diverged methodologically. Mises sought to turn economic theory into a strictly deductive "praxeology" of logical propositions derived from "human action." Hayek was skeptical. People learn, and how people learn is an empirical, not a deductive question (Caldwell, 2004). Perhaps even more fundamentally, Mises' method depends on keeping ends analytically separate from means, but *human* action, which normally integrates these elements of thinking, rarely can be understood this way. Finally, Mises always argued for a strict demarcation between the social and physical sciences whereas Hayek abandoned this distinction.

Hayek was strongly influenced by Warren Weaver's distinction between simple and complex phenomena, and the inapplicability of statistics to carry us far in the study of organized complexity (Caldwell, 2004, 302-06). He realized the theory of evolution was such a science, as was economics. Hayek understood that the social sciences were compatible with work being done in other scientific fields focusing on organized complexity, breaking down the traditional distinction between the social and natural sciences (Caldwell, 2004, 362).

Using our terminology, market orders emerge from the independently chosen activities of all participants. These participants are linked together by feedback through changing prices, with each responding based on their local knowledge and insight, and each response perpetuating the feedback as signals to future participants. Prices signal how money—systemically defined wealth—can be most efficiently used or acquired, although it is up to individuals to determine how money relates to their other values. Hayek called the pattern that emerged a "spontaneous order."

Michael Polanyi

Around the same time the chemist Michael Polanyi (brother of Karl) developed a similar understanding of science. Polanyi argued that science is a community devoted to free inquiry about the physical world, one whose norms subjects its members' theories and arguments to powerful tests while honoring the few whose work challenging dominant views survives this demanding scrutiny.

In science people pursue research of their choosing, while remaining subject to common rules and to the free and un-coerced discipline of the community's judgment as a whole. The many decisions that ultimately generate the community's knowledge are made independently by individual scientists, but science itself is a community creation. While individual scientists master only their own field, and often only small parts of it, their knowledge overlaps that of others. Polanyi (1969, 85) contends that "an indirect consensus forms between scientists so far apart that they cannot understand more than a small part of each other's subjects." The scientific community is self-governing, but it is not a hierarchy. No one is in charge.

Using our terminology, science emerges out from scientists' independently chosen activities, linked together and coordinated by feedback from the scientific community as a whole. Within science, reputation—not money—constitutes a scientist's systemic "wealth." A scientist might not be personally motivated by reputation as a creative entrepreneur might not be motivated by profit maximization, but reputation and money are the respective means by which these systems coordinate information far too complex for anyone to grasp in detail.

Polanyi (1969, 85) describes science as a "spontaneous order." Hayek and Polanyi described different spontaneous orders and identified different communicative systems of positive and negative feedback that develop spontaneously within them. Both science and the market arose out of independently chosen and often contradictory plans made and pursued by those acting within their frameworks of procedural rules. Each also agreed the subject of the other's study was a spontaneous order.

2: SPONTANEOUS ORDER

Not all social emergence constitutes a spontaneous order such as the market or science, even though both Hayek and Polanyi sometimes employed the term to encompass emergent social orders as a whole, and even biological phenomena. But their doing so obscured what was most unique about the market and science. For example, Polanyi writes that

> [a]n aggregate of individual initiatives can lead to the establishment of spontaneous order only if each takes into account in its action what others have done in the same context before. Where large numbers are involved, such mutual adjustment must be indirect: each individual adjusts himself to a state of affairs resulting from the foregoing actions of the rest. This requires that information about the state of affairs in question be available to each member of the aggregate; as in the case of such communal states of affairs as the conditions of various markets. . . (Polanyi, 1998, 195-6).

In a similarly expansive fashion, Hayek (1973, 37) writes that "the special kind of spontaneous order we call organism." This expansive definition of spontaneous order casts the net too widely.

Polanyi's description appears to make a jazz ensemble a spontaneous order. While jazz is emergent, jazz musicians hear the performance and can adapt to it. Market or science participants see only that tiny portion of the whole that interests them, and little of the context. In jazz, musicians are "playing together" as a deliberate act; in markets or science there is no equivalent. In jazz the connection between the emergent performance and the intentions of the musicians is very close; in markets or science this need not be the case. Jazz has a beginning and an end. Neither the market nor science does.

Hayek's example of an organism is genuinely emergent, but organisms develop towards a particular goal, a development that can be described as successful or not. They are teleological in a way that markets and science are not. Participants pursuing incompatible projects constitute a central and inevitable dimension of market and scientific phenomena, with the outcome of their competition unknown. Markets and science are discovery processes. In organisms competition like this would be pathological; the ends towards which they are developing are thus defined in advance. Puppies do not occasionally develop into goldfish.

I will define a spontaneous order more rigorously than did Hayek or Polanyi. Spontaneous orders such as the market and science are a *special kind* of emergent order within society, and they are special in the same way. Emergence arises from mutual adjustment. As Hardwick (2008) and Hardwick and Marsh (2012) have emphasized, the spontaneous orders of science and the market arise from mutual adjustment *among independent equals* using systemically defined feedback signals as guides to their actions.

Hayek and Polanyi identified the basic processes that generate spontaneous orders. They arise from networks of independent equals whose actions generate positive and negative feedback that help guide future actors in pursuing their own independently conceived plans, thereby continuing the feedback process. Each person is a node within a network and is linked by feedback, with each node free to act on its own. The feedback they generate minimizes the knowledge anyone needs about the system as a whole in order to succeed within it.

All spontaneous orders possess certain abstract features in common. Participants are equal in status and all are equally subject to whatever rules must be followed to participate within the order. All are free to apply these rules to any project of their choosing. Anything that can be pursued without violating a rule is permitted, including pursuing mutually contradictory goals. Finally, these rules facilitate cooperation among strangers based on certain broadly shared values that are simpler than the values actually motivating many people when they participate. Compared to human beings, spontaneous orders are "value-thin."

With this foundation we can begin to answer the first of Keller's two main theoretical questions: How do "new stable modes of organization" originate? Here is an initial answer with respect to some.

Origins

Spontaneous orders developed from within societies that were growing increasingly "civil," in the sense that more and more individuals were sharing equal and secure legal

status and were free to cooperate with one another along mutually acceptable terms. This development was long and drawn out, even in cultures profoundly influenced by ideas of liberal equality. For example, civil society had long existed among whites in the Antebellum South, but slaves were excluded. Today African Americans enjoy the same legal status as whites within the old Confederacy, and consequently are part of civil society.

As it developed, civil society also became increasingly differentiated. Using the terminology of ecology, with which it shares important systemic similarities, more and more niches developed where new types of organizations and activities could flourish. Systems of specialized rules and feedback developed within some subcultures such as the early scientific community

The feedback that emerged was increasingly impersonal, anonymous, and abstract. For example, in science over time standards of cooperation differentiated from those applying in society as a whole. Specialized rules facilitated scientific agreement even as they became less relevant for other kinds of cooperation. The scientific community became increasingly autonomous from the society within which it arose, and proved able to exist across many different societies, transcending local culture and custom. This process continues. Even now new and unanticipated spontaneous orders can arise, as with the Worldwide Web.

I believe this process describes a fundamental change in the nature of human relationships that, once it took enough hold, has progressively transformed society from one where hierarchy and status were taken for granted to one where hierarchy required justification and status was assumed to be equal. In a very real sense it is a social mutation from what had preceded it.

My description of how distinct spontaneous orders emerge out of a less defined context offers one broad answer to Keller's question of how new complex adaptive social systems emerge. Her next question, how they interact with existing systems, is far more complicated. I believe Polanyi's—and even more Hayek's—studies of spontaneous orders powerfully enrich our capacity to answer this second and most complicated set of questions.

Two disturbing implications

When I first read Polanyi's essay "The Republic of Science" I was a young graduate student and a relatively orthodox classical liberal who admired Hayek's work. I believed market economies reliably responded to consumers' desires and needs, and rewarded with profit those who did so most effectively. We were all consumers, so markets mirrored the values of—and responded to the choices of—free men and women. The details could get intricate, even paradoxical, but the basic principle seemed straightforward.

If, as Polanyi argued, science was also a spontaneous order this comfortable picture got more complicated. Both markets and science responded to free and un-coerced actions by participants, but they responded differently. People followed different rules. Feedback signals were different. And most importantly, the values each privileged as systems of coordination also differed. Science privileged reliable knowledge whereas the market privileged instrumental exchange. There were no truly neutral rules.

Two important insights arose from this realization. First, *different rules generate different spontaneous orders,* privileging plans reflecting different values. Once I realized that the market was not the only spontaneous order it became an open question as to how many such orders there might be. None could simply be declared the "best" for bringing people's voluntary plans into fruition. It depended on the plans.

Second, *the values underlying these rules are often distinct from the values of those acting within their purview.* A scientist's personal motivation need not be connected to the reception of his or her research. The same holds for participants in the market process, where choices impact prices regardless of the chooser's motivation. The orders succeed because—and as far as—rules and feedback are impersonal and apply to all, but the people acting within these orders are neither necessarily acting impersonally nor simply making an instrumental exchange or seeking reliable knowledge. Very importantly, the values privileged by rules are not necessarily harmonious with the values underlying people's motivations. The traditional free-market liberal argument that markets simply reflect people's values is false.

Systemic values

A distinction exists between individual values and what I call "*systemic values.*" No necessary identity exists between the values of those acting within an order and values privileged by the order itself, values that strengthen as orders develop. In any given instance, systemic and individual values might be in harmony but they also might not.

This journal—COSMOS + TAXIS—is a response to just such an issue. In systemic terms, publishing scholarly research is not intended to make money through royalties, but rather to gain authors recognition as having made valuable contributions within their field. With enough recognition

they are rewarded by the scholarly community with better positions, research funding, and so on.

Increasingly today academic journals are published by corporations seeking to make a profit. Profit arises from scarcity relative to demand. Corporations want to maximize their profit by limiting access, whereas scholars want to make access to their work as easy as possible.

The values of corporate publishers and scholars published by them are rooted in different kinds of spontaneous orders valuing different systemic resources and privileging organizations whose needs are in harmony with those resources. By contrast, online open source creative commons journals such as this one are in harmony with scholarly values but not with market values. The Internet's "gift economy" is in harmony with the "gift economy" that characterizes science (Benkler, 2006, 455-6; see also Hyde, 1969, 77-83).[3]

Levels of concreteness

Certain common qualities are unique to *all* spontaneous orders. Their rules have to be *procedural*, facilitate *cooperation*, and in a formal sense apply to all *equally*. With such rules people may engage in contradictory projects and in the process contribute to a larger order, facilitating successful pursuit of an unknown number of future plans. People are therefore free to act entirely on their own insights. These abstract propositions apply to all spontaneous orders.

But any given set of rules, such as those generating market or scientific relations, must be more concrete than simply facilitating cooperation. They facilitate certain kinds of cooperation. Prediction, measurement, experiment, and to a lesser degree rational explanation generate science, but not markets. Contract and property rights generate a market but not science. One privileges discovering reliable knowledge, the other privileges instrumental exchanges.

Even more concretely, different property rights and rules of contract generate different patterns of market phenomena. Markets exist when child labor is allowed and when it is not, when slavery is legal and when it is not, when workers give up their freedom while on the job, and when they do not. This same principle holds for virtually the entire gamut of property rights that is usually simply assumed to exist, their concrete details ignored. What does it mean to "own land?" It is different in the market economies of Norway or England than in the market economy of the United States.

The same observation holds for science. The details of the so-called "scientific method" manifest differently within different sciences. They also change over time within a science, depending on the development of leading theories and the discovery of new means of measurement and experimentation.

Consequently we need to distinguish which level of abstraction (among many) is being used in a study. This is particularly true when comparing spontaneous orders or how they interact, which is Evelyn Fox Keller's second big question. An abstract market order can only coherently be compared to an equally abstract alternative. There are several levels of concretization before we can compare actual historical instances of market and alternative phenomena (diZerega, 2008). This important area has only begun to be explored.

An abundance of spontaneous orders: Democracy

Ultimately I realized the principles underlying liberal democracy were also based on formal equality and the freedom of citizens to pursue different and even contradictory insights, subject only to following democratic procedures formally neutral as to their use. One person one vote, freedom of speech, freedom of organization, and common electoral rules that apply regardless of the party or issue provide a framework of rules enabling people to pursue any plan of their choosing compatible with the rules. Feedback through votes is both positive and negative (diZerega, 2000; 2011).

Whereas science seeks to discover reliable knowledge and markets seek to facilitate the discovery and coordination of private plans through making instrumental exchanges easier, democracies seek what I term "public values," which are the values citizens of a community want manifested within the community as a whole.

Consider contractual property rights, which define the sphere of voluntary relationships into which right holders may enter. Markets cannot exist without such a sphere, yet the details of what should constitute such a right are by no means obvious or objective. For example, what counts as pollution and what does not, and do the criteria change over time with advances in knowledge or intensified concentrations of what was considered negligible at one time? The answers to these questions are public values that cannot be discovered by markets, which depend on their having already been determined. Another example of how public values are distinct from those served by the market is the current controversy over private prisons, where few believe profitability is a sufficient measure of their value to society. Democracies enable all participants within a society to have, at one point at least, formally equal input into such decisions.

In *The Constitution of Liberty*, Hayek (1960, 109) comes very close to grasping that democracies are spontaneous orders, writing that it:

> is in the dynamic, rather than in its static, aspects that the value of democracy proves itself. As is true of liberty, the benefits of democracy will show themselves only in the long run, while its more immediate achievements may well be inferior to those of other forms of government (Hayek, 1960, 109).

He was describing a discovery process where no one oversees the whole, as contrasted to an instrumental organization. The same point could be made with regard to markets and central planning.

It is a puzzle to me why Hayek did not make the final connection, thereby uniting the three dominant institutions of liberal equality and making clear just how the principle of equal status transforms a society. But he did not, adhering instead to the old state model of describing democracy and referring to the rarely existing "will" of the majority as its "sovereign" (ibid., 403).[4]

In this failure Hayek missed the true significance of liberal social principles and the profound social mutation they made possible. Based on the ideal of equal status of all, Western liberalism replaced societies based on aristocratic and monarchical hierarchies with ones based on equal legal status. In the absence of emergent phenomena, liberal principles would have had seriously chaotic results beyond the institutional level of a small town. Instead, liberal societies flourished economically, advanced scientifically, and—as democracy established itself—generally became more peaceful internally and externally.

I think Hayek missed this connecting theme because of the context within which he developed his ideas. Common law was the other emergent order Hayek principally discussed, and in crucial respects it differed from the market order and science. Common law is not a spontaneous order in the sense that markets, science, and democracy are (Vasconcelos Vilaca, 2010).

Legal rulings are inherently hierarchical. Coercive decisions are rendered over those unable to influence its content by others who are. Law might define and refine what constitutes a voluntary contract, a procedural rule necessary for the market to arise, but law itself requires a hierarchy of power in order to enforce its decisions. Judges are the key participants in a common-law "discovery process" (Burczak, 2006, 45-57). The general public is not. Perhaps his focus on the law, despite realizing that sometimes it needed to be changed from the outside by legislative action, prevented Hayek from seeing this final connection.

Around the time I developed my insights about democracy as a spontaneous order R. J. Rummel was discovering how these characteristics explained why democracies behaved differently from undemocratic states internationally as well as their greater internal peacefulness (see Rummel, 1997). Soon afterwards, John Kingdon (1995, 222-230) came to similar insights while researching how American democracy responded to unpredictable issues, how it "learned" and adapted very quickly compared to undemocratic states. Rummel was aware of the complementarity of his analysis with Hayek's of spontaneous orders as well as my own of democracy.[5] Kingdon apparently was not.

Earlier writers had sometimes appreciated the discovery-oriented characteristics of democratic politics that distinguished them from more traditional forms of government, but lacked the concept of emergent order that would enable them to fundamentally distinguish democracy from these same forms. Bernard Crick (1962, 61) in particular came close with his conception of politics as rejecting the entire concept of sovereignty, even sovereignty of the people. Crick also emphasized that politics was eternal discovery, where no single policy is sacrosanct and all must be subject to political decisions. It depends on societies not being dependent "on a single skill, a single crop, or a single resource" (ibid, 141).

James Madison, the earliest serious thinker to explore this perspective, may have come closest to an understanding of democracies as spontaneous orders, but lacked the term. Madison's emphasis on democratic republics as being most secure when possessing many "factions," none of whom constituted a majority, as well as his argument that differently elected kinds of bodies, such as the House and Senate, are needed for discovering effective policies desirable for the community as a whole, led to this insight. He explicitly rejected majority rule and argued no unified will or plan was needed or desirable. Madison knew he was exploring new territory and argued that established ways of thinking about politics could not grasp what was happening in America (Madison, 1981, 361-62; see also diZerega, 2000, 57-132). But his warning was largely ignored, his path-breaking insights not followed up.

The Worldwide Web

During the same period that Kingdon, Rummel, and I were developing complementary insights on democracy as

a spontaneous order, the Worldwide Web was coming into existence. The web is the first spontaneous order to arise entirely from within the contemporary world. In doing so it enriched the gift economy which had long remained vital to science and scholarship in general, but otherwise had largely dropped from sight. The "gift economy" had long characterized many materially simpler human societies. Now it appeared at the leading edges of applied technology and on an enormous scale (Benkler, 2006; Barabasi, 2003). As in other spontaneous orders, the web generates useful order without anyone being in charge. The worldwide web reflects liberal values of equal access and status, while information is coordinated by feedback from within an almost unimaginably complex network community.

Wikipedia is an example of how the web enables up-to-date knowledge to become widely available more rapidly than with older more centralized equivalents such as encyclopedias, even online ones. Further, it is accomplished entirely through voluntary contributions of time and expertise.

Language

Jürgen Habermas argues that equal status is inherent in the inner logic of language. Habermas argues that *at its core* every speech action claims to speak truthfully about the external world, appropriately within its social context, and be truthfully intended on the part of the speaker. Language that violates these principles is distorted communication parasitic on these principles (Habermas, 1979, 1-68; see also Adelstein, 1996, 229). If Habermas is correct, as I believe he is, language—which in any event is clearly emergent—would also qualify as a spontaneous order that in practice, as with the others, can be distorted by power and other forces.

In their pure form, each set of rules generating a spontaneous order is a more narrowly focused example of speech and communication among equals. Each comprises an analytically distinct sub-dimension of Habermas' ideal speech situation, which constitutes the most abstract universal description of the normative structure of speech relationships. I think democracy, science, the market, and the web can be considered as specialized communicative subsets immersed within language, which itself makes civil society possible.

Studying many spontaneous orders helps us understand them more deeply than is possible from focusing on only one, which is usually the market. Each spontaneous order arises from following rules biased towards certain values, and as systems each is to some degree separated from the purposes and values of the people whose actions generate them (through poetry language can even take us to where words cannot explicitly go). Through comparative study we can see what these orders share in common and what differentiates them. We can also explore conflict-laden and symbiotic relations between these orders, and how their principles interact with the place and time wherein they arose and continue to persist. Because any actual order exists enmeshed within a larger social, historical, and physical context, this field cries out for comparative studies. We hope this journal will attract such studies.

3: CIVIL SOCIETY

Jane Jacobs was not a theorist of spontaneous order; her focus was on civil society. Her work on cities, and especially urban neighborhoods, provide a perceptive study of the intricate human networks that comprise urban civil society. Her urban communities respond to a wide range of values that are woven together to create a complex urban culture, one that may differ importantly from city to city (Plaut *et al.*, 2012).

Unlike spontaneous orders, civil society is not coordinated by any single system of feedback signals, but incorporates many, including all we have discussed as coordinating spontaneous orders. This abundance of feedback means that no single standard of success or failure is defined within civil society. Individuals have wide latitude as to which kinds of feedback to attend to, and how much.

Civil society comprises the field of relations among status equals, most of whom are relative strangers or unknown to one another. It is not defined by procedural rules, as are spontaneous orders, but by equal status alone. Agreement is its coin of the realm, enabling independent equals to enter into open-ended cooperation with others. In other words, civil society constitutes the realm of freedom within society. Spontaneous orders such as the market contribute to this freedom only insofar as they remain immersed within civil society, and when they free themselves from it, problems arise.

Civil society is limited by how easily status equals can cooperate across a wide range of values. From this perspective, and for most purposes, the world consists of many civil societies, each of which honors equal status among its members, but do not necessarily see one another's members as belonging to the same civil society.

I think we can draw a distinction based on often tacit customary practices and beliefs as well as those that are more explicit. As a rule of thumb, different people will tend to feel more or less "at home" in different civil societies,

which are differentiated at different scales (example: I feel more at home in America than in Italy, and more at home in Northern California than in the Midwest, and more at home in Sebastopol than in Eureka). People will therefore feel more or less able to enter into a variety of cooperative relations across many values.

America and Italy also demonstrate how different examples of civil society have indistinct boundaries. Not only do spontaneous orders such as science and the market include many members from within both the United States and Italy, many kinds of associations and interests share members across them as well. But to be at home in a civil society requires a kind of cultural "fluency" that can take years, to attain, and in some cases it can never be attained.

Economic and scientific relations cross these boundaries most easily because their feedback is standardized and impersonal, speaking to basic human interests shared by many worldwide. Other more subtle social relations translate across boundaries far less easily.

Social Ecosystems

In this respect civil society is analogous to an ecosystem. Both are theoretical constructs defined by the issue to be studied, their boundaries described by the kinds of relationships on which the investigator is focused. We can look at the ecosystem of a pond that exists within the ecosystem of the Adirondacks that exists within the ecosystem of the northern forest and so on. Short of the biosphere as a whole, the boundaries are permeable with respect both to life forms and material resources, some expanding beyond it, and new members arriving from outside. It turns out the Amazonian rainforest receives important nutrients in the form of dust from a part of the Sahara, but for most purposes we would not include both in a study of the Amazon. Planet earth is the ultimate ecosystem, as a (at this time hypothetical) world wide society of status equals is the ultimate civil society. But for most purposes more defined cases are more useful and easier to understand.

Historically civil society appears first as an urban phenomenon. Only in cities were populations large enough that in some instances complex orders could arise based upon relationships between equals. The city may well be the womb of civil society as civil society is the womb of spontaneous orders.[6]

David Hume, Adam Ferguson, and Adam Smith provided the first serious studies of how civil society could be understood as an emergent order. To my mind the next major thinker was Alexis de Tocqueville (1835/1961), whose book *Democracy in America* is the first extended study of civil society. "Democracy," as he used the term, refers to the unprecedented equality of status among most in nineteenth-century American society, and how it manifested itself socially as well as in government. Tocqueville (ibid., 90) emphasizes that in America the "appearance of disorder which prevails on the surface, leads [the foreign observer] at first to imagine that society is in a state of anarchy; nor does he perceive his mistake until he has gone deeper into the subject." Tocqueville's emphasis on subtle unplanned spontaneous order has not been much pursued, but now that civil society has become a subject of considerable interest, perhaps scholars will be more open to appreciating his insights.

Much more recently, the late Richard Cornuelle grasped the importance of what he called the "independent sector"—as distinct from both the market and government—as a vital sphere of social creativity and individual freedom. But the very diversity of feedback signals—and the freedom to respond to them in a variety of ways—prevents the larger patterns so prevalent in spontaneous order processes from emerging. As Cornuelle (1993, 102) observes:

> Look at Saul Alinsky's conquest of America's worst slum, at Henry Viscardi's success in putting the handicapped to work, at Cleo Blackburn's work in rebuilding slums, at the Menninger's work in mental health, at Millard Roberts' work in education. These operations rarely reach far beyond what these gifted and strong-willed men can do themselves.
>
> Yet their cumulative impact is enormous.

Civil society is the most complex human emergent order, because order grows out of so many seemingly disparate elements. Perceiving it, as Tocqueville explained, calls for prolonged immersion. There is no equivalent to prices, professional reputation, or votes. No single feedback signal coordinates all of Cornuelle's examples. Yet each sends ripples of influence out to others with similar interests. As with emergent orders in general, the resulting order is too complex to lend itself to deliberate construction. Cornuelle emphasized this point, and more recently and from a different political perspective, James C. Scott (1998) makes a similar argument.

Both Scott and Cornuelle see themselves as working in harmony with lines of inquiry Jane Jacobs had done much to illuminate. Both emphasize that their analyses should not be subsumed within the market model so many of their admirers find attractive. Scott (2001) went so far as to write a long

critique of such attempts to reduce civil society to market relations.

This observation sets the stage for one more theorist of civil society who—while coming from a very different intellectual tradition—helps provide a more encompassing framework within which to explore the role of spontaneous orders in society. Jürgen Habermas began his intellectual career as a leading second-generation member of the Marxist-rooted Frankfurt School, and many Marxists have been among the most intense critics of civil society. Habermas, however, developed his thinking in a different direction. I believe this happened because of his interest in language as containing within it values of equality and un-coerced communication. I think Habermas' work provides one of the best overviews of civil society from an emergent perspective, as well as substantially enlarging the universe of questions opening themselves up for exploration.

Compared to many working within the Hayekian tradition, Habermas is more sensitive to the kinds of communicative *distortion* possible within formally voluntary frameworks. Discussing them is well beyond the scope of this paper, but I hope my analysis of systemic tension and contradiction demonstrates how these kinds of insights are central to truly understanding emergent social orders. Using a different vocabulary from my own, Habermas writes:[7]

> The lifeworld forms, as a whole, a network composed of communicative actions. Under the aspect of action coordination, its society component consists of the totality of legitimately ordered interpersonal relationships. It also encompasses collectivities, associations, and organizations socialized for specific functions (Habermas, 1998, 354).

Habermas sees, as many working within his Neo-Marxist tradition do not, that society cannot be rationally governed by even the most enlightened citizenry. It is too complex and decentered. Democracy itself must be immersed within and subordinate to civil society. Unlike many coming from a Marxist perspective, Habermas emphasizes that any complex decentered polity is beyond the capacities of citizens to control. Administrative planning is impossible (ibid., 297-98). Decisions are always open to challenge, and at its core this process of public organization, discussion, and debate must be located within civil society, which Habermas (ibid., 307) describes as "anarchic" and "wild." Habermas (ibid.; see also Pelinka, 1999, 204) is clearly describing an emergent process:

> The institutions of public freedom stand on the shifting ground of the political communication of those who, by using them, at the same point interpret and defend them. The public sphere thus reproduces itself *self-referentially*, and in doing so reveals the place to which the expectation of the sovereign self-organization of society has withdrawn. The idea of popular sovereignty is desubstantialized. Even the notion that a network of association could replace the dismissed "body" of the people . . . is too concrete (Habermas, 1998, 486).

In Habermas' work we see a convergent stream that brings together two traditions of modern social thought long thought of as polar opposites.

In his pioneering work Cornuelle raised the important question of to what degree the independent sector could provide what I term public values better than traditional political institutions. In Habermas' work we find a convergent stream from a very different intellectual tradition. I believe considerable cross-fertilization is possible.

And here we get, at last, into examining the more conflict-ridden and tension-filled dimensions of social emergent processes.

4: REALMS OF TENSION AND CONFLICT

Posthumous introductions: Marx, meet Hayek; Hayek, meet Marx

When we recognize a variety of emergent and spontaneous orders, questions about tensions and conflict as well as reinforcement and symbiosis arise (diZerega, 2010). Because different spontaneous orders are coordinated through different feedback systems reflecting different values, they privilege values that can be contradictory to one another. Earlier I described how the market's focus on profit, arising from scarcity relative to demand, worked at cross-purposes with those of science that rewards through recognition and reputation. There are many such possibilities.

In addition, because coordinating signals within spontaneous orders simplify the information people need to operate effectively within them, there is no guarantee that what is eliminated is unimportant from the *standpoint of the participants*. In principle systems can work to undermine the larger goals held by those acting within them, not simply because their plans were mistaken but because—given order-specific biases—their broader purposes were undermined. For example, as I write this paper Monsanto is seeking to prevent consumers in California from being informed of whether

or not their food has genetically modified organism (GMO) contents. If they get their way, consumers preferring non-GMO food will have much more demanding tasks discovering the truth. Guided by price alone they might purchase cheaper GMO-containing food, thereby injuring producers of non-GMO food they would prefer to purchase if they knew the difference.

Most classical liberal and Austrian-inspired studies have paid little attention to these issues, since they consider markets to be ultimately harmonious and in most cases tending towards equilibrium unless perturbed from the outside. Hayek, Ludwig Lachmann and a few more recent scholars in this tradition are exceptions to this generalization (Hayek, 1978, 4; Lachmann, 1986, 124; High, 1986, 113-19; Caldwell, 2004, 224-30).

By contrast, the anti-capitalist tradition of the left offers insights that—while transformed in important respects when viewed from within a spontaneous order framework—nevertheless provide useful starting points for understanding this darker side of relationships between spontaneous orders. For example, Habermas writes that civil society:

> encompasses collectivities, associations, and organizations socialized for specific functions. *Some* of these functionally specialized action systems become independent vis-à-vis socially integrated spheres of action … Such systems develop their own codes, as the economy does with money and the administration does with power (Habermas, 1998, 354).

There are at least five dimensions to this issue, two closely identified with the Marxist tradition and three more universally discussed.

1. Commodification

Karl Marx began his most sophisticated analysis of capitalism by examining the commodity, an item produced entirely for sale. He saw it as exemplifying a system of social relations more complex than simple exchange and, when the primary focus of economic production, unique to capitalism (Marx, 1867/1992, 125-77). "Commodification" involved the progressive transformation of all productive activity to the creation of products valueless to their producers except for their exchange value as commodities. Marx argued that a high human cost accompanies commodification, the gradual expansion of capitalist relations to cover ever more dimensions of human life.

Little attention has been paid to Marx's concept because it has been subsumed within Marx's flawed theoretical system, especially his labor theory of value, and it has been further discredited by the appalling political consequences of using that analysis to structure a society. However, once we recognize that there is no simple correlation between personal motivations and desires and the market order, I think the *problem* Marx described becomes both theoretically interesting and practically important. I have begun to explore it myself with regard to the media and I hope others will follow, either expanding my analysis or demonstrating why my argument fails and commodification is not a problem (diZerega, 2004).

2. Alienation

Spontaneous orders become impersonal forces confronting us as a part of our environment—and their utility in social life *requires* that they do so to at least some degree. They can therefore be encountered as dominating forces. If the values they privilege are at odds with the values of those acting within them, they turn from enhancing freedom to limiting it.

Money is the systemic resource for markets, as power is for governmental organization. Power is easily understood when it manifests as physical domination. The role of the market is more complex because it arises out of relations of formal equality.

The market's systemic bias is towards instrumental values acquired through consensual instrumental action. In cases of pure market exchange, parties are resources for one another. When transactions are frequently face-to-face among resource owners, this bias is diluted by the more complex values motivating both parties as human beings. As the market becomes more impersonal this value complexity disappears. We exchange with strangers and with representatives of strangers.

At least with respect to the market, in Marxian terms a spontaneous order can become an alienating force, a product of human activity which then stands over and against individuals as a force of domination and constriction rather than empowerment and liberation. I believe this insight can also be applied to science, as illustrated by the history of eugenics. It occurs in democracies as well, with the problem often—but not always—labeled "majority tyranny" (diZerega, 2011).

Alienation is the shadow side of relations being the product of human action but not of human design. Systemic biases are not necessarily harmonious with the values and

purposes of individuals who pursue their plans within that system. Spontaneous orders tend to bring ever larger fields of action, and so elements of civil society, into their domain. Alienation and commodification are related, as Marx argued.

3. Power and competition

Hayek compared competition in spontaneous orders with competition in a game. In both cases competition was necessary to discover what could not otherwise be ascertained (Hayek, 1979, 67-70). His observation is important, but the differences between these two examples are also important.

A game has a clear beginning and end, and during it the rules are constant. A spontaneous order is an ongoing field of relationships with no beginning and no end. People enter and eventually leave. There is no final move, for within such orders the basic actions are repeated across generations, indefinitely.

In addition, unlike in a game the rules are subject to change at any time and—as in a game—any change in the rules will have an impact on the "players," assisting some and penalizing others. All those participating will have an interest in the content of the rules, but not all will be equally able to influence that content. Those currently winning within such an order have an advantage in shaping changes in the rules to keep them winning.

For example, the Disney Corporation played an important role in getting copyright laws changed to prolong their commercial control over Walt Disney's characters. The nuclear industry has obtained special exemption from liability laws that apply to others. Costs of accidents were socialized while profits remained private. Today's banking crisis repeats this pattern on an even larger scale. The oil industry uses eminent domain to build pipelines free from requirements for voluntary contracts. There are many such examples.

This pattern appears again in democratic politics. Early in American history political parties passed electoral laws virtually ensuring a two-party system against competitors. Their efforts have been so successful that the only time the system broke down was before the Civil War. Americans scarcely know anymore that women and free blacks had the vote in New Jersey until the early 1800s, when they lost the franchise. Variations of this disenfranchisement occurred in other northern states that once allowed at least some women and free Blacks to vote. And as is well known, this problem was vastly larger and much longer lasting in the South. Today one party is seeking to change electoral rules in states where it has the power, again to influence electoral outcomes. Both parties continually gerrymander Congressional districts to preserve their power when unbiased rules might lead to their defeat.

What counts as property rights also reflect historical power inequalities, where the powerful had a disproportionate role in defining those rights. For example, the distribution of political power among those who seized Indian land then influenced how that land was divided into bundles of rights, leading to conflicts today over how much surface rights can be disrupted or destroyed by those owning subsurface rights. Rights reflect relations of power, dispossessing Indians and subordinating ranchers to corporations.

We see an equivalent pattern in democratic politics. Having a well-known family member in elected office usually gives other members an advantage should they choose to enter politics. The names Roosevelt, Taft, Rockefeller, Kennedy, Bush, and Byrd all attest to this fact. The male descendents of our Founders died before becoming adults save one, and John Quincy Adams became a President as had his father. [8] In every case abstract equality among participants is drastically modified by systemically derived inequalities.

These inequalities are strengthened by a quality inherent to human life. Successful parents normally want to use their success to assist their children. The form and extent this assistance takes varies dramatically, of course, but it is a basic human motivation. The ideal of equality under the rules can conflict with love for those closest to us. As Lenore Ealy observed to me, "the challenge is balancing the motivating incentive of giving to our children and grandchildren with the claims of other citizens."

Finally, as has been the historical case everywhere, the actual terms of exchange in markets reflect formal equality and substantive inequality. For example, in America a job is almost always more important to a worker than most workers are individually to most job providers. This is why both employers and employees see their relationship as hierarchical, involving boss and underling, rather than a partnership.

Resource inequality usually benefits an employer, but when the prospective employee is in very high demand it can be the other way around, as with movie and sports stars (Magruder, 2012). As a general rule public policy is dominated by those whose resources are most able to influence politics. For example, when labor is weak monetary policy ranks unemployment as less undesirable than inflation, when labor is strong, priorities change.

4. Ecology and spontaneous orders

Society exists within the natural world, which is itself characterized by two additional emergent processes: the dynam-

ics of ecosystems and of biological evolution. The first covers emergent networks within a varied natural community of plants, animals, and fungi where species may come and go, but do not themselves fundamentally change. As with spontaneous orders and civil society, the dynamics of ecosystems seem to me to be a variant of Keller's "internal selection." The second, evolutionary system, governs the origin of new species or new variations within a species. It usually covers larger spans of time. It is characterized by natural selection.

Human systems are immersed within and dependent upon natural ones. In *Guns, Germs, and Steel*, Jared Diamond (1999) makes a compelling case that a thorough knowledge of earthly ecosystems and geography before civilization arose would have made it possible to predict where on the planet it would happen. Obviously natural systems can be degraded to the point of collapse, and changes in natural systems have destroyed human ones through their failure to adapt to changes in their environment, as with the Norse in Greenland (Diamond, 2011, 178-276). The people of Easter Island—either foolishly through over-cutting or inadvertently through introduced species—so degraded their ecosystem that it collapsed (ibid, 79-120; for the role of rats, see Marshall, 2012, 30-36). The list is longer but these examples are unchallenged in their clarity.

These examples also illustrate a dilemma.

In the short run human systems adapt more quickly than most natural systems, but they respond chiefly to feedback from the human world. Human technologies can change many times within a generation, because signals circulate rapidly between individuals and systems. The generation born in 1900 lived when horses and carriages were the dominant mode of transportation. Many survived to see the first moon landing in 1969.

Natural systems adapt through generational change, which is the speed of reproduction. It is no accident that natural forms that rapidly reproduce handle humanity's influence more successfully than do more slowly reproducing organisms. Because of this difference in speeds of adaptation, a human system can disrupt a natural one yet at the same time be completely dependent on that system. This tension is intrinsic to interacting systems where one is overwhelmingly cultural and the other overwhelmingly biological.

5. Organizations vs. spontaneous orders

Spontaneous orders make complex organizations possible, and richer orders enable them to be larger and more varied. At the same time spontaneous orders always threaten the continued existence of organizations within them. Research projects can suddenly fail when a theory on which they have based their work is unexpectedly replaced by a new discovery. Political parties can be rejected at the polls. Businesses can disappear because no one buys their products any more. Consequently *there is no lasting harmony of interests between a spontaneous order and the organizations existing within it.* Organizations seek to persist; spontaneous orders threaten that persistence.

There is a close analogy here with the relationship between individual organisms and the ecosystem within which they flourish. Both organisms and organizations can be understood teleologically. They can succeed or fail. For organisms, the same ecosystem that makes them possible can eliminate them, as when a deer is caught by a cougar. If deer could vote, cougars would be imprisoned to the benefit of individual deer but to the long-term detriment of the ecosystem that supports them. Organizations stand in the same relationship with the spontaneous orders within which they exist and flourish.

5: A PARADIGM ARISING

Thomas Kuhn's use of the term "paradigm" was loose, but generally fell into three broad contexts. First it refers to a set of beliefs about the world. Second, paradigm refers to the methods and tools and principal texts that define how a field is practiced. Third, it refers to a scientific achievement serving as an example of how that science is done. Kuhn himself said his major intent was the second (Kuhn, 1970).

Hayek gave us the market order as a paradigm in this sense. Similar insights were developed by Polanyi and, in biology, by Keller and Geller. Their research helped link how egalitarian rules generated organized complexity in biology with how egalitarian rules generated spontaneous orders as another form of organized complexity in the human sphere. Keller also gives us a broader view of our paradigm as a more all-encompassing research project, in Kuhn's first sense. As Keller put it:

> We have learned that a science of self-organized complexity will have to take into account processes of self-assembly and self-organization in multilevel systems, operating on multiple spatial and temporal scales through multilevel feedback in which the internal structure and properties of the component elements are themselves responsive to the dynamics of the system (Keller, 2009a, 30).

This paper has sought to make connections explicit across the board, unifying an approach of enormous potential, thereby expanding it to cover other spontaneous orders such as democracy and the net. It provides a framework for exploring the complex relationships between and within them, and the place organizations play within them.

In the process the emergent paradigm helps clarify a series of confusions that have long plagued clarity of understanding in social science. Failing to distinguish spontaneous orders from organizations has been a source of confusion, because the same word has consistently been used to describe two fundamentally different kinds of order. Hayek emphasized the confusion arising over the term "economy," which refers to both the spontaneous order of a market economy and the economy of a corporation or a household. Science suffers the same ambiguity. Science is a spontaneous order and a scientist "does science" by pursuing a research project. Democracy is a spontaneous order when there is no overarching purpose pursued by the polity, but a democracy in a major war possesses a national unity of priorities and acts like an organization. Significantly, it is when a democracy is most unified under a single hierarchy of goals (most "democratic" from an organizational perspective) that it acts most undemocratically. The significance of this difference is often overlooked. This confusion runs throughout our language.

Social emergence takes three broad forms: spontaneous order, where all share equal status and the system generates a single or very narrow set of signals for systemic coordination; civil society, where status is equal and a great many and sometimes conflicting kinds of feedback provide a rich matrix of information allowing for a wide range of choice and creative response; and other social emergent systems, such as the evolution of customs, in which there need not be equal status among participants, but there is no single goal of the system of relationships thereby established.

This essay has attempted to describe what I think is a promising new paradigm in the social sciences. It is a paradigm that integrates it into the burgeoning study of emergent processes, particularly in biology. It seems to me a rich and exciting framework for research and scholarship.

NOTES

1 An insightful philosophical treatment of this perspective, and how it differs from traditional Western philosophical perspectives, is Joanna Macy (1991).

2 "Paradigm" as Kuhn employs it covers several meanings, but these complexities do not matter for the point I am making. See also Masterman (pp.59-90) in Lakatos and Musgrave (1970).

3 "Walking his talk," Benkler made his book available to all as an open-source creative commons document: http://cyber.law.harvard.edu/wealth_of_networks/Main_Page

4 I think Hayek's error arose from his relative lack of knowledge of the American revolutionary tradition of political thinking, particularly that of James Madison. As Madison emphasized, European thought could not comprehend the principles underlying American representative democracy, or any democracy (cf. diZerega, 2011).

5 Personal communication.

6 Putnam (1993) gives a good account of the history of civil society in Northern Italian city states.

7 As Hayek and Keller both found important foundations in Warren Weaver's work, so much of Habermas' work owes a considerable debt to theorists such as Alfred Schutz (like Hayek, once a student of von Mises) and Thomas Luckmann, who are better known to those conversant with Hayek's work.

8 I am grateful to Prof. Mary Hanna of Whitman College for pointing this important fact out to me.

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