The Collective Dynamics of Belief

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One of the themes that dominates the *Protestant Ethic* is that belief precedes rationality; that the values by which one economic order can be judged superior to another are neither universal nor exogenous, but arise endogenously within a specific historical and social context. Although this line of thought has been enormously influential in sociology, it has attracted considerable criticism as well. How is it then, that people, collectively, come to believe the things that they do? In this chapter, I first review briefly the debate between what I call "rationalist" and "historicist" views of human behavior, and argue that both perspectives suffer from different versions of the same problem—that of explaining collective behavior in terms of a representative individual. I then motivate and describe a very simple class of decision making models, from which I conclude that rules which are simple, intuitive, and even rational from an individual's perspective, can generate collective dynamics that are complex, unpredictable, and counter-intuitive. As a result, collective outcomes are ambiguously related both to individual preferences and also contextual variables, and causality in historical processes is rendered elusive. I conclude by describing how thinking about collective belief formation may shed light on some phenomena of contemporary capitalism.

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[1] I am grateful to Peter Bearman, Victoria Johnson, and Richard Swedberg for their comments on earlier drafts. I am also grateful to the members of the Collective Dynamics Group—especially Peter Dodds, Dunia-Lopez Pintado, and Matthew Salganik—for many stimulating discussions. Finally, I would like to thank RS, Victor Nee, and the Templeton Foundation for inviting me to contribute this paper, and the National Science Foundation (SES-0094162 and SES-0339023) and the McDonnell Foundation for financial support.

1. Introduction

In the *Protestant Ethic*, Weber (1958) famously argued that the origins of modern Western capitalism lie not in the inherent economic superiority of the system over its natural alternatives, but in the religious zealotry of a certain branch of Protestantism—in particular, its belief that wealth accumulation (but not consumption) was material evidence of spiritual purity. Had Protestantism not taken the turn that it did, capitalism would not have developed as we know it today. Thus, in a certain sense, capitalism—or more particularly the laissez faire style of capitalism practiced in, for example, the US—was an accident of history. It was, however, an accident that subsequently embedded itself into the very core of the cultures that formed around it, via a process of rationalization in terms of economic principles that came—after the fact—to be regarded as universal. Thus the accident is not viewed today as an accident at all; rather it is seen as part of an inevitable, deterministic convergence towards rational enlightenment. Weber concluded, therefore, that while its origins may have been unpredictable, its future was not: the Protestant West had been locked into the "iron cage" of capitalism from which it would not escape[2].

[2] It is worth noting that Weber's full argument is considerably more complex, and his aims more encompassing, than my simplistic sketch of it might imply. Very briefly, Weber's larger project (of which the *Protestant Ethic* is only one part) was to understand the rationalization of culture in modern western societies—a phenomenon he saw as unique in history. His explanation was that all cultures can be characterized in terms of the relationship between three social "spheres"—religion, the polity, and the economy—each of which may or may not exhibit, in any given society, the hallmarks of rationalization, by which he meant the codification of social conduct, and its associated ends, in terms of an impersonal system of rules, roles, and relationships. In non-western societies, Weber argued, one or two of these spheres may have experienced rationalization; but only in western societies did the particular process of rationalization taking place in each sphere turn out to reinforce, rather than undermine, the rationalization of the other two. In Indian culture, for example, Hinduism is highly rationalized, but the particular nature of the resulting belief system causes its adherents to withdraw from worldly economic activity, rather than actively pursuing it. Calvinism, by contrast, had precisely the opposite effect. It is thus the peculiar historical process by which rationalization appeared in all spheres of western culture that Weber was seeking to understand in the Protestant Ethic—a process which, on account of the mutually reinforcing

Subsequently, Weber's argument has been adopted as a central pillar of the sociological critique of economic rationality[3]. Attitudes, norms, and rules which are often justified as "rational", "efficient", and "optimal" frequently turn out to have arisen via historically and culturally specific adoption processes which, on closer inspection, seem to be driven not by rationality at all, but by explicit or implicit pressures to conform with some emerging institutional or social norm (Meyer and Rowan 1977; DiMaggio and Powell 1983). Only after such a norm is established as dominant in a particular place and time does its rational superiority with respect to what previously might have been regarded as legitimate competitors come to seem not only self-evident, but also universal. According to this argument, it is then the perceived "rationality" of such institutional arrangements that enables them to extend well beyond the specific historical-cultural circumstances in which they are established.

Needless to say, not everyone is persuaded by this style of argument. One can assert, as Weber appears to do in the *Protestant Ethic*, that beliefs precede rationality, and one can usually tell a story, as Weber does, that is consistent with the argument that these beliefs, and thus their subsequent rationalization, are culturally and historically contingent. But

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nature of its constituent parts (the so-called "iron cage"), continues to exert its influence even today. A full account of Weber's real project, however, is well outside the scope of this essay, which aims to explore a problem that Weber's analysis exhibits, but doesn't identify: the conflation of individual and collective logic. For the purpose of this essay, therefore, the simplistic version of the Protestant Ethic sketched out in the text will suffice. I am grateful, however, to Peter Bearman for clarifying the scope and subtlety of Weber's intellectual framework.

[3] Ironically, Weber's argument also laid the foundations for rational choice theory: Because, at least in western societies, individual action could be understood in terms of rational principles, it followed that theories of individual action could proceed on the basis of universal rational principles, unencumbered by the details of the particular social-cultural context. Thus Weber occupies the unusual position of intellectual progenitor of two opposing philosophies of human behavior.

one could just as easily assert that the causal arrows points in the opposite direction. All forces, after all, even timeless and universal forces, must manifest themselves in specific places at specific times. Thus one could interpret the relationship between Protestantism and early modern capitalism as simply the particular historical and cultural circumstances under which a universally superior economic system won out. Certain ultimately irrelevant specifics of those beliefs may be idiosyncratic and contextually dependent, but their important details reflect universal principles. It might *seem*, in other words, as if certain specific features get institutionalized for non-rational reasons, and then are subsequently rationalized in terms of universal principles. But in fact the opposite process is occurring: rationality precedes beliefs, which are therefore merely a means to an end.

On account of the contentious nature of Weber's explicitly historical account of capitalism, the *Protestant Ethic* has come to occupy an important place not only in the development of what would later become economic sociology (Swedberg 1998), but also in the long running debate over causality in historical, social process (Boudon 1998; Calhoun 1998; Goldstone 1998) that has taken place among sociologists, particularly in the last twenty years[4]. At the risk of oversimplifying what has become an increasingly differentiated and sophisticated discussion, I wish to divide the debaters into two camps, which I will label (again risking some violence) *rationalists* and *historicists*. Rationalists, on the one hand contend that historical outcomes can only be understood when they are

[4] See the special issues of *Sociological Methodology and Research,* 20(4) (1992) and *American Journal of Sociology*, 104(3) (1998), along with Tilly (1984), McDonald (1996), Abbott (2001), and Adams et al. (2005) for a range of viewpoints.

derived from instrumental models of individual action that are based on consistent and timeless human traits and preferences (Kiser and Hechter 1998; Goldthorpe 2000). Historicists, by contrast, contend that no such traits and preferences exist; that all action is historically contingent; and that only by examining the basis of what is considered "rational" in any particular and necessarily historical context, can one understand historical processes (Somers 1998).

The remainder of this chapter proceeds as follows. In the next section, I want to describe briefly the pros and cons of these two stylized positions before suggesting that, in fact, they have more in common than they at first seem. Both, I shall argue, make the same fundamental error of substituting individual for collective behavior; thus both reach conclusions about causality that are ultimately unsustainable. In Section 3, I outline an extremely simply model of collective belief formation that helps illuminate the difference between individual and collective dynamics; and in Section 4, I discuss some of its implications for understanding collective causality—especially the relation between beliefs and rationality. Finally, in Section 5, I attempt to relate this rather abstract discussion of causality to more concrete examples of contemporary capitalism.

2. Rationality, History, and Causality

One way to frame the argument between rationalists and historicists is that it is about the process by which people, organizations, institutions and even societies come to place value on certain things and not others. Rationalists tend to be of the mindset that there is no such process: people always value the same things in all times and all places, and we

can know what those things are simply by reflecting for a moment. Usually they conclude that people value time, goods, and money, and that all three are more-or-less interchangeable Historicists respond that people do not, in fact, value the same things at all times and in all places, nor does the historical record suggest monotonic convergence towards universal agreement—disagreement, in fact is remarkably persistent, even within cultures (Huckfeldt, Johnson, and Sprague 2004). Furthermore, preferences, values, and beliefs, do not simply vary exogenously across temporal, spatial, and social context—at least some of these variations are generated endogenously by the actions of the participants themselves, who are then subsequently subject to the "new rules".

Sewell (1996a), for example, discusses the storming of the Bastille as an event that only become an "event" in the historical sense several days after the fact, and only by virtue of the interpretation given to it by several groups of actors, most of whom were not actually involved in the event itself[5]. As Sewell points out, the actual occurrences of July 14 were not inevitably transformative, and had the National Assembly and the King simply ignored them, quite likely we would not have heard of the Bastille today. Probably some kind of revolution would still have occurred, but the manner of its occurring, and the particular mechanisms by which the socio-political order was overturned may have been quite different. But the National Assembly did pay attention, elevating what could have been construed as straightforward mob violence to the lofty act of a people recovering their sovereignty. Subsequently the King paid attention as well, withdrawing his soldiers

[5] Much earlier, Danto (1965) made a similar but more general argument regarding the recording of all of history—that, in effect, history cannot be recorded at the time it is happening, because the meaning of what is happening now is only ever apparent later.

to the provinces and traveling to Paris in contrition. But it was these subsequent acts, following from active decisions made by non-participants, that generated the real impact of the Bastille. The Bastille itself was nothing—just another random blip in a chaotic series of events of which no-one was in charge—but the *story* of the Bastille was everything, uniting a nation around a new set of assumptions, beliefs, and perceptions about what was possible, acceptable, and indeed rational.

Sewell's account of the Bastille suggests that narratives are more than simply records of events; in a very real sense they *are* the events. They are not, however, events like a riot or an attack on a fort, which are merely a sequence of actions. Rather, they are events that transform the values and beliefs of actors in such a way that an action which may not previously have maximized some notion of expected utility, and hence would not have been considered "rational," now does. Or as Sewell remarks elsewhere, "Humans, unlike planets, galaxies, or subatomic particles, are capable of assessing the structures in which they exist, and acting—with imperfectly predictable consequences—in ways that change them." (Sewell 1996b, p. 251). This process by which the non-rational becomes rational, without ever changing the interpretation of "rational" itself, lies at the heart of the historicist mindset.

Another way to think about the rationalist-historicist argument, therefore, is not simply in terms of universal rationality vs. historical contingency, but in terms of the relation between two different kinds of beliefs. First, there are what might be called "ordinary beliefs": beliefs that one thing is better than another; that some things are right and others

wrong; or that some statements are true, while others are false. Ordinary beliefs are the kind we most often associate with the word "belief" in part because they don't require any particular knowledge or reason to justify them—we simply hold them, even if we haven't thought about why. However, if we do think about why, we immediately encounter the second set of beliefs, which are beliefs about universal, or at least general, principles according to which our ordinary beliefs can be justified. For example, we may believe that the *Mona Lisa* is a great work of art, period. Such a belief is an ordinary belief, because it doesn't require us to know anything about what makes a work of art great, or even care about not knowing. However, we may also believe that our ordinary belief is justified by our understanding, obtained possibly through study and experience, of the general principles of art, according which the quality of particular works can be judged systematically. Because these latter beliefs are, in effect, beliefs about beliefs, I will call them "meta-beliefs."

In a nutshell, the argument can then be boiled down to the question of whether ordinary beliefs derive from meta beliefs, or the other way around. According to the rationalist perspective, meta-beliefs are simply the recognition (possibly in temporally specific language) of general, and possibly universal, principles. The key to the rationalist argument is that even if these principles have to be discovered or learned in some historically specific manner, they are not in any sense arbitrary; rather they are fixed benchmarks according to which our ordinary beliefs are either confirmed or rejected. Thus while the process of establishing a stable set of beliefs about the world may take some time, and may exhibit the appearance of chance and contingency, the end result is

pre-determined by the necessity of converging to unchanging rational principles. By analogy, it may have been an accident of history that Newton was the first person to write down the universal law of gravitation, but the mathematical form of the law itself was inevitable.

The historicist perspective, quite to the contrary, claims that ordinary beliefs simply emerge out of a cauldron of various non-rational forces and historical accidents. And once one set of beliefs has come to dominate another, it is fixed in place by a process of collective rationalization, in which meta-beliefs are actively constructed to coincide with what we already think is right (Berger and Luckman 1966). Thus a rationalist would claim that "A is better than B because A conforms more closely than does B to the standards of some general class of things X, to which both A and B belong." And an historicist would respond that the very standards of X that are being used to judge A and B were inferred, over time, as generalizations of specific cases, including A, around which a consensus of value or quality had already arisen. The rationalist argument, in other words, is inextricably self-referential, claiming, in effect, that "A is better than B because A is more like A than B is." As silly as this critique may sound when written down in this formal way, it is remarkably consistent with many explanations of why certain artifacts, individuals, or even social movements have been successful, where many others that might once have been considered comparable, or even better, failed.

Why, for example, is the *Mona Lisa* far and away the most famous painting in the world? The rationalist explanation is simple: it is so famous, because it is the best. As the art

historian Kenneth Clark put it, the *Mona Lisa* is "the supreme example of perfection," which causes viewers to "forget all our misgivings in admiration of perfect mastery" (Clark 1973). Sassoon (2001), however, argues that statements of this grandiose nature do not stand up to scrutiny. Indeed, there are thousands of great works of art which the *Mona Lisa*, on intrinsic merit alone, would be hard pressed to exceed. Even within the Louvre itself, there are hundreds of masterpieces, more than a few of which, at various stages in history, have been considered equal or superior to the *Mona Lisa*. Even Da Vinci himself painted other masterful portraits, two of which hang in the very next room, which very few non experts could identify, or even name. Was it therefore the mysterious identity of the subject? Or the intriguing smile? Maybe, but once again there are plenty of other examples of acknowledged masterpieces created in less than perfectly documented circumstances, and no-one seems to have even noticed the smile until the mid-19th century.

In other words, whatever characteristics we come up with to justify the known outcome, these characteristics then turn out to be shared by numerous other paintings that no-one outside of the art history world has even heard of. So why is it the *Mona Lisa* that is famous, and not a whole class of paintings that share certain highly prized characteristics? Of course, it is possible to keep adding characteristics to the list—"it's the *combination* of the smile, the use of light, the famous artist, the prestigious location, etc…"—such that ultimately only one painting—the one we now know is the winner—satisfies the description. But now we encounter the circular reasoning: the *Mona Lisa* is

the most famous painting in the world because it is more like the *Mona Lisa* than anything else.

The historicist critique of rationality as ultimately self-referential is therefore a hard one for rationalists get around (as opposed to simply dismissing it as postmodernist rubbish). Unfortunately, historicists face an equally serious problem. It *may* always be the case that the very standards by which one thing is judged to be better than another are themselves the outcomes of a collective social process, and that our belief in their objectivity and universality is therefore neither objective nor universal. It *may*, in fact, be the case that we decide first what we like, and only then do we define the relevant standards such that what we already know we like turns out to be better. But as with theories of cognitive dissonance (Festinger 1957) and social construction (Berger and Luckman 1966), the problem with this argument is that in emphasizing our tendency to rationalize what we already believe, it fails to account for why we believe it in the first place.

Historicists, in other words, can no more verify their claim that rationality is constructed than rationalists can verify theirs that "A won because A is the best". One way to resolve this logical impasse, and a way on which both sides might agree, would be to conduct experiments. In the same way that we do for professional team sports, where the best team is judged not by its victory in a single game, but by its record of wins and losses over a playoff series or an entire season (Lieberson 1997b), we could perhaps agree that if the *Mona Lisa* really deserves to be the most famous painting of all, then if we were to

rerun history—possibly many times over—it would always, or at least most of time, prove to be the winner. Furthermore, one might invoke such a hypothetical competition to assess the relative merit not only of competing cultural artifacts, but religious ideas, social norms, and economic institutions as well.

Unfortunately, while in certain special cases it may be possible to conduct precisely this kind of experiment (Salganik, Dodds, and Watts 2006), real historical processes only ever get run once; thus we are not in a position to demonstrate that in some other version of the universe, the *Mona Lisa* is just another painting in the Louvre. And the problem is much worse for general historical processes like the emergence of capitalism, the course of the French Revolution, or the war on terror, than it is for cultural artifacts. Whether or not they become popular, artifacts at least persist; thus we can measure, for example, how much better known is the Mona Lisa than Géricault's *Raft of the Medusa*; compare their respective attributes; and speculate on why the former, not the latter, is more famous. We may not be able to experience a world in which their relative positions are reversed, but we can at least consider it. In general historical processes, however, once a decision is made to do one thing and not another, we quickly lose all ability even to imagine what other, counter-factual worlds might have looked like; thus we cannot make any sensible comparisons at all. Experimental history, therefore, is at best impracticable, and at worst inconceivable.

Comparative studies, of the kind proposed by Weber, and subsequently developed by historical sociologists, therefore seem like a reasonable compromise. We cannot re-run

history, but we can consider, as Weber did, some (usually small) number of cases—for example, countries that did and did not develop a particular version of western capitalism—and determine which of many possible ex-ante variables were consistently (a) the same across countries experiencing similar outcomes, and (b) different across countries experiencing different outcomes. If we can identify one such variable, or combination of variables—say the presence or absence of Protestantism—we may conclude that Protestantism was the cause of modern Capitalism, just as if we had run multiple experiments over and over again, and discovered the same correspondence.

"Small-*N*" across-case comparisons of this kind, however, have been criticized for succumbing to a linear, deterministic view of reality (Lieberson 1991; Lieberson 1994), meaning that (a) the statement "A causes B" implies that the presence of A always results in B, and A's absence always results in B's absence; (b) changes in the outcome variable are proportional to changes in the input (causal) variables; and (c) the input variables exert effects that are independent of one another. Not everyone agrees with this characterization of the small-*N* research, and arguments abound over what methods comparative-historical sociologists really employ (Steinmetz 2004), and to what extent those methods really do assume a deterministic model of the world (Goldstone 1998). Nevertheless, most sociologists these days advocate a stochastic view of causality, treating their dependent variables as random functions of the independent variables[6].

[6] That is, "A causes B" now implies that A's presence merely increases the probability that B will occur, but does not imply that A is either necessary or sufficient.

The stochastic view of causality also has problems, however. To begin with, conclusions must now be probabilistic in nature; thus many more cases are required in order reject a null hypothesis with any confidence. This "large-*N*" requirement alone may be sufficient to render probabilistic approaches to historical processes impractical—simply because enough cases may not exist. But even when sample size is not a limitation, causal explanations based on across-case comparisons (whether small- or large-*N*) face a more serious difficulty than stochasticity—namely that of nonlinearity (Aminzade 1992; Griffin 1992; Quadagno and Knapp 1992).

Because they can be decomposed easily into their constituent parts, and therefore can be represented meaningfully in terms of component-level characteristics, linear systems are tremendously appealing both intuitively, and also analytically. Unfortunately, for the same reason they are extremely poor representations of historical processes. In linear systems, for example, large effects can result only from large causes, similar initial states lead to similar end states, and changes in the dependent variable can be reversed by reversing the corresponding change in the independent variable. In actual historical processes, by contrast, fluctuations in timing or location that would appear trivial under most circumstances, can occasionally have monumental consequences. Thus states of the world which seemed indistinguishable at some point in time can end up looking very different at some later point; and conversely, very different initial states may result in very similar seeming outcomes. Finally, once certain critical events have transpired, it is

typically impossible to return to some early state simply by reversing the values of the relevant parameters (in physical systems, this property is called *hysteresis*).

In an attempt to get away from the implausible implications of what Abbott (1988) calls "general linear reality", some historical sociologists have therefore rejected across-case comparisons altogether in favor either of informal within-case analysis, or formal descriptive methods such as sequence analysis (Abbott 2000) and narrative networks (Bearman, Faris, and Moody 1999). By incorporating the details of individual cases, rather than simply representing them as parameters (as comparative methods do), descriptive methods can begin to tease out the importance of narrative in shaping history. They also have the advantage of re-situating action in the hands of individuals, rather than in aggregate variables or abstract social forces.

Unfortunately, as Abbott himself has acknowledged (Abbott 1998), it is extremely difficult to turn descriptive accounts into causal arguments. At a very minimum, the statement "X caused Y" implies that the occurrence of X is followed by some outcome Y sufficiently often that it could not be explained by chance alone. So if we knew, for example, that going on a particular diet (X) results in weight loss (Y) only about as frequently as people lose weight normally, then even if we observe some instance of a friend, say, who went on the diet and lost weight, we could not claim that the diet actually "caused" the weight loss—*even in that particular case*. Therefore, if all we have available to our analysis is a description of that one case in which X occurred and then Y occurred, there is really nothing we can say, one way or the other, regarding causality. In

order to establish causality, in other words, we need to know not only about the sequence of events that actually occurred—we also need to know about all the sequences that could have occurred but didn't.

In a nonlinear, stochastic world, therefore, not only are true experiments (in most cases) impossible to conduct, but neither within-case descriptive, nor across-case comparative methods can serve as substitutes (Lieberson 1997a). The inability of empirical methods to identify causality in historical processes, however, should not necessarily be construed as good news for rationalists either. As discussed earlier, in fact, the rationalist attempt to instead locate causality within universal "covering laws" of individual action is typically viewed by historicists as simply missing the point (Abbott 1998; Somers 1998). Individuals may indeed behave rationally, or at least reasonably, in the sense that given what they know, and where they are, they try to obtain the best outcome for themselves that they can imagine. But, to paraphrase Marx, they can only do so under the circumstances in which they find themselves. Thus it is the circumstances—the "boundary conditions"—that determine not only what options individual actors face, but even what preferences they have, and thus what they will perceive as "rational" in the first place. The essence of causality, in other words, lies in the construction an agent's utility function, not the algorithm by which the agent maximizes the function itself.

There is much to recommend the historicist critique, which in some sense is clearly correct: anything that changes the rules by which the game is being played will result in the actors behaving differently, even if at all times they are behaving rationally. But

where does it lead us except back to our starting point? Historicists point out, correctly, that context matters, but in lacking plausible, action-oriented models of generative processes, they have no compelling account of how the context got to be the way it was. Rationalists meanwhile claim, also correctly, that the outcomes that persist are those that coincide with our notions of rationality, but they cannot account for the emergence of these notions without assuming the existence of the very boundary conditions that the historicists wish to explain. Is there a way to break the cycle?

I want to argue that the disagreement between the rationalist and historicist views stems not from any fundamental incompatibility between covering laws (even rational choice covering laws) and historical contingency, but rather from a common misunderstanding of the relationship between micro (individual) and macro (collective) behavior. Rational choice models are invariably specified in terms of the behavior of individual actors, where an "actor" can be an individual person, but can also be some aggregate entity, like a firm, or a government, whose actions one can speak of in the singular. Yet the outcomes of interest in history, including the decisions of firms, governments, and so on, are inherently the products of collectives of individuals. The mistake that the rationalist perspective makes is to treat collectives as if they were simply very large individuals—what in economics is known as "the representative individual" (Kirman 1992).

Historicists, meanwhile, make a different version of the same mistake. Although they focus on external context over internal rationality, and contingency over optimization,

they still treat the collective as an individual actor responding to its environment[7]. Often this treatment is disguised by an emphasis on aggregate or structural variables in place of explicitly identifiable actors, but regardless of the labels attached to the variables (which in some cases refer to the characteristics of individuals and in others to characteristics of populations), the causal logic requires the assumption of a representative agent[8]. And it is the assumption of the representative agent itself, along with the required logical conflation of individual and collective units of analysis, wherein the fundamental error lies.

In order to illuminate the problem of the representative agent, I want to focus on the micro-macro aggregation process; that is, the business of how individual actors making individual decisions—about what to do, what to buy, or what to believe—manage to generate the collective outcomes—like social movements, market demand, and religious fervor—that the historian actually observes. In order to make some progress, I consider only a very special class of micro-macro aggregation phenomena—namely binary decision making problems. Within that class, I want to argue that under reasonably general conditions, individuals—even individuals exhibiting a fair degree of rationality—will make decisions based in part on the decisions of others. Although this point is neither new nor particularly surprising (at least to most sociologists), its implications for macro-sociological phenomena remain poorly understood.

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[7] For example, in discussing Crane Brinton's metaphor of revolution as a "fever," Tilly (1984, p. 102) notes "Despite all the qualifications he attached to it, the idea of fever suggests that revolution happens to something like a single person—to a society personified."

[8] For example, Skocpol (1979) invokes a set of structural variables, which appear to correlate with shifts in political power in different countries. However, implicit in her argument is the assumption that some "actor"—a country, or population—is responding to its structural environment.

3. The Collective Dynamics of Beliefs

The key point to make with respect to the formation of collective beliefs is that individuals do not form their beliefs independently. In this sense, beliefs are part of a much larger class of decisions which, as Schelling (1969; 1973; 1978), Granovetter (Granovetter 1978), and others (Katz and Lazarsfeld 1955; Hedstrom 1998; Watts 2003), including a growing number of economists (Leibenstein 1950; Young 1993; Bernheim 1994; Young 1996; Morris 2000; Brock and Durlauf 2001; Durlauf 2001; Blume and Durlauf 2003), have pointed out, exhibit what might be called *decision externalities*, meaning that the likelihood of choosing some particular alternative depends in some manner on the choices of others. Fashions, fads, and manias—whether in regard to modes of dress (Simmel 1957; Blumer 1969), norms of behavior (Mackay 1932; Aguirre, Quarantelli, and Mendoza 1988), or styles of thought (Sperber 1990), are perhaps the most obvious examples of decisions made on the basis of other people's behavior (Meyersohn and Katz 1957). But even adoption decisions of an apparently more objective nature, including those related to farming techniques (Ryan and Gross 1943), medical drugs (Coleman, Katz, and Menzel 1957), contractual arrangements (Young and Burke 2001), and organizational strategies (Becker 1970; DiMaggio and Powell 1983; Davis 1991) exhibit similar characteristics.

Although decision externalities appear to be widespread, their precise origins remain a matter of some speculation. Experiments in social psychology beginning with Sherif (1937) and Asch (1953) have demonstrated the importance of group pressure in determining the choices of individuals—effects that appear relevant to a range of social

behavior, including the expression of political opinions (Noelle-Neumann 1993), participation in criminal activity (Glaeser, Sacerdote, and Scheinkman 1996; Kahan 1997), and tacit conformity to perceived group norms (Bicchieri and Fukui 1999; Cialdini and Goldstein 2004). But individuals may also pay attention to the actions of others in order to learn from them, assuming, in effect, that those others know something that the individual does not. Thus people infer from each other's observable behavior information as diverse as the likelihood that an incipient revolution will succeed (Lohmann 1994), that a particular technology is superior to its alternative (Arthur and Lane 1993; Lane 1997), or that a particular restaurant (Banerjee 1992; Bikhchandani, Hirshleifer, and Welch 1992) or movie (De Vany and Walls 1996) is worth attending.

Finally, decision externalities may arise out of what economists call "network effects", meaning that the utility of an object is a function not only of its intrinsic characteristics, but also of the number of other people possessing compatible or complementary devices (Katz and Shapiro 1985; Economides 1996; Liebowitz and Margolis 1998). For example, a fax machine is effectively useless when no-one else has one, but becomes increasingly valuable as the size of the relevant "network" grows. By analogy, the value of watching a particular reality TV show, for example, may be enhanced by the enjoyment derived from discussing it with friends and coworkers. While similar to conformity, such cultural coordination problems are somewhat distinct in that individuals are acting out of a desire to benefit from group participation—"joining the network"—rather than out of fear of sanctioning.

Thus individuals may be influenced by others for a variety of reasons: out of a desire for conformity; in order to imitate those considered more socially desirable than oneself; as means of reducing the complexity of the decision-making process; as a way of inferring otherwise inaccessible information about the world; or in order to reap the benefits of coordinated action. Although psychologically distinct, all these mechanisms, along with possibly many others that I have not considered, have the effect of generating decision externalities, in that each decision-maker affects the preferences of others, and is affected by them.

In order to make some concrete progress, I want to restrict my attention to the class of binary decisions, meaning that each individual faces a choice between only two alternatives A and B, which we may also think of as states (e.g. "active" vs. "inactive," or "adopt" vs. "refrain"), one of which, say B, is treated as a default state. This restriction appears severe, in that many decisions of interest including, for example, decisions about which works of art to pay attention to, involve choices between many alternatives simultaneously. As Schelling (1978) and Granovetter (1978) have both argued, however, a binary decision framework may be much more general than it at first appears, in part because many decisions *are* binary in nature (adopting vs. not adopting some innovation), and in part because more multi-faceted decisions can be effectively reduced to binary decisions (Borghesi and Bouchaud 2006).

The benefit of considering only binary decisions is that we can now take the dramatically simplifying step of writing down the decision rule of an individual i in terms of what we

might call an *influence response function* $p_i(\phi_i)$, where $p_i(\phi_i)$ is the probability that an individual i will choose action A as function of the weighted sum $\phi_i = \sum_j w_{ij} s_j$ of other individuals choosing A[9]. Influence response functions of this general type are often simply postulated as plausible heuristics (Granovetter 1978; Kuran 1991; Watts 2002). However, recent work (Lopez-Pintado and Watts 2005) demonstrates that under quite reasonable assumptions, they can also be derived as best responses to certain classes of strategic games and social learning scenarios. In other words, while falling short of "full rationality", influence response functions are entirely consistent with a rational choice view of the world.

Arguably the simplest type of influence response function, and the one that has received by far the most attention in the social contagion literature (Schelling 1973; Granovetter 1978; Morris 2000; Watts 2002), is a *deterministic threshold function*, according to which individual i adopts A with probability 1 if at least some critical fraction ϕ_i^* of i's neighbors has adopted A; otherwise i remains in the default state B. Deterministic threshold functions are particularly convenient because they capture the entire function in a single parameter (ϕ_i^*); thus heterogeneity in individual preferences, say, can be captured easily by drawing thresholds from some specified distribution $f(\phi)$. However, there is no obstacle, in principle, to constructing more complicated and realistic influence

[9] Technically speaking, this simplification applies only to situations in which each individual i responds directly only to some "aggregate" externality ϕ_i; that is, where $\phi_i(\vec{s})$ is a linear function of the set of actions $\vec{s}$ of all other individuals. The importance and validity of this relatively benign restriction are discussed in some detail in Lopez-Pintado and Watts (2006).

response functions (Dodds and Watts 2004; Dodds and Watts 2005; Lopez-Pintado and Watts 2006). Regardless of their form, the main question of interest is how these individual-level response functions, once specified, aggregate to produce collective decisions.

The first major insight into this question, dating back to Schelling (1973) and Granovetter (1978), is that collective outcomes are only weakly determined by the characteristics of the population itself. Granovetter, for example, illustrates the point with a hypothetical crowd, poised on the brink of a riot. Because all involved are uncertain about the costs and benefits associated with rioting, each member of the crowd is influenced by his peers, such that each of them can be characterized by some threshold rule: "I will join a riot only when sufficiently many others do; otherwise I will refrain". Granovetter observed that if the distribution of thresholds is precisely uniform—that is, one person will riot spontaneously, one person will join in when he observes one other rioter, another will join when he observes two others, and so on—the entire crowd will end up in the riot.

This result, however, is exceedingly fragile with respect to perturbations in the distribution of thresholds. If, for example, no-one has a threshold of three, and instead two individuals have a threshold of four, then the cascade will terminate after only three people have joined in. The change is trivial, but to an observer, the result could not be more different: rather than witnessing an all-out riot, she would see just three trouble makers jostling an otherwise orderly crowd. If presented with these alternative outcomes in different parts of a city or on different days, such observer might very well conclude

that she was witnessing either very different crowds or similar crowds under very different conditions. Yet we know from the construction of the model that both the crowds and the contexts are, by all reasonable measures, indistinguishable[10].

Although idealized in a number of important respects, Granovetter's example has profound implications for both the rationalist and historicist perspectives above. If everyone chooses to adopt A instead of B, then a rationalist (i.e. representative agent) model of the world would imply (i) that A is intrinsically better than B; and (ii) that we would expect A to win out in any roughly similar population and situation. What Granovetter's crowd demonstrates, however, is that when individual decision rules are determined, even in part, by the decisions of others, neither conclusion holds. The historicist view, meanwhile, fares better in that it also allows for contingent outcomes; however, the source of the contingency is rather different. Whereas historicists locate the contingency in the social environment, the historical context, or some other feature of the world that is exogenous to the process under consideration, in Granovetter's model, the contingency is endogenous, arising out of the nonlinearity of the process itself. Thus we may conclude that when individual beliefs are formed interdependently, the collective outcome is fundamentally *ambiguous*, in the sense that it is not determined in any obvious way by the characteristics of the individuals, considered in isolation of each other.

[10] Kuran (1991) considers a similar example, and reaches essentially the same conclusion, in the context of discussing the East European revolution of 1989.

Granovetter's model is clearly simplistic—too simplistic to be an accurate representation of real social processes. However, the ambiguity clouding the relation between individual characteristics and collective behavior grows only stronger and more pervasive for more realistic models of belief formation. For example, Granovetter assumed that each individual observes and weights equally the decisions of all other individuals in the population—an assumption that is almost certainly not valid for most real-life decisions where typically we receive or solicit information from only a tiny fraction of the total population. Social influence in the real world, therefore, propagates not from everyone to everyone else directly, but indirectly via sparse networks of influence relations. Recent work on such network models of influence, however, suggests that the dynamics of the corresponding collective decisions are even more unpredictable and counterintuitive than in Granovetter's model (Watts 2002; Watts 2003; Watts and Dodds 2005). In sparse networks, for example, even identical distributions of thresholds can display wildly different behavior from realization to realization, without changing the influence network, or the relevant boundary conditions.

Under fairly broad conditions, therefore, it is possible to show that when individuals make decisions in response to the decisions of other people, the relationship between individual preferences and collective decisions breaks down. There need not, for example, be any measurable ex-ante differences, either in the ideas themselves or in the environment through which they spread, between ideas that "succeed" and those that do not. What are we to say about causality in such circumstances?

4. Individualistic Logic and Collective Dynamics

At the level of individual actors, there is nothing terribly complicated about cause and effect in threshold models. It takes only a moment's reflection to accept that each of us is influenced, to some extent or another, by the attitudes, actions, and decisions of the relatively small group of people to whom we pay close attention, with whom we communicate often, or whose opinions we respect for one reason or another. Thus the notion that individuals are influenced by their local network neighborhood is relatively intuitive.

What is harder to understand, and therefore to incorporate into our mental models of influence processes, is that those very same people are just as much affected by the attitudes, actions, and decisions of their neighbors as we are ourselves. Thus every member of our "influence neighborhood" has his or her own influence neighborhood which may or may not overlap to some extent with our own. The same statement is true for every member of our neighbors' neighbors, and again for our neighbors' neighbors' neighbors, and so on. The collective outcome therefore, is determined not by the decision of any representative agent, but by interacting chains of sequential decisions, where any one individual is aware of, and therefore can react to, only part of a larger sequence of decisions that is extended both spatially and temporally, and most of which are invisible to individual making the decision. In other words, it is in aggregation process itself, not in the specification of individual action, that all the ambiguity arises.

Ambiguity, naturally, does not imply that *anything* can happen—it is still the case that some *kinds* of beliefs are more likely than others to emerge as dominant. For example, religion in general serves many socially useful purposes; thus one might reasonably expect that all human cultures will invent, borrow, or adapt some manifestation of religious beliefs. Likewise, it is reasonable to suppose that no book on nonlinear differential equations will ever become an international best seller—simply because not enough people could read it, even if they were so inclined. Even when people are highly dependent on each other for information about what to prefer, they still have preferences; thus there is usually some general class of beliefs, artifacts, or ideas which, in any given time and place, is more likely to succeed than others.

As with the example of the *Mona Lisa*, however, this class of viable candidates can be surprisingly broad; and which particular one of them wins out is not just unpredictable—it is effectively arbitrary[11]. Thus while some form of capitalism might have arisen in any history of the world, to say that American capitalism adopted its current form *either* because it satisfies the needs of people better than its alternatives, as a rationalist might claim, *or* because it came about as a natural, if unanticipated consequence of some pre-existing religious philosophy, as an historicist might argue, is to commit the fallacy of attributing individualistic logic to collective behavior. When collective behavior is generated from individual behavior via a nonlinear, stochastic aggregation process, it simply is not "explainable" in the usual way of "A caused B."

[11] Blumer (1971) has made a similar argument, albeit in slightly different language, with respect to the identification of social problems.

When faced with such non-intuitive phenomena, it is not surprising that we look for ways to reinsert simple notions of cause and effect. And conveniently, once any particular outcome has been observed, some story can always be told that traces a path from some initial state A to some final state B, and thus *sounds* like a causal story. It is in this ex-post sense-making process, during which the formation of our ordinary beliefs is described and accounted for, that our meta-beliefs are formed. And it is our meta-beliefs that allow us to invoke the individualistic framework. The explanation that "we prefer A to B because of some random, distributed sequence of individual-level decisions that nobody really understands" is simply not as persuasive an argument as "we prefer A to B because A is better according to the following principles; thus our decision represents a collective choice of better over worse." It is not even as good as "we prefer A to B because at some earlier time *t*, a certain group of influential people chose A, and everyone else followed them; thus our decision represents an historical accident that subsequently got locked in." These explanations invoke meta-beliefs in different ways, but they are the same in that they describe a collective process as if only a single entity was making decisions.

Meta-beliefs, however, do more than generate plausible sounding causal stories: they also have consequences for subsequent decisions. Once we have decided that not only do we prefer A to B, but that we have a principled basis for doing so, we will subsequently be predisposed to prefer things "like A" to things "like B". Simple threshold models like the one above are not capable of representing the importance of meta-beliefs, but one might imagine the thresholds themselves changing as a consequence of new beliefs that become

widely adopted. Ideally, such a model could account both for the formation of ordinary beliefs, and also for their eventual rationalization in terms of meta-beliefs—as instantiated, for example, in collective memory (Olick 1999) or organizational culture (Dobbin 1994)—which then, in turn, set the conditions for subsequent rounds of contestation between existing beliefs and new competitors. A great deal of work remains to be done on formal models of collective behavior if they are to include important features like meta-beliefs, as well as higher-level "actors" like organizations, which are both individual entities, capable of making decisions, and also aggregations of lower-level entities (Abell 2001). I would argue, however, that the fundamental ambiguity clouding individualistic notions of cause and effect will, if anything, only be exacerbated by the introduction of these additional complexities.

5. Lessons for Modern Capitalism?

So far in this chapter, I have argued that discussions of causality in historical processes—whether of the rationalist or historicist persuasion—have largely overlooked an essential distinction between the individual and the collective. In this sense both rationalists and historicists make the same error, substituting a fictitious individual—a representative agent—for the collective. Although the two perspectives differ on how much of this hypothetical individual's behavior can be attributed to internal rationality, and how much to external context, both are equally guilty of applying individualistic logic to what are invariably instances of collective behavior. This being a book about capitalism, however, I want to conclude by relating this somewhat abstract conclusion to the behavior of markets.

Without question, one of the truly incredible events of the last decade has been the phenomenal increase (in the late 1990's) and subsequent decrease in the aggregate value of the US stock market. There are many reasons to think so: some individuals became fabulously wealthy; new industries were spawned (and in some cases subsequently abandoned); and Americans became much more conscious of the stock market than at any other time in history. Given all the attention directed at the stock market, however, one question has received surprisingly little comment: How is it that an entire market can expand and then contract again so dramatically? Some of the variation can no doubt be explained in terms of companies entering and leaving the market, but most of it is due to the dramatic changes in the valuations of companies already present. So how should one properly assign value to these firms?

The economist's (i.e. rationalist) standard answer is that a firm's value reflects the risk-adjusted, time-discounted cash flow generated by its stock. Future revenue, however, can only be estimated by making some assumptions about future performance, risk, and other factors. Therefore, even leaving aside questions about whether or not real people actually evaluate firms the way they are supposed to, the answer still requires the potential investor to form some beliefs regarding the firm's prospects for generating revenues and profits in the long term. Furthermore, because the value of any commodity in a market is only what someone will pay for it, investors must form these beliefs in the context of other investors doing the same thing—what Keynes called a "beauty contest" (Keynes 1936).

Even more confusing, market prices only reflect current beliefs about value to the extent that a trade taking place at the going price doesn't change the price itself. Thus, given what people collectively believe about a firm, the value of a single share is well defined in equilibrium, because selling one share isn't going to make any measurable difference to the price. But selling *all* the shares of that firm, or even a substantial fraction of them, renders equilibrium prices meaningless. If, for example, everyone who owns shares that are valued at some particularly price, wants to sell simultaneously, then clearly the price is too high; and potential buyers, knowing this, will only agree to pay much less. But in such situations, when existing beliefs suddenly give way, then until some new, stable set of beliefs takes its place, it is unclear just how much less one should pay. As a result, the price can plummet in a way that is wildly disproportionate to the importance of the information about the economy, say, or the company itself, that triggered the shift in beliefs. As a result, sudden and dramatic changes in collective beliefs can raise or lower the measured value of a firm by orders of magnitude, even though very little about the firm itself may have changed.

For example, when 3Com spun off Palm Inc. (the maker of the popular Palm Pilot) as a subsidiary in March of 2000, the subsidiary was valued at more than twice what the parent company had been worth *before* the spin-off (Norris 2003). And in the same month, Cisco Systems—a maker of Internet switching equipment—became the most valuable company in the world, with a market capitalization exceeding that of General Motors, Citigroup, and Wal-Mart combined (Berenson and Gaither 2001). At the time, a

great many sensible and informed people, including professional analysts and fund managers, apparently believed that the prices they were paying were justified. Yet one year later, Cisco had "lost" 80% of that value, magically wiping out $400 billion dollars of wealth. And two years after that, Palm's market capitalization had fallen from $50 billion to $500 million—a staggering 99% loss in just three years (Norris 2003).

Advocates of rationality might respond that eventually people always figure out the truth, and that if they don't, their views get weeded out through a process of selection (Friedman 1953). Thus crazy fluctuations like those of Palm and Cisco are dismissed as "irrational" deviations from the otherwise orderly performance of a largely rational market. Over those same three years, however, much the same phenomenon occurred at the scale of the entire stock market. As long as everyone believed in the endless promise of technology companies, prices continued to rise, portfolios become "worth" more, and everyone who owned technology stocks became richer simultaneously. And when everyone stopped believing, the opposite occurred. In this manner trillions of dollars in wealth were created, then lost again, simply by everyone deciding collectively that they preferred, then disdained, technology. Everyone literally got richer—and then poorer—at the same time, with all the consequences for consumption, investment, tax revenues, and government policy that follow from macro changes in wealth.

As with the discussion of rationalist vs. historicist perspectives above, therefore, the characterization of financial markets as rational or irrational is not so much right or wrong, as simply missing the point. The point is that "the market" is not some single

entity which typically behaves rationally, and just has occasional, albeit unpredictable bouts of irrationality; rather, it comprises large numbers of individual actors, each of whom is behaving more-or-less sensibly, but who are each forming their opinions about what is reasonable in response to their observations about what other people are doing. And it is in the aggregation process that the appearance of irrationality, or for that matter, rationality, arises. Individuals, in other words, may or may not behave rationally—it may not actually matter. The point is that they do not behave *independently*, and that the interdependencies are every bit as responsible for shaping collective behavior as the preferences of the individuals themselves.

Similar observations apply to consumer markets, which although less volatile than the stock market, are susceptible to the same social forces. For example, roughly two years ago, and after many years of flirting with Dr. Robert Atkin's low-carbohydrate diets, demand for "low-carb" foods suddenly exploded, generating thousands of new products on supermarket shelves, and accounting for tens or even hundreds of millions of dollars of revenue (Warner 2004). Hundreds of firms participated in this market, researching, producing, distributing, and marketing either modified or entirely new products. The surge even resulted in a number of entirely new firms being created specifically for the purpose of supplying consumer demand for low-carb everything. And then, just as suddenly, the market collapsed, leaving many of the same firms in deep trouble (Warner 2004). How does an idea, which had actually been around for decades, suddenly become so popular that an entire industry feels obligated to respond to it, only to evaporate again just as rapidly?

There is, of course, a story—or rather many stories. Perhaps it was that growing public awareness of national obesity trends finally crossed a threshold. Perhaps it was changing lifestyles that led people to prefer ready-to-eat meals over those made from basic ingredients. Perhaps it was the death of Dr. Atkins in 2003, and his company's subsequent decision to branch into food products as well as diet books. Or perhaps it was the success of another low-carb, high-protein diet: *The South Beach Diet*. And conversely, once sufficiently many people actually tried to lose weight with low-carb products, they discovered that the diets didn't work; so that's when the craze ended. All these explanations sound plausible, but once again, in speaking of "the market" as a single entity with an individual's desires, preferences, and learning capabilities, they all paper over, rather than illuminate, the mechanics of the process by which collectives come to exert demand for some products and not others.

Finally, nowhere are the consequences of collective beliefs more apparent than in markets for cultural products like books, movies, music, sport, as well as the individuals who produce them. One of the most striking features of these cultural markets is what is called the "winner take all" (Frank and Cook 1995) or "superstar" (Rosen 1981) effect, according to which market leaders are dramatically more successful (either in terms of market share, or compensation) than runners-up, even when the differences between them are slight. The standard explanation for the effect, is that market demand (and hence revenue) is "convex", meaning that at the top end, small increases in quality correspond to large increases in demand (Rosen 1981). In the case of cultural markets, reproduction

technology allows each potential consumer to purchase "the best" product for the same price as the next-best. And because lesser quality is generally a poor substitute for higher quality, a single product—the "superstar"—may experience thousands of times the demand of an average product. From this observation, it quickly follows that difference in compensation between "the best" artists, writers, actors, and athletes, and even the second-best, ought to be considerable.

Although evidently correct at some level, the convexity argument omits more than it explains. Clearly, when the most popular product is many times more popular than the next most popular product, then as long as the technology can allow for relative costless reproduction, demand will be convex. But how does everybody agree about what they like in the first place? It may be the case, in other words, that over 50 million people "wanted" each of the first five volumes of J. K. Rowling's *Harry Potter* series, and without modern printing and distribution technology, it may not have been possible for them all to buy the same book. But why did so many people want it? And what does the unprecedented success of the series reveal about the qualities of Rowling's writing, the reading preferences of modern children, or the difficulty that even experts have in picking winners[12]? The standard view, as espoused by Tucker (1999), concludes that although there is nothing particularly outstanding about Rowling's writing, and although the length, tone, and characters of her stories appear, if anything, to fly in the face of what experts thought children wanted, it *must* have been what they wanted, else why would they have bought it?

[12] The first Harry Potter book was rejected by several children's book publishers before being picked up finally by Bloomsbury, a small, independent press.

Success, in this view, is its own explanation, after which analysis is reduced to the mere documentation of whatever features the work in question exhibits. Once again, we end up with self-referential reasoning along the lines of "A succeeded because people wanted something with the qualities of A." But now we can understand the source of the self-referentiality. The problem is that "the people" are being treated as a single entity that is capable of "wanting" something as an individual might. In truth, there is no such entity—only many individuals making individual-level decisions—but we create one anyway in our narrative explanations, because we don't know how else to explain anything. Unfortunately, in doing so, we eliminate from our consideration the very aggregation process by which a large population of individuals, each making individual decisions, came to behave like a coherent collective. Once again, both rationalists and historicists are equally guilty of this misattribution of individual logic to collective behavior. The emphasis of their narratives may differ—in the rationalist narrative, the individual makes something happen, whereas in the historicist narrative, something happens to the individual. The nature of the individual may differ as well, sometimes played by a person, and at other times by a collective. But in all cases, the narrative requires cause and effect to operate at the same scale.

6. Conclusion

What I have attempted to demonstrate in this chapter is that when dynamics is taking place at more than one scale (here, I have used just two scales, individual and collective, but more are possible), and where the aggregation process between the two is nonlinear

and stochastic, causal statements that are meaningful with respect to individual behavior are largely irrelevant to the behavior of the collective, and causality at the level of collective is rendered deeply ambiguous. Put another way, there is no unique, as in one-to-one, mapping between any compact description of the "before" state and its subsequent unfolding. Rather, the mapping is "many-to-many": many possible sets of initial conditions and exogenous parameters may correspond to any one outcome; and any one set of initial conditions and parameters may correspond to many possible outcomes. In such situations, we may still extract orderly descriptions that help us to understand the behavior of the system, but these descriptions are necessarily statistical in nature, comprising, for example, the shapes of probability distributions, rather than the ordering of particular outcomes. Thus while we may hope to understand better the processes by which collective outcomes are generated, even a perfect understanding of those processes will not correspond to a *causal* explanation of why one particular outcome pertains and not another. Indeed, no such explanation is possible.

For many people, this conclusion may be hard to take seriously, if only because contrary to the claim that much of social reality cannot be explained in the traditional sense, we live awash in explanations. Very little of note happens in a modern society that is not subsequently reported on, dissected, analyzed, and digested. Entire professions, including our own, exist in whole or in part to "make sense" of history as it unfolds before us. Thus to say that explanations are not possible is to defy not only everyday experience, but common sense. I would argue, however, that in this case, common sense is wrong, and that the apparent success of our explanations derives not from their ability

to actually identify cause and effect, but from our desire to believe in the narratives we construct. It may not, in the end, matter to us all that much whether or not these narratives reveal anything about how a particular outcome came to be—what matters is that we think they do, and thus reassured we are able to get on with our lives.

That may be fine for most people; however, policy makers, if they wish to be effective, cannot afford the luxury of trusting their common sense, especially when it tells them that outcomes which they failed utterly to anticipate appear in hindsight to make perfect sense. As financial, commodity, and cultural markets become increasingly global, and the costs of communication, information, and trade continue to drop precipitously, the social processes by which collectives determine their beliefs about the world will become ever-more consequential. In part, these changes are driving down the barriers between historically segregated populations; thus the potential size of collectives is increasing. And in part they are increasing the speed at which social influence can propagate, and thus social change can potentially manifest itself. In each case, however, the qualifier "potentially" is important. Greater access to previously inaccessible influence can lead to boring homogeneity, but it can also lead to balkanization and conflict, or vibrant diversity. Likewise, faster communication and lower transaction costs can lead either to more, or to less, stability in the face of change; better adaptability or worse.

Nothing, in other words, is certain in the social world—not even change itself—but if policy makers wish to do more than simply wake up in the morning and see what happens, they have an obligation to understand how it is that people, whether it be

themselves, their constituents, or the intended targets of their interventions, come to believe the things they do. Because regardless of what kind of policy they are trying to implement—whether it concerns the regulation of capital markets, the development of legal institutions, or the improvement of public health—its impact will be mitigated, enhanced, or subverted by the collective beliefs of the relevant population. Common sense is not much use in this regard, and philosophical debate, having swirled around the topic for decades without result, has exhausted itself.

Formal modeling of the kind I have described here may not ultimately yield the answers either, but it does at least have the advantage of illuminating the distinction between the individual and the collective. Clearly there is much to be done to develop the primitive, overly simplistic models discussed above. And even then, the end result will likely not be prescriptive in the way that we have come to expect of models in the physical and engineering sciences, either because social phenomena are simply too complex, or else because, unlike physical phenomenon, the very act of understanding human-social behavior, or even just building theories of it, has a way of changing the phenomena themselves. Nevertheless, formal models of social processes can help in the same way that they have helped in every other field of science—by extending our understanding of the world beyond where ordinary intuition can reach.

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