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EXPLAINING ECONOMIC CRISES: ARE THERE COLLECTIVE REPRESENTATIONS?

ABSTRACT

This paper uses the economic crisis of 2008 as a case study to examine the explanatory validity of collective mental representations. Distinguished economists such as Paul Krugman and Joseph Stiglitz attribute collective beliefs, desires, intentions, and emotions to organizations such as banks and governments. I argue that the most plausible interpretation of these attributions is that they are metaphorical pointers to a complex of multilevel social, psychological, and neural mechanisms. This interpretation also applies to collective knowledge in science: scientific communities do not literally have collective representations, but social mechanisms do make important contributions to scientific knowledge.

INTRODUCTION

In 2008, a major crisis took place that initiated the most severe economic downturn since the great depression of the 1930s. Some economists have offered explanations of why this crisis and others occurred based on the collective mental representations of the organizations involved, including the relevant banks, governments, and regulatory agencies. For example, some economists say that the desires of investment banks to make large profits and their beliefs that real estate prices would continue rising led to a bubble that eventually burst. But do organizations actually have collective representations such as beliefs, desires, intentions, and emotions, or is this way of speaking ontologically dubious?

This paper uses the explanation of the 2008 economic crisis as a case study to evaluate six candidate accounts of the nature and legitimacy of collective representations:

1. Realist: Collective representations are real functional properties of social groups.

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2. Instrumentalist: Collective representations are not real, but are useful ways of talking about social groups.
3. Emergence: Collective representations are emergent properties of social groups.
4. Aggregation: Collective representations are aggregate properties of social groups.
5. Bogus metaphors: There are no collective representations, and their attribution is not only metaphorical but misleading.
6. Metaphorical pointers: Explanations in terms of collective representations can be useful metaphors because they point to complex, interlocking social and psychological mechanisms that potentially provide scientific explanations of the occurrence of social phenomena such as economic crises.

I will argue for the metaphorical-pointer view of collective representations, and sketch some of the psychological and social mechanisms that make talk of shared mental states scientifically useful. This view provides an alternative to the realist claim of Gilbert (2000) that scientific and other communities have collective beliefs. The six accounts are not all mutually exclusive, because in some contexts a realist may interpret collective representations as emergent or aggregative.

I begin by documenting the use of ideas of collective mental representations by leading economists who have been attempting to explain the economic crisis of 2008, providing many examples of attributions of beliefs and other mental states to organizations. I then spell out six ways of interpreting these attributions: as bogus, instrumental, realist, emergent, aggregative, or productively metaphorical. Whereas actions can be legitimately attributed to organizations, I argue that the assignment of collective mental representations is at best productively metaphorical and at worst misleadingly bogus. The productive metaphors are ones that can be fleshed out through attention to psychological and sociological mechanisms whose nature is beginning to be investigated in the incipient enterprise of 'cognitive social science', which includes some important trends in economics.

In philosophy, discussion of these issues often uses the term 'collective intentionality' for shared representations. In what follows, I will avoid use of the term 'intentionality', because outside philosophy it naturally is often taken to mean more specifically 'having to do with intentions'. My concern is with intentions plus all other kinds of mental states that are sometimes attributed to groups as well as individuals.

COLLECTIVE REPRESENTATIONS IN ECONOMICS

To show that economists do employ ideas about collective representations, this section provides a set of quotes from two distinguished commentators on the 2008 crisis: Paul Krugman (2009) and Joseph Stiglitz (2010). Unlike many mainstream economists whose faith in the wisdom of markets led them to provide reassurance

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that the pre-crisis economy was fundamentally sound, both these economists had previously written about inherent weaknesses arising from irrationalities such as subprime mortgages and the housing bubble. Hence, they were well equipped to produce analyses of what happened in 2008. Krugman and Stiglitz are both winners of Nobel prizes in economics.

My quotations below are selections from a larger stock of attributions of collective properties to the key organizations involved in the crisis. The most important organizations were government administrations (such as the Bush and Obama administrations in the US), government agencies (such as the US Federal Reserve System and the Bank of Canada), and private for-profit financial institutions (such as Citibank and Goldman Sachs). I organize the quotations according to whether they concern actions, beliefs, desires, intentions, or emotions of organizations. Page numbers are in Krugman (2009) and Stiglitz (2010).

Actions

Krugman, 22: 'The Federal Reserve pumped cash into the system.'
Krugman, 173: 'The Fed is set up to do two main things: manage interest rates and, when necessary, provide cash to banks.'
Stiglitz, xv: 'The Treasury and Federal Reserve veered like drunk drivers from one course to another.'
Stiglitz, 3: 'Banks refused to lend to each other.'
Stiglitz, 110: 'The Obama administration decided to bail out the bankers.'

Beliefs

Krugman, 21: 'If the central bank is overoptimistic about how many jobs can be created, if it puts too much money into circulation, the result is inflation.'
Stiglitz, 3: 'The banks didn't know whether what they owed to their depositors and bondholders exceeded the value of their assets.'
Stiglitz, 7: 'The banks… badly misjudged the risk associated with high bank leverage.… they believed that if troubles arose, the Federal Reserve and the Treasury would bail them out, and they were right.'
Stiglitz, 54: 'The Fed recognized the mistake.'
Stiglitz, 74: 'The Bush and Obama administrations recognized the severity of the recession.'

Desires

Krugman, 186: 'The Federal Reserve's willingness to buy commercial paper is a major step in this direction.'
Stiglitz, 102: 'The Obama administration wanted to reverse the harsh 2005 law.'
Stiglitz, 126: 'The banks wanted to believe that they had not made bad decisions.'

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Intentions

Krugman, 178: 'When Bear Stearns, another of the original five major investment banks, got in trouble in March 2008, the Fed and the Treasury moved in – not to rescue the firm, which disappeared, but to protect the firm's 'counterparties'.'

Stiglitz, xix: 'Wall Street's high rewards and single-minded focus on making money might attract more than its fair share of the ethically challenged.'

Emotions

Krugman, 50: 'In early 1995, both Mexico and Argentina went suddenly from euphoria to terror.'

Stiglitz, 16: 'Worries about moral hazard let the IMF and the US Treasury to argue vehemently against bailouts.'

Stiglitz, 45: 'Wall Street was enjoying record profits.'

Stiglitz, 161: 'Banks don't like transparency.'

Note that 'Wall Street' is a metonymic reference to a multiplicity of financial organizations. Of all these quotes, my favorite is from Stiglitz: 'The banks wanted to believe that they had not made bad decisions.' (126) It says that the banks taken together had a shared desire to have a belief about their actions, i.e., a collective representation about a collective representation of a collective behavior!

From these examples, it is evident that collective mental states in the form of organizational beliefs, desires, intentions, and emotions have been used by economists as part of the explanation of economic crises. Simplifying, we could say that American banks desired to maximize their profits, believed that subprime mortgages were an effective way to do this, worried that their competitors might be more successful, and intended to create new kinds of investments such as derivatives of subprime mortgages. These mental states can be used to offer causal explanations why the banks performed the risky actions that eventually led to the collapse of the US housing bubble and the general economic crisis. But what is the nature of these supposed collective mental states?

INTERPRETATIONS OF COLLECTIVE REPRESENTATIONS

This section proposes six ways of interpreting the use of collective representations in explaining economic and other social developments: bogusness, realism, emergence, aggregation, instrumentalism, and metaphorical pointers. The following section argues for the sixth interpretation. Please note that my forceful statement of the first five positions does not endorse them.

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1. Bogusness

Talk of collective mental representations is metaphysically and scientifically bogus. Banks, governments, agencies, and other kinds of organizations do not have mental states such as beliefs, desires, intentions, and emotions, which are only possessed by individual people. At best, talk of collective representations is metaphorical, but the metaphors merely distract from legitimate explanations that could be based on the real causes of social phenomena, which are the behaviors of individuals, where the behavior of an individual results from the mental states of that individual. The correct approach to social phenomena is methodological individualism, according to which the only appropriate explanations concern individual behavior. That distinguished economists such as Krugman and Stiglitz refer to collective representations is only a sign that the books cited above are popularizations, not parts of scientific explanations of economic crises that, if done more rigorously, would eschew talk of collective representations. More precise treatment of crises by economists such as Acharya and Richardson (2009) and Reinhart and Rogoff (2009) do not mention collective representations. A more psychological book on crises by Akerlof and Shiller (2009) discusses mental states such as confidence as a property of individuals, not groups.

2. Instrumentalism

There are no collective representations, but it is useful to talk as if there were. Banks and administrations may not have mental states, but it is convenient to talk as if they do. Perhaps we could even take a 'collective stance', analogous to the intentional stance of Dennett (1987), or the empiricist stance of van Fraassen (2002). Stances do not have to be true, just useful, and the collective stance is useful for characterizing what banks, governments, and other organizations do, even if it does not provide causal explanations.

3. Realism/functionalism

Scientists and philosophers are justified in attributing collective representations to organizations for the same reason that they are justified in attributing mental representations to individuals: inference to the best explanation. We ascribe beliefs, desires, intentions, and emotions to people because doing so is part of the best available explanations of their observed behavior. Analogously, we can legitimately ascribe collective versions of such representations to organizations in order to explain their actions, such as financial decisions. In philosophy of mind, the dominant view of mental states since the 1960s has been functionalism (not to be confused with the very different uses of this term in psychology and sociology), according to which beliefs, desire, etc. are not characterized by their physical instantiation, but rather by their input-output functionality. Organizations such as

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banks and administrations also have such functionality leading to group behavior, so it is realistic to ascribe collective representations to them.

4. Aggregation

An easy way of justifying attribution of collective representations to organizations is to treat them as aggregate properties that apply merely as a result of properties that belong to individuals in the organizations. Then we might understand an utterance such as 'Citibank believes that interest rates will decline' as roughly equivalent to one of the following:

'Everyone who works for Citibank believes that interest rates will decline.'
'Most of the people who work for Citibank believe that interest rates will decline.'
'The major leaders at Citibank believe that interest rates will decline.'

Organizations do have many aggregative properties, such as the number of people working for them. That Citibank has 332,000 employees is merely an aggregate of the number of people working for its different branches. Perhaps collective representations could be viewed as aggregates in much the same way. Just as the major leaders at Citibank have many properties in common, such as university educations and weights over 100 pounds, they also have many beliefs in common and we can sum this up by saying that the bank has those beliefs.

5. Emergence

Some properties of organizations are emergent in that they belong to the whole but not to any of the parts (Bunge 2003). Financial corporations such as Citibank have legal privileges and liabilities that are not held by any of the people who work for them, even the chief officers. For example, Citibank can legally perform actions such as buying and selling other companies that are not performed by any its employees in their roles at the bank. Similarly, countries can perform actions such as printing money and declaring war that are not aggregates of the actions performed by any individuals, who lack the legal right to perform such actions. The examples of actions quoted from Krugman and Stiglitz are clearly emergent properties of financial and governmental organizations: when the Federal Reserve pumped cash into the system, it was not because its board and directors were pumping cash into the system. Similarly, it is legitimate to say that collective beliefs, desires, intentions, and emotions are like actions in that they can be emergent properties of organizations.

6. Metaphorical pointers

My alternative, metaphorical-pointer interpretation of collective representations incorporates what I think is most plausible about the other five interpretations. It is not an attempt to give an analysis of the concept of collective mental state,

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but rather to provide a theoretical explanation of the occasionally successful attribution of mental states to organizations. I claim that attributions of collective representations are not literally true, but can often be metaphorically useful for specific reasons that are not recognized from the perspective of the other interpretations. Metaphors are effective in science when they heuristically lead to further understanding of mechanisms that underlie the phenomena that the metaphors are used to describe and explain. For example, Darwin's great metaphor of natural selection did not refer to any selective action by an entity called 'nature', but it pointed to mechanisms of variation, transmission, and competition that Darwin was able to sketch. Subsequently, these mechanisms have been filled out in great detail by advances in new fields such as genetics, molecular biology, and population ecology. Darwin's metaphor was not just a useful way of speaking: it was a crucial pointer to a set of mechanisms affecting individuals and species.

Similarly, I propose that collective representations are metaphorical pointers to psychological and social mechanisms that are just now beginning to be investigated. Some metaphors in science are productive, such as natural selection, helper T cells, and quantum entanglement. Other metaphors are destructive distracters, pointing science in directions that do not lead to deeper understanding, such as luminiferous aether, intelligent design, and meme (which I think draws attention away from empirically supported psychological mechanisms in favor of superficial biological analogies between conceptual and biological development – see Thagard 1988). Making the case for the metaphorical-pointer interpretation of collective mental states versus all the other interpretations requires characterization of the relevant mechanisms.

MULTILEVEL MECHANISMS

Many philosophers and cognitive scientists have described the advantages of explaining phenomena at multiple levels, ranging from the molecular to the social (e.g., Bechtel and Abrahamsen 2005; Churchland and Sejnowski 1992; Craver 2007; McCauley 2007, 2009; McCauley and Bechtel 2001; Newell 1990; Simon 1969; Thagard 1999, 2006, 2010). Thagard and Wood (2010) adapt ideas developed by philosophers of science, particularly Bunge (2003) and Bechtel (2008), to produce an account of the self as a multilevel system of interacting mechanisms. The same approach is potentially fertile for characterizing the role of collective representations in economics.

We can define a system as a quadruple, < Environment, Parts, Interconnections, and Changes >, EPIC for short. Here the parts are the objects (entities) that compose the system. To take a social example, a financial bank is composed of such parts as the employees, offices, and computers. The environment is the collection of items that act on the parts, which for a bank would include people who deal with it, such as customers, as well as other organizations, such as regulatory agencies and other businesses. The interconnections are the

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relations among the parts, especially the bonds that tie them together. In a bank, relations include the physical connections between the nonhuman parts, such as the computers that are located in offices. More important are the bonds that bind people together as part of the banks, including ones that are legal (based on contracts) and ones that are psychological (see below). Finally, the changes are the processes that make the system behave as it does, for example, the financial transactions that produce the bank's profits or losses.

An economy cannot be easily decomposed into a single EPIC system, but needs to be considered at multiple levels, with the economy consisting of many organizations, which consist of large numbers of individual people. Persons have mental representations such as beliefs, which can be understood as patterns of neural activity, where neural firing results from biomolecular interactions. Thagard and Wood (2010) argue that explanation of dozens of important phenomena about the self such as self-representation and self-regulation requires recognition of interacting mechanisms at four levels: the social, individual, neural, and molecular. We can think of a multilevel system as consisting of a series of quadruples, with the structure:

$$< E_1, P_1, I_1, C_1 >$$
$$< E_2, P_2, I_2, C_2 >$$
$$\ldots$$
$$< E_n, P_n, I_n, C_n >$$

At each level, there is a subsystem consisting of the relevant environment, parts, interconnections, and changes. Let us now see how these ideas apply to economic crises.

APPLICATION TO ECONOMICS

Economic changes such as booms and busts are the result of actions taken by banks, other businesses, government administrations, regulatory agencies, and other social organizations. Such groups are EPIC systems where the most important parts are people. The nature of the relations between groups and individuals is the central problem in social science, challenging thinkers not only in economics but also in sociology, political science, anthropology, and social psychology. Holists assert the primacy of groups over individuals, whereas methodological individualists counterclaim that only individuals and their interactions are real. Attention to multilevel EPIC systems provides a much richer way of understanding the interactions of groups and individuals. Thagard and Wood (2010) advocate a method of *multilevel interactive mechanisms,* MIM for short, according to which social systems are best understood by depicting their operations at all the relevant levels.

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From the MIM perspective, economic changes such as crises are best explained by considering social, psychological, neural, and even molecular mechanisms. The relevance of social entities such as banks and administrations is obvious, but much less clear is their relation to individual psychological mechanisms, let alone neural and molecular ones. As an EPIC system, the most important parts of organizations are people, but how are they bound together? I think the answer holds the clue to a deeper understanding of collective representations.

In addition to legal arrangements such as charters and contracts that initiate them, social groups are held together by the ways in which their members represent themselves as being members of a group. To take a simple example, a marriage is usually not only a legal agreement, but also an ongoing relationship whose development is crucially affected by the mental representations that the spouses have of each other and of the relationship itself. Such representations include beliefs that one spouse has about the other spouse, but also their beliefs about how the two are joined together in the marriage. Just as important, the representations are typically emotional, with strong interconnecting bonds resulting from intense positive emotional reactions that the spouses have about each other, themselves, and their marriage relationship. Other mental states are also relevant, including the desires and intentions that the spouses have concerning continuing interactions with each other. These interactions include various kinds of sensory processes, including vision, touch, and hearing.

Similarly, in economic organizations such as banks, the interconnecting bonds among the individuals who work for the bank, ranging from top executives to lowly employees, are in large part the result of mental representations. What matters most is how the individuals think about themselves, each other, the group that they all belong to, and the organization that they all work for. A major aspect of this thinking is emotional: as in marriage, the strongest bonds depend on intense positive emotions directed toward the organization and the other members of it. Physical interactions such as conversations, meetings, and corporate rituals can reinforce such bonds.

But what are beliefs, emotions, and the other mental representations that hold an organization together? From the MIM perspective, the answer lies in moving down a level and understanding them as patterns of neural activity, in accord with the identity theory that equates mind and brain. Obviously, this is a highly controversial doctrine in philosophy, but there are increasingly strong arguments in its favor (e.g., Bechtel 2008; P. S. Churchland 2002; P. M. Churchland 2007; Thagard 2010). In current cognitive psychology, identification of mental processes with brain processes is widely assumed, and the major textbooks in cognitive psychology are increasingly concerned with neuroscience (e.g., Smith and Kosslyn 2007; Anderson 2010).

The rise of cognitive neuroscience is at odds with the widespread functionalist view of mental processes as abstract computational information processing, but reflects dramatic increases in understanding of brain mechanisms. These increases

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have resulted in large part from dramatic experimental advances resulting from the instrumental capabilities of measuring brain events (e.g., PET, fMRI, transcranial magnetic stimulation, near infrared spectroscopy, and optogenetics), and also from theoretical advances in mathematical and computational models of neural networks (e.g., Dayan and Abbott 2000; Eliasmith and Anderson 2003). Moreover, there has been substantial progress in appreciation of the molecular underpinnings of neural processes, for example, in how emotions arise in part from the operation of neurotransmitters such as dopamine.

If mental representations in humans result from neural mechanisms, then we have a strong reason to reject the claim that groups such as banks and governments have them, because groups do not have neural processes. Groups have brains only to the metaphorical extent that the individuals in them have brains. Hence, I reject the realist claim that social organizations such as banks actually have beliefs, desires, intentions, and emotions, since these require brains. Functionalists argue that we should not rule out the possibility that computers and other thinking things that are biologically very different from us could also have mental representations, but their representations would likely be very different from those in humans; so I see no reason to call them beliefs, desires, intentions, or emotions (on representation in robots, see Parisien and Thagard 2008).

Rejecting realism does not require dismissing collective representations as entirely bogus, or adopting the instrumentalist claim that talk of collective representations is just a handy way of talking that makes no claims about how the world works. Rather, I propose that use of collective representations by economists such as Krugman and Stiglitz is useful to the extent that it points to social, psychological, neural, and molecular mechanisms that are responsible for economic changes. We have already seen that the psychological mechanisms that bind groups together crucially involve representations *of groups,* so we cannot simply abandon talk of groups in some mad reductionist race to the bottom. There is no simple reduction of groups to individuals, because the bonds that enable individuals to make up social groups are substantially made up by mental representations of those groups that arise from physical interactions resulting from group membership. We cannot replace talk of Citibank with talk of the individuals in it because part of what makes those people part of Citibank is their mental representations of Citibank and its actions, which are emergent properties. The changes in people's mental representations about Citibank result from interactions that people have in part because they all work for Citibank.

It becomes explanatorily useful to assign a collective mental representation to a group under the following two conditions. First, many of the key individuals who make up the group should have the appropriate mental representations and corresponding brain processes. Second, these individuals should have those representations in part because of their activities in the group, especially their interactions with other members of the group. I am not giving a definition or analysis of 'collective representation'; these are neither necessary nor sufficient

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conditions. Rather, they are typical conditions under which talk of collective representations can have explanatory value because they point to social and other mechanisms that indicate the causes of important changes.

THE PSYCHOLOGY OF ECONOMIC CRISES

That collective representations do have indirect value of this kind can be shown by decomposing psychological ideas that have been broadly used in explanations of economic collapse, including confidence, irrational exuberance, and risk. I begin with a discussion of a recent book by two leading economists, George Akerlof and Robert Shiller (2009). The title of this book is *Animal Spirits: How Human Psychology Drives the Economy, and Why It Matters for Global Capitalism*. Akerlof and Shiller take the term 'animal spirits' from Keynes's classic treatise, *The General Theory of Employment, Interest, and Money* (1936).

Keynes used the term to highlight the fact that economic decisions are heavily affected by emotional reactions:

> Even apart from the instability due to speculation, there is the instability due to the characteristic of human nature that a large proportion of our positive activities depend on spontaneous optimism rather than on a mathematical expectation, whether moral or hedonistic or economic. Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits – of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities. (161)

Like Keynes, Akerlof and Shiller reject the claims of many economists that decisions are the results of purely rational choices. Instead, they rely on results from the field of behavioral economics, which, since the pioneering work of Kahneman and Tversky (1979, 2000), has been providing alternatives to theories about the rationality of choice and market behavior that have been dominant in microeconomics.

Akerloff and Shiller (ch. 1) describe the role of confidence in economic developments and introduce the interesting notion of a *confidence multiplier*. As Keynes recognized, confidence plays a major role in the business cycle, which depends on the willingness of consumers to spend and businesses to invest based on their degree of trust that the economy will prosper. By analogy to Keynes's idea of a consumption multiplier effect on investment, Akerlof and Shiller describe a psychological feedback loop in which loss of confidence in the economy can lead to reluctance to spend and invest that leads to a worsening economy that then leads to further loss of confidence. Thus the psychological state of confidence and the amplifying feedback loop of the confidence multiplier can be a key causal factor in economic downturns such as what followed the crisis of 2008.

Like most behavioral economists, Akerloff and Shiller do not discuss the psychological and neural mechanisms underlying confidence, but there is much

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relevant research in the burgeoning field of neuroeconomics that looks at the neural basis of economic decisions (e.g., Glimcher et al. 2009). At the psychological level, we can understand confidence as not simply a cognitive phenomenon such as subjective probability, but as also an emotional phenomenon that involves the brain's perception of physiological changes as well as cognitive appraisal of the relevance of a situation to a person's goals (for defense of this account of emotion, see Thagard and Aubie 2008 and Thagard 2010). Emotional overreactions to good developments can lead to what Shiller (2005) called *irrational exuberance,* and overreactions to bad developments can lead to irrational despair. Confidence, confidence multipliers, and irrational exuberance can all be understood in terms of psychological and neurological processes of emotional cognition.

The rapidly growing field of *affective neuroscience* makes it clear that the mechanisms needed to explain emotional cognition, and hence confidence, are neural as well as psychological (e.g., Panksepp 1998; Rolls 2005). Moreover, addressing neural mechanisms requires attention to molecular mechanisms that affect neural processing, including the role of neurotransmitters such as dopamine and hormones such as oxytocin. Consider, for example, the notion of risk, which is important for psychological explanations of economic behavior. Loewenstein et al. (2001) argue that the results of behavioral experiments involving risk are best explained by noting that judgments of risks have emotional feeling as an integral component. Recent studies have shown that risky behaviors such as financial trading have identifiable molecular correlates (Coates and Herbert 2008). For example, the morning testosterone levels of male traders on a London exchange predict their day's profitability, and levels of cortisol (a hormone associated with stress) rise with increasing uncertainty. Coates and Herbert conjecture that these molecular changes can contribute to market volatility:

> Cortisol is likely, therefore, to rise in a market crash and, by increasing risk aversion, to exaggerate the market's downward movement. Testosterone, on the other hand, is likely to rise in a bubble and, by increasing risk taking, to exaggerate the market's upward movement. These steroid feedback loops may help explain why people caught up in bubbles and crashes often find it difficult to make rational choices. (6170–1)

Hence the feedback loops involved in confidence multipliers can derive from molecular and neural mechanisms as well as psychological ones.

The occurrence of psychological, neural, and molecular emotions should not, however, lead us to forget that there are also important social mechanisms involved in the development of emotional cognition (Thagard 2006). Emotional transmission can happen as the result of exchange of information, for example, if people tell others about an event that makes them happy or sad. But it can also happen more physiologically through unconscious imitation of facial expressions and body language, a process known as emotional contagion (Hatfield, Cacioppo, and Rapson 1994). Moreover, there is an increasingly understood neural basis for emotional transmission in cases where the neurons that fire when an observer

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perceives another person's emotional expressions are the same as the neurons that fire when the observer is actually experiencing an emotion (Iacaboni 2008). Such mirror neurons provide a mechanism by which social interactions can lead an observer seeing another person expressing an emotion to acquire some version of that emotion, which can lead to empathy but also to contagion of emotions such as irrational exuberance and panic.

Traders working together on a trading floor and people working together in an investment bank are all developing their own emotional reactions and confidence levels in part because of the social interactions they have with other people. Thus the mechanisms of spreading confidence and despair that affect economic bubbles and collapses are social as well as psychological, neural, and molecular.

The MIM (multilevel interacting mechanisms) approach may sound reductionist in its concern with molecular and neural mechanisms. But because it does not neglect psychological and social mechanisms, it is better characterized as *multilevelism,* in opposition to both reductionist individualism and antireductionist holism. In the case of economic booms and busts, scientific explanations should incorporate *all* of the following:

- Molecular mechanisms involving neurotransmitters and other chemicals.
- Neural mechanisms involving cognitive and emotional processes.
- Psychological mechanisms involving inferences and conscious and unconscious reactions.
- Social mechanisms by which both cognitive and emotional reactions are transmitted through communication, contagion, and neural mirroring.

Because all of these are relevant to understanding gains and losses in investor confidence, multilevelism is the best available scientific approach to explaining economic crises.

Multilevelism interprets collective representations as metaphorical pointers. Banks, administrations, and other organizations do not literally have beliefs, desires, intentions, or emotions, because these are neural states of individuals. But the actions of organizations are emergent properties that the organizations do literally have, and these actions result from mechanisms that are social as well as psychological, neural, and molecular. When a bank makes an investment, this choice results from processes that include the social interactions of the people making the decisions, as well as the individual psychological, neural, and molecular mechanisms of these people. Moreover, these mechanisms interact, as when social interactions cause brain and molecular changes, for example, via mirror neurons and hormones such as cortisol, strongly affected by social stress. Appreciating the full complexity of social, psychological, neural, and molecular mechanisms makes it possible to see why talk of collective representations is not merely bogus or expedient, as long as it is understood as pointing to a panoply of explanatorily powerful processes.

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APPLICATION TO SCIENTIFIC KNOWLEDGE

Margaret Gilbert (2000, ch. 2) proposes that the account of collective belief that she has long defended applies to understanding scientific change. She says that a group of people have a collective belief that *p* if they are jointly committed to believe as a body that *p*. A joint commitment occurs when each person has expressed willingness to be party to it in conditions of common knowledge. According to Gilbert, a scientific consensus is a kind of collective belief when members of a scientific community have a joint commitment to a belief. Scientific change occurs when the consensus shifts, as happened, for example, in the 1990s with the adoption of the novel view that most stomach ulcers are caused by bacteria (Thagard 1999). Other advocates of the view that scientific communities are the collective bearers of scientific knowledge include Kusch (2002), while skeptics include Bouvier (2004) and Wray (2007).

From the multilevelist perspective and the metaphorical-pointer view of collective representations, scientific communities do not have beliefs (or knowledge), but it can nevertheless be epistemically informative to make statements such as 'In the 1980s, the gastroenterology community believed that ulcers are caused by excess acidity, but by the mid-1990s the community believed that infection by *Helicobacter pylori* is the cause.' Beliefs, construed as patterns of neural activity, are the property of individual scientists. Nevertheless, attribution of collective beliefs is useful when it serves as a metaphorical pointer to interacting neural, psychological, and social mechanisms.

Social interactions are important contributors to the fixation of belief in scientific and other communities. When scientists visit each other or attend conferences, they exchange information about evidence, hypotheses, and explanations in ways that are more immediate than the slower exchanges that occur via publications. Exchange of information does not always lead to consensus, but often it does, through a process that is both social and psychological. Aspects of this process are captured in the CCC computational model of consensus formation (Thagard 2000, ch. 7); CCC stands for 'consensus = coherence+communication'. This model consists of a group of simulated scientists, each of which is capable of making judgments about what hypotheses to accept on the basis of how well they explain the available evidence, using algorithms for assessing explanatory coherence. The social process of communication consists of exchange of information between scientists concerning hypotheses, evidence, and the explanatory relations between them.

In CCC, mutual agreement occurs when transfer of information relevant to assessing the explanatory coherence of competing theories leads to a state in which all scientists accept the same theory. Theory acceptance is the result of individual psychological processes in which parallel constraint satisfaction leads a scientist to accept a theory on the grounds that it provides a better explanation of the evidence than the available alternatives. In CCC, consensus results from a combination

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of the individual-level mechanism of explanatory coherence and the social-level mechanism of information exchange. CCC does not deal with biologically realistic neural-level mechanisms, but the explanatory coherence algorithms it uses can be implemented in neural networks that use large numbers of neurons and distributed representations (Thagard and Aubie 2008).

If the CCC model of consensus and the method of multilevel interacting mechanisms are on the right track, then we can see why scientific communities do not literally have beliefs, but why it can be expedient to attribute beliefs to them when the beliefs of the individuals in them result from processes that are social as well as psychological. Such processes are much more common than the strong condition of joint commitment mentioned by Gilbert, which strikes me as rather rare. Such joint commitment does occur occasionally in science, for example, in scientific consensus conferences organized by the NIH and other agencies. I attended the Canadian consensus conference on *H. pylori* in 1997 where participants made collective decisions about methods of diagnosing and treating ulcers (Thagard 1999, ch. 12). Usually, however, the emergence of scientific consensus, when it happens, is much more casual, but still interesting because of the complex of psychological and social mechanisms involved.

In sum, the metaphorical-pointer view of collective mental representations that I developed for the case of explaining economic crises seems also to apply to cases of collective belief in science. It avoids the overly realist and ontologically puzzling attribution of beliefs and other mental states to scientific groups and organizations. Just as important, it also avoids the neglect of important social factors in scientific development that accompanies an excessively individualist attention to only psychological processes occurring in particular scientists. Details need to be worked out, but the method of multilevel interacting mechanisms is as relevant to explaining scientific change as it is to economic crises.

CONCLUSION

Unlike Gilbert, my account of collective belief is not intended to capture some everyday concept, for I do not share the view of many analytic philosophers that the goal of philosophy is just to describe ordinary concepts. I think that philosophy, like science, should be revisionary, looking to develop concepts with greater explanatory potential than everyday ones (Thagard 2009). In particular, the goal of social epistemology is not to capture ordinary ways of talking about collective representations, but rather to develop modes of thinking about social dimensions of knowledge that have greater explanatory breadth and depth than ordinary understanding.

Like other areas of epistemology and ethics, social epistemology should also have important normative implications, pointing to ways in which the social processes of developing knowledge can be improved. Both economics and science studies have crucial normative applications. Economists attend to crises not only to

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understand what happened but also to try to figure out how financial crashes can be avoided or ameliorated. Given the amount of misery produced by unemployment, poverty, and other economic misfortunes, understanding economic crises has a strong ethical dimension. Economists and policy makers must attempt to draw lessons about the mechanisms inside and between individuals, banks, and governments in order to acquire knowledge about how to prevent future disasters. Similarly, the point of the social epistemology of science is not just to describe how scientific knowledge grows as the result of social and individual processes but also to establish new norms for increasing the growth of knowledge by enhancing collaboration and other social processes (see, for example, Thagard 1999; Goldman 1999).

This paper has been concerned more narrowly with a particular case of scientific explanation, the economic crisis of 2008. I have shown how economists like Paul Krugman and Joseph Stiglitz discuss the events leading to this crisis in terms of collective representations, including beliefs, desires, intentions, and emotions. I have argued, however, that these discussions should not be taken as literally true, but rather as metaphorical pointers to a whole complex of multilevel interacting mechanisms. To understand economic crises and other social phenomena, we need to work out the complex interrelationships among processes that operate at many levels, including molecular, neural, and psychological as well as social.

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