# Comments on Butos and McQuade

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**Abstract:** *Hayekian Systems: Research into the Structure of Social Interaction* by William Butos and Thomas McQuade is an important and valuable book. It synthesizes a vast and valuable literature while making independent contributions of its own. I discuss the book, given special attention to epistemic issues. I also encourage readers of this article to become readers of the book. I close by encouraging all social scientists to further develop the research program Butos and McQuade have articulated.

Butos and McQuade (2023) have successfully taken on the monumental task of unifying the analysis of social processes, including "markets, firms, money and banking systems, science communities, and governments" (p. 3), by viewing them all as "Hayekian systems." They have produced a pioneering work. Rather than dully repeat Hayekian nostrums, Butos and McQuade advance an innovative Hayekian research program. They build on Hayek to move in new directions. And they *demonstrate* how to do work within their research program. They demonstrate with penetrating analyses of markets, entrepreneurship, money and banking, legislatures, government bureaus, and science. They are showing us how it's done, and their effort should be recognized, studied, and absorbed within the social sciences.

Their look at science may be the most important of their applied studies. "We have paid particular attention to science" they note (p. 174). Their discussion (pp. 148-149) of "central planning in science" is a gem. They say, "Attempts to plan science centrally, whether overtly or indirectly by monopolization of its funding, foster an institutional framework incompatible with science as a self-ordering and self-correcting order." The core function of science is "to generate new knowledge." And, they say, "The circumstances and conditions that induce the creation of knowledge are bound up in the specific institutional arrangements that compose science and govern the sorts of interactions in which scientists engage." Science, in other words, is a social process. But "the structure of government funding of science has adverse implications for long-term stability and adaptability and therefore for the generation and use of scientific knowledge." As the tragi-comic events of the Covid pandemic illustrate all too vividly, science has become unscientific.

Butos and McQuade's startling conclusions on the epistemic efficacy of science today follow from their Hayekian systems framework. We are past due for a revival of the Society for Freedom in Science, which was founded in 1940 (Baker and Tansley 1946). Michael Polanyi, whom

Butos and McQuade cite extensively, was a founding member (McGucken 1978). Among their core principles was "Scientific life should be autonomous and not subject to outside control in the appointment of personnel or in the allocation of the funds assigned by society to science" (Baker and Tansley 1946). The Hayekian systems framework of Butos and McQuade reveals how vital "the allocation of funds" is to the life of science. And yet governmental funding decisions dominate resource allocation in science today. Should we be surprised, then, by expert failure in science?

The Hayekian social systems Butos and McQuade explore are "systems of social interaction" (p. 3) and thus dynamic. They are "adaptive, anticipatory systems with process closure" (p. 3). The two great "inspirations" for their theory are Hayek's *The Sensory Order* (1952a) and Robert Rosen's *Anticipatory Systems* (1985). Hayek's *The Sensory Order* describes a modular, flexible, and coherent system that can adapt to its environment because of its adaptive memory, which produces a continually updated classificatory model of the system's environment. Rosen and Hayek both describe adaptive systems whose responses to stimuli depend on the (ever changing) internal state of the system. This internal state is, in effect, what tells the system how to respond to stimuli. It is an adaptive model of the system's (external and internal) environment that, at least implicitly, *anticipates* the good or bad consequences of alternative behaviors of the system. Rosen helps to clarify this role of anticipation in such systems. And he adds the important notion of "process closure," which Butos and McQuade characterize as a "causal cycle" (p. 2). Cottam et al. (2000, p. 162) say, "The classic form of process closure is that of the hunger–hunt–kill–eat–satisfaction loop associated with carnivores." Certain processes unfold within the system and between the system and its environment. These processes sustain the system. And they form a kind of loop whereby the complete set of processes enables that same set of processes to be repeated so long as the external environment continues to provide a given set of external inputs, such as the animals hunted, killed, and eaten. (The idea of process closure has interesting connections to autocatalytic sets and "constraint closure," which, unfortunately, I cannot pursue here.) "*Process closure*," Collier (2000, p. 286) explains, "concerns the fact that an overall process must achieve self-reinforcement by supporting system viability and, hence, the continuing system capacity to carry out that process. If the system is to achieve overall process closure the elements of the system must interact with each other and with the environment in particular, circumscribed ways."

Butos and McQuade took inspiration from modern biology in conceiving Hayekian systems. And they celebrate "biological analogies in social theory" (p. 42). The sort of view they lay out helps prepare the way for the unification of biology and the social sciences. We are apes who share a long evolutionary history with other social animals, especially other apes. We are unique among primates, but we nevertheless share a long evolutionary history with them. Elsewhere I have said, "Evolution is a palimpsest in which new phenotypes overwrite old phenotypes without fully effacing them" (Koppl forthcoming). Thus, we have an apish disposition toward "linear dominance hierarchies" in which status is forcibly extracted from others in the group through threats and attacks and in which the status hierarchy (at least within a sex) is a strict linear order (Chase et al. 2002, Butovskaya 2020). But, uniquely among primates, we also have a disposition toward reverse dominance hierarchies wherein a coalition of lower status humans acts in a coordinated manner to limit the power of the highest status males (Boehm 1993, 1999, 2020).

Trade is another phenotype unique to our species. *Homo sapiens* engage in *quid pro quo* exchange, which other creatures do not. Other species have a kind of gift exchange wherein the reciprocation is indeterminate at the time of the initial transfer of value (McGrew and Feistner 1992). But, as Adam Smith (WN I.ii.3) observed, "Nobody ever saw one animal by its gestures and natural cries signify to another, this is mine, that yours; I am willing to give this for that." That sort of *quid pro quo* exchange, in which no value is transferred until the reciprocal transfer is agreed upon, is *contractual* exchange. Adam Smith (WN I.ii.3) identified the form of all contractual or quid-pro-quo exchanges. "Give me that which I want, and you shall have this which you want." Long-distance exchange must have been contractual because the opportunities of reciprocation would have been limited and uncertain, thus obliging the trading partners to agree on quid and quo ex ante. Brooks et al. (2018) discuss evidence of long-distance exchange occurring at least 300,000 years ago. Evolutionary time has passed since then, suggesting that contractual exchange may be

in some degree a biological adaptation shaped by natural selection. (See Koppl et al. 2023, pp. 39-40 for a lengthier discussion of the evidence for early contractual exchange.)

Knowledge is the great leitmotif of *Hayekian Systems*. Butos and McQuade tell us that a Hayekian system is "an *epistemic* system, a system capable of building within it some relevant knowledge of its environment, and capable of employing that knowledge within the system . . . to anticipate environmental effects and thereby to successfully adapt to them" (p. 42, emphasis added). They laud "epistemology treated as a natural science" and say that the "Hayekian research program should be viewed as a scientific project about knowledge" (p. 24). The word "knowledge" when used by Hayek and by Butos and McQuade has a nontraditional meaning. It does not mean "justified true belief." Hayek (1945, p. 519) speaks of "contradictory knowledge," which is impossible in standard epistemologies. Butos and McQuade boldly propose that the word "knowledge" be used to "refer to the classification produced as a side-effect of the adaptation to its environment by any adaptive system." If "knowledge" is generated by *any* adaptive system, it applies beyond our species and perhaps even beyond the realm of biological life. It is to this broad notion of knowledge that I now turn.

Hayek said, "The peculiar character of the problem of a rational economic order is determined precisely by the fact that the knowledge of the circumstances of which we must make use never exists in concentrated or integrated form, but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess" (1945, p. 519). And, "the concrete knowledge which guides the action of any group of people never exists as a consistent and coherent body. It only exists in the dispersed, incomplete, and inconsistent form in which it appears in many individual minds, and this dispersion and imperfection of all knowledge is one of the basic facts from which the social sciences have to start" (1952b, pp. 29-30). Because the "knowledge" of Hayek's "knowledge problem" is "concrete knowledge" it may be "contradictory." What one person "knows" may contradict what another person "knows." The possibility of contradictory knowledge implies that in Hayek's sense of the word "know" you *can* know what ain't so. Scott Scheall (2016) rightly insists that Hayek's conception of "knowledge" is "nonstandard." He cites Hayek's (1969, p. 41) claim that "'knowledge' of the external world . . . consists in the action patterns which the stimuli tend to evoke."[1]

There seems to be no harm in using the word "knowledge" for the sort of concrete knowledge of circumstances that Hayek emphasized. We might wish to speak of "belief" for such cases and preserve the word "knowledge" for something more "scientific," "justified," or otherwise fancy. If we call Hayekian knowledge "belief," however, we may overlook or undervalue the objective grounds for it. This risk is compounded by the sense that there are no limits to what an agent believes, as illustrated by the cliché of the madman who believes himself to be Napoleon. (While beliefs need not be reasonable or self-consistent, Brandenburger and Keisler 2006 cast doubt on whether all possible beliefs can be represented in one's model.) What is called "belief" may easily be dismissed as "mere belief" or "subjective opinion," which may then divert our attention from the concrete knowledge flows of Hayekian systems, which Hayek put at the center of economics and other social sciences.

My preferred sense of "knowledge" is far from the meaning dominant in modern epistemology. One standard philosophical definition of "knowledge" is "justified true belief." This definition has been traced back to the Platonic dialogues *Theatetus* and *Meno* (Gettier 1963, Shaffer 2020), although others have cast doubt on the view that Plato thought knowledge was justified true belief (Moss and Schwab 2019; Parikh and Renero 2021, p. 94). Dutant (2015) and Antognazza (2015) both argue that, as Dutant (2015, p. 112) put it, "the Justified True Belief analysis is a twentieth century invention." The view that "knowledge" is justified true belief has been criticized by Popper (1962), Wittgenstein (1958a, 1958b), Gettier (1963), and many others. Gettier's classic paper (covering less than three pages) is the most salient among these criticisms and deserves a quick review.

Gettier (1963) gives two counter examples to the claim that knowledge is justified true belief. A streamlined version of the first counterexample conveys the argument. Two men, Smith and Jones, are rivals for a job. Smith has seen Jones empty his pocket, count out ten coins, and put them back in. After interviewing

for the job, Smith was told the position will go to Jones. Smith infers that the job will be offered to someone with ten coins in their pocket. Unbeknownst to Smith, Jones was subsequently ruled out for the job and he, Smith, happens to also have ten coins in his pocket. Unexpectedly, Smith is chosen over Jones and gets the job. Gettier claims that Smith has a justified true belief that the job would go to someone with ten coins in their pocket and yet (in Gettier's opinion) "Smith does not *know*" that someone with ten coins in their pocket will get the job. Gettier's brief argument has spawned a large literature on "Gettier problems" and "epistemic luck." Hetherington (2005, p. 1) says, drolly, that this slim and powerful argument initiated "post-Gettier epistemology," which began "with a deafening 'Kapow!'"

Citing Gettier, the prominent epistemologist Alvin Goldman (2010, p. 115) has declared justified true belief "a dead letter." Despite Goldman's negative judgment and others like it, justified true belief continues to be a vital benchmark for many epistemologists. Like Gettier, these theorist view justified true belief as a necessary, but not sufficient condition for "knowledge." Goldman (2010) speaks of "the *justified-true-belief-plus* sense of knowing," where "plus" is "a placeholder for an anti-Gettierization condition" (p. 131). The "plus" in Goldman's case is, roughly, "reliability." He and Beddor say that the "key idea behind" his reliabilism "is that the justifiedness of a belief depends on the mental history of the subject's belief. In particular, it depends on the reliability of the process(es) which cause the belief in question" (Goldman and Beddor 2021). In harmony with Goldman's "plus," Ichikawa and Steup (2018) say, "Most epistemologists have found it overwhelmingly plausible that what is false cannot be known." Moreover, even among epistemologists who recognize as important a "lightweight" sense of "knowledge" that requires truth but not justification, "most typically admit that there is also a stronger sense which does, and that it is this stronger state that is the main target of epistemological theorizing about knowledge."

Thus, the view of knowledge as "justified true belief" may still be the default view, but some "plus" must be added to the formula if we are to move from necessary to sufficient conditions for a proposition to be "known." Hayek's "concrete knowledge" is far from this philosophical view of knowledge.

Timothy Williamson (2000) has repudiated all ideas to the effect that knowledge is justified true belief plus something. He insists that "evidence is what justifies belief" and that evidence must be known if is it to be, indeed, evidence. Thus, "knowledge is what justifies belief" (p. 207). He retains the idea, however, that we can "know" only what is true. And he views knowledge as a "mental state" (pp. 33-41). We are still far from Hayek's view of knowledge and from any concept of knowledge appropriate to the theory of Hayekian systems.

Within philosophy there are epistemological traditions that come closer to Hayek and to Butos and McQuade's "side-effect of the adaptation to its environment by any adaptive system." Important examples include the broad tradition of epistemological naturalism which was initiated by Hume's *Treatise of Human Nature* (1739-1740) and represented more recently by Quine (1969) and Kitcher (1992) among others. Scheall (2020, p. 117) considers the evolutionary epistemology of Campbell (1965) and others to be a part of "the family of naturalistic epistemologies," and he places Hayek in that group. Campbell (1965, p. 380, n.2) says, "any process providing a stored program for organismic adaptation in external environments is included as a knowledge process, and any gain in the adequacy of such a program is regarded as a gain in knowledge." This quote reveals an affinity between Campbell and Hayek. Scheall (2020, pp. 118-119), however, notes distinguishing features of Hayek's epistemology, which was well developed by 1952 (and thus prior to Campbell's essay of 1965) when he published *The Sensory Order*.

Much of social science uses the term "knowledge" in a broader and looser sense than either "justified true belief" or "justified true belief plus." Berger and Luckmann (1966) give us a salient example. Their famous essay on the sociology of knowledge asks us to "put quotation marks around" the terms "knowledge" and "reality" (p. 2). (See Koppl 2010 for an argument that Berger and Luckmann are not "social constructionists" as that term is generally understood.) They explicitly sidestep "such classical concerns of epistemology as truth, justification, and rationality" (p. 2). Everyday actors in society consider themselves to "know" many things that are not true. And their "knowledge" is not justified or rational in any rigorous sense. And yet such "knowledge" guides their actions. Berger and Luckmann explain, "As long as my

knowledge works satisfactorily, I am generally ready to suspend doubts about it" (p. 41). Hayek's "knowledge problem" is about this sort of everyday knowledge. And, more generally, the "knowledge" of Hayekian social systems is of this sort. If we accept Butos and McQuade's analysis of science, then even scientific knowledge does not fully satisfy the requirements of traditional epistemology. It is more like Berger and Luckmann's "everday knowledge" than "justified true belief."

The biologist and complexity theorist Stuart Kauffman provides another example of a nonstandard meaning of "knowledge" arising outside the philosophical literature in epistemology. His view seems close to that of Campbell's (1965) "stored program for organismic adaptation." Kaufmann says, "complex living systems must 'know' their worlds. Whether we consider *E. coli* swimming upstream in a glucose gradient, a tree manufacturing a toxin against a herbivore insect, or a hawk diving to catch a chick, organisms sense, classify, and act upon their worlds. In a phrase, organisms have internal models of their worlds which compress information and allow action" (Kauffman 1993, p. 232).[2] Kauffman's characterization of knowledge does not require knowledge to exist in the form of propositions or even beliefs. *E. coli* cannot affirm or deny any proposition. And it has no beliefs. Its behavioral repertoire is hardly more complicated than swimming sugarward (Beisel and Afroz 2016, Long, Zucker, and Emonet 2017, and Micali et al. 2017).

Kauffman (2000) and Kauffman et al. (2008) use the words "yuck" and "yum" to discuss the simple models an agent such as *E. coli* might have. If such an agent is to respond to "environmental features," Kauffman et al. (2008, p. 39) explain, then it "must also have yuck and yum receptors, capable in the simplest case of 'recognizing' molecules of yuck or yum, and responding appropriately by avoiding yuck and eating yum." In this case, "the agent confronting yuck or yum receives information 'about' yuck or yum." This simple Hayekian system has a form of knowledge. "The cell, we want to say, has embodied knowledge and know-how with respect to the proper responses to yuck and yum, which was assembled for the agent and its descendants by heritable variation and natural selection." The distinction between "knowing how and knowing that" was elaborated in the celebrated essay of Ryle (1945-1946).

In Kauffman's account, the organism's model of its world, its classificatory system, exists primarily in the form of its reactions to events in its environment. *E. coli*'s model of the world puts everything in the external world into one of Kauffman's two great classes: yuck and yum. Yuck is the set of "repellents" such as glycerol, and yum is the set of "attractants" such as D-glucose. And this classification exists in the form of *E. coli*'s tendency to more toward attractants and away from repellents. This tendency to move toward attractants is a disposition, which can be overridden. The probability of override depends on "previously-encountered signals" and "the organism's internal parameter space" (Long, Zucker and Emonet 2017). Thus, the classificatory system of *E. coli* is a heterogeneous set of dispositions in which the external environment (as sensed by the organism) and the internal state of the organism jointly determine which dispositions prevails. Much the same is true of the mammalian mother whose disposition to flee a danger may be overridden by the disposition to protect her offspring.

Kauffman's remark on the internal models of organisms, which was quoted above, suggests a definition of knowledge as "reliably acting appropriately to circumstance in a class of cases" (Koppl 2021), which we may roughly reduce to "knowledge is adaptation." This definition is close to Campbell's (1965) account in which, recall, "any process providing a stored program for organismic adaptation in external environments is included as a knowledge process, and any gain in the adequacy of such a program is regarded as a gain in knowledge." It is also close to Butos and McQuade's "classification produced as a side-effect of the adaptation to its environment by any adaptive system." For humans and bacteria alike, knowledge in this sense need not be propositional. You know how to ride a bicycle. And you know rules of grammar that you cannot state. Most English speakers, for example, do not *know that* "adjectives in English absolutely have to be in this order: opinion-size-age-shape-colour-origin-material-purpose Noun" (Forsyth 2013, p. 45). But they *know how* to formulate idiomatic sentences that respect this "royal order of adjectives" (Edelstein 2020, p. 219).

If knowledge is adaptation, certain collectives might be said to "know" their environments. In the famous example given by Hutchins (1991, 1995) the "cognitive division of labor" (1991, p. 34) of a merchant

ship prevents us from imputing full knowledge to any person on it. And yet the ship responds appropriately to its environment. While not, of course, perfect or immune to system failure, the ship *reliably* responds appropriately to its location, the wind speed and other relevant aspects of its external environment and to its fuel level, the engine temperature, and other relevant aspects of its internal environment. It would not be unreasonable to say that the knowing unit is the ship as whole. We might define "knowledge" to exclude its application to Hutchins' ship. But as I have noted elsewhere (Koppl 2018, p. 120), "if we are not privy to the details of the ship's division of cognitive labor, then we cannot specify which persons knew which things and which persons made which choices. We do not need a map of the ship's division of cognitive labor to recognize that their interactions are generating potentially adaptive outcomes that depend on new information coming from both outside and inside the ship. In other words, we do not need a map of the ship's division of cognitive labor to see that it is thinking, learning, and acting in much the way individual humans think, learn, and act."

In the spirit of Hutchins (1995), whom they cite, Clark and Chalmers (1998) develop an "externalist" philosophy of mind.[3] They say, "when it comes to belief, there is nothing sacred about skull and skin. What makes some information count as a belief is the role it plays, and there is no reason why the relevant role can be played only from inside the body" (p. 14).

If we equate knowledge with adaptive response, even some inanimate objects might be said to "know" their environments. Your car "knows" when to distribute more power to the rear wheels. It is largely a matter of convenience and convention how broad a class of entities may be said to "know" their worlds. The usual convention in social science is to restrict knowing entities to persons and certain collections of persons such households and firms. It may be time to set that convention aside.

The volume Butos and McQuade have produced is an exemplar of high scholarship. They move seamlessly from general principles to practical problems, teaching us at every moment how to think like Hayekian systems theorists. Importantly, their lessons do not become catechisms. On the contrary, they stimulate new thoughts and new questions in the reader. We have focused here on epistemological questions, which are foundational to Hayek's *oeuvre* and to the theory of Hayekian systems. But their work raises an indefinite number of important questions in pure and applied social science, including questions with urgent policy implications. And it shows us by example how to approach such questions. Other scholars should join in the effort by developing the theory of Hayekian systems and applying it to urgent problems of pure and applied social science. The path has been shown to us; let us trod upon it.[4]

## NOTES

1 I have elided a bit that Scheall (2016, p. 208) did not. And he cites the article as it appears in Caldwell (2014) where the quote can be found on p. 320.

2 The reference to compressing information is an allusion to Gregory Chaitin's work as Kauffman has confirmed in a private communication. See Chaitin da Costa and Doria (2012) for an introduction and overview.

3 Dekker and Remic (2024) is a valuable discussion of Hayekian social science and the "extended mind" literature "kickstarted" by Clark and Chalmers (1998). Roughly, they view Hayek as a precursor to the extended mind literature and thus not fully compatible with the behavioral economics tradition of Kahneman and Tversky (1979) and others.

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