

## The Problematics of a Social Constructivist Approach to Science

Bryce Christensen  
*Southern Utah University*

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**Abstract:** In his paper, "The Problematics of a Social Constructivist Approach to Science," Bryce Christensen takes John Gray's hope that science can serve as a remedy for anthropocentrism as an entry point for discussing the debate between scientific realists and social constructivists. Christensen examines the way science appears to buttress the realist position when it confronts humans with truths that contradict their expectations and desires. In his discussion, Christensen also surveys the ways that science fits within social constructivist theory when it serves identifiable social needs or advances identifiable group interests. Further, Christensen identifies eschatological cosmology as an extreme test case for social constructivism because its bleak final predictions do not serve any of the group interests that social constructivists typically highlight as the driving force in their theoretical paradigm. Christensen concludes by suggesting that when social constructivists insist that their theory accounts for all of science, they risk creating a quasi-theological justification for new Inquisitors of the sort who once condemned Galileo for reporting observations that did not fit within their worldview.

## Bryce CHRISTENSEN

### The Problematics of a Social Constructivist Approach to Science

As part of a highly provocative commentary on modern science, British philosopher John Gray urges scientists to use their work as a "remedy for anthropocentrism" (23). Scientists are uniquely qualified to proffer such a remedy, Gray believes, because they have opened a dark and chaotic cosmic vista that is "intensely uncomfortable to the human mind" (23), a vista within which humans are "one of the most predatory and destructive" of species, yet one that "can no more be masters of their destiny than any other animal" (4). Unfortunately, in Gray's opinion, to date, scientists have done relatively little to deploy their research as the much-needed antidote to anthropocentrism that he seeks. Quite otherwise. Instead, "science has been used to support the conceit that humans are unlike all other animals in their ability to understand the world" (24). Indeed, "science supports the myth of progress" (19), Gray complains, and even "promises that the most ancient human fantasies will at last be realized. Sickness and ageing will be abolished; scarcity and poverty will be no more; the species will become immortal" (123). As much as he would like to see science puncture human illusions about the centrality and omnipotence of homo sapiens, Gray finally acknowledges that this can never be. "Science," he resignedly concedes, "will never be used chiefly to pursue truth. ... The uses of knowledge will always be as shifting and crooked as humans themselves" (28). Hence, to regard science as "the disinterested pursuit of truth" is "to ignore the human needs science serves" (18). With his provocative two-sided assessment of science, Gray adopts a very peculiar position in an on-going and often contentious academic debate that pits scientific realists on the one hand against social constructivists on the other. At stake in this debate is the very nature of science: for scientific realists, science proceeds by discovering and verifying empirical realities; for social constructivists, science proceeds by inventing a plausible means of interpreting nature and then persuading colleagues and the general public to believe in it. When Gray acknowledges the power of scientists to perceive "uncomfortable" truths that contradict human expectations and desires, he lends credibility to scientific realists who assert that their discipline gives them direct access to realities that have not been socially constructed. However, what Gray gives with one hand, he withdraws with the other. For in arguing that because science serves human needs, its darker and least anthropocentric findings will usually be ignored, Gray largely endorses the premises of social constructivism. Nonetheless, in drawing back from a thoroughgoing endorsement, Gray still grants science the power to expose -- even if only occasionally -- the limits of social constructivism (for a collection of constructivist work, see Riegler's *Radical Constructivism* website at <<http://www.radicalconstructivism.com>>; on constructivism and the humanities, see also Tötösy at <[http://clcwebjournal.lib.purdue.edu/library/totosy\(constructivism\).html](http://clcwebjournal.lib.purdue.edu/library/totosy(constructivism).html)>). Gray's views on science thus illuminate both the strengths and inadequacies of a theory of cultural development that has in recent decades grown remarkably influential in academic discourse.

When he is focusing on its too-rarely-used power to expose truths "uncomfortable" to the human mind, Gray acknowledges what many scientists and scholars of science insist upon: that science proceeds by the objective verification of empirical realities that exist independent of human desires or expectations. This belief in the objectivity of science indeed informs the popular or common view of the scientific enterprise. In sharp contrast, social constructivists view science (or any other system of meaning) as an invention born of human needs and reflecting human desires. Social constructivists thus do not regard science as a process of objective discovery and empirical verification. Speaking from the social constructivist perspective, German critic Wolf Lepenies writes: "Science must no longer give the impression it represents a faithful reflection of reality. What it is, rather, is a cultural system, and it exhibits to us an alienated interest-determined image of reality specific to a definite time and place" (64). Likewise developing the social constructivist perspective, American sociologists Bruno Latour and Steve Woolgar dismiss the possibility that scientists are exposing "some entity with an independent existence 'out there'" in their experimental research: "We do not conceive of scientists," they continue, "as pulling back the curtain on

pre-given, but hitherto concealed truths. Rather, objects ... are constituted through the artful creativity of scientists" (qtd. in Bailey 165). In the same spirit, social constructivists Egon G. Guba and Yvonna S. Lincoln challenge as naïve the view that "knowledge" is something they have "discovered" (69). Guba and Lincoln thus dismiss as untenable the belief that science can ever establish "the truth of any proposition" by "testing it empirically in the natural world" and the concomitant belief that "facts can be uncovered and arrayed independently of the values that may later be brought to bear to interpret and give meaning to them" (69). Articulating central social constructivist doctrines, Guba and Lincoln insist that "the 'truth' [note the skeptical quotation marks around the word] of any proposition (its credibility) can be determined by submitting it semiotically" to "qualified persons." "Constructivist 'truth'" (note those quotation marks around truth again!) thus emerges in "tentative agreements or consensus among [those] who find the proposition credible" (104-05). What happens in social constructivism is that, in the words of cultural historian Ernst Gellner, "objective truth is ... replaced by hermeneutic truth" (35). Empirical fact simply dissolves in a sea of social interpretation. Predictably enough, in that sea of interpretation, it is the self-interest of the interpreters that bobs to the surface -- in science as in every other human pursuit. "Since all knowledge is social construction," explains one commentator, "scientists are [as] self-serving and unreliable [as anyone else] ... and anything [they] state as truth is suspect" (Raymo C2).

Because he sees modern science perpetuating "ancient human fantasies" of human centrality and omnipotence as it serves the "shifting and crooked "needs of truth-averse human, Gray can only be sympathetic to social constructivist views of science. However, the glosses that social constructivists put on their work enrage scientists who believe their research does in truth (no quotation marks) give them direct access to empirical realities. Biologist Richard Dawkins, for instance, ridicules theorists whose social constructionist doctrines imply that "a tribe which believes that the moon is an old calabash tossed just above the treetops ... [holds a view] just as true as our scientific belief that the moon is a large Earth satellite about a quarter of a million miles away" (qtd. in Bailey 166). Such theorists, Dawkins asserts, betray the inadequacy of their doctrines every time they make a journey by relying on aerospace engineers rather than flying-carpet fabulists. "Show me a cultural relativist [i.e., a social constructivist] at 30,000 feet and I will show you a hypocrite," he writes (qtd. in Bailey 166). Indulging in a similar spirit of mockery, science writer A.K. Dewdney who finds in the way "a stone thrown in a vacuum will [actually] execute a parabola with a precision great enough to rule out any other polynomial function as a possible path" ample justification for ridiculing social constructivists who suppose that "Galileo and Newton lay this fantasy upon us because they were Italian or English" or because they were "expressing a post-Renaissance yearning for perfection" (2-3). "Anyone," Dewdney adds derisively, "who thinks that a social construction lurks in the labors of Kepler (who put the [Copernican] theory on a solid footing with his discovery of elliptical orbits) should read of research driven purely by the observational data of Tycho Brahe, and learn of Kepler's frustration when he discovered that the one social construction he did attempt, the 'mysterium cosmographicum,' was a dismal failure. It did not fit the data" (7-8). Biographer Giuliano Pancaldi adds the name of Alessandro Volta to the list of scientists who in some measure seem to have grasped realities not socially constructed within their own culture. Pancaldi freely acknowledges that the "constructivist notion" explains very well why, once Volta had discovered how to make an electric storage battery, "any expert electrician in Europe could bend the battery to his or her own particular intellectual and social needs." However, he insists that only "the realist notion" can account for the fact that "the voltaic batteries built throughout Europe in the early nineteenth century were basically the same device" (4).

In his arguments for a realist rather than a social-constructivist approach to science, philosopher Robert Fogelin focuses not on early nineteenth-century electrical batteries that worked but rather on a late-twentieth-century telescope that failed. The initial failure of the orbiting Hubble Telescope, Fogelin reasons, "illustrates what it is like to encounter reality -- to be constrained by it" (138). And "when the instrument was failing," Fogelin remarks, "nobody suggested that it took a telescope as powerful as the Hubble to show how fuzzy stars really are. There are certain things that you can't talk your way out of" (138). Fogelin thus takes the Hubble episode as paradigmatic

of the way that empirical science "provides a check against our thought" (187), its experiments and observations confronting would-be social constructivists with what C.S. Pierce calls an "external permanency ... something upon which our thinking has no effect" (qtd. in Fogelin 126). To the degree that science directly grasps some "external permanency," it transcends "the human needs" that -- Gray complains -- so frequently convert science into a prop for anthropocentric illusions. Indeed, if social constructivism rests upon the premise that human desires -- socially negotiated -- shape all meaning, then empirical science challenges that premise by silencing those desires, at least in certain experimental contexts. "Empiricism," the intercultural scholar W.E. Hocking explains, "is ... a form of self-denial, a moral will to let the object speak for itself. Empiricism holds that if we allow it to do so, the object will speak, i.e. that truth is accessible" (qtd. in Fernandez-Armesto 120). The nineteenth-century American scientist Joseph Henry went even further in setting empirical science apart from the human desires informing social constructivism. For he gave the merely human self-denial of empiricism a theological cast, remarking just before performing an experiment that "We are going to ask God a question. Let us pray that we do not miss his answer when He gives it to us" (qtd. in Atalay 24). A doctrinaire social constructivist would, of course, dismiss Henry's language as precisely the kind of deceptive and self-serving rhetoric that clerics often used to advance their cultural and social interests -- their "shifting and crooked" human needs -- long before scientists like Henry took it over for their own ends. No transcendent or superhuman Deity speaks through scientific experiments, in their view, any more than he speaks through popes and bishops. To be sure, social constructivists often do concede the existence of an "external permanency" outside of the hermeneutic circle within which society interprets that permanency. However, for social constructivists, that external permanency remains remarkably mute. For social constructivists, empirical experiments on that external permanency never enable "the object [to] speak for itself" and so never make truth directly "accessible." Rather, empirical experiments merely make new material available for interpreters to work with in their hermeneutic and rhetorical labors. For social constructivists, the final test of "truth" (quotation marks obligatory) is social acceptance, not empirical verification. Social constructivist Humberto Maturana asserts consequently that "scientific explanations do not explain an independent objective reality" (<<http://www.inteco.cl/biology/>>). Explaining that all "new domains of reality" are the constructs "we bring forth in a community of observers" as the "praxis of living" enmeshes us in "the happening of being human, in the languaging of language," Maturana concludes that "science, modern science, as a cognitive domain is not an exception to this" (secs. 4, 11). The prominent social constructivist Siegfried J. Schmidt rejects likewise the views of scientific realists when he argues that the putative "objects" of scientific research are "not objects in an ontological sense," that indeed "scientists do not talk about objects; instead they talk about phenomena and problems. Phenomena and problems, however, do not exist in themselves; they exist only in relation to scientists, which is to say in relation to knowledge, interests, needs, and preferences in sociohistorical situations" (624-25). To be sure, in the social constructivist view, empirical data may affect sociohistorical situations by making certain lines of interpretation more difficult to maintain than others, but such data never reveal a definitive and objective truth and never constitute the divine voice Henry sought to hear through empirical experimentation.

But the likelihood that scientists make contact if not with deity at least with reality -- and not a socially constructed reality at that -- seems particularly high when those scientists report findings which can serve no discernible social purpose. Such findings are no doubt those that Gray has in mind when writing about the "remedy for anthropocentrism" which scientists provide when their work delivers a mental perspective that is "intensely uncomfortable to the human mind" (23). Science can indeed deliver discomfort on many different levels. For instance, when Louis Godin and Charles-Marie de la Condamine led an expedition to South America in the 1730's while Pierre-Louis Moreau de Maupertuis led simultaneously an expedition they led to Lapland, scientific discomfort took the form of an affront to national pride. For although most educated Frenchmen of the time hoped that these dual expeditions -- long, arduous, and dangerous -- would provide empirical verification for the geophysics of their countryman René Descartes, their observations provided no such verification. Instead of showing that the earth was prolonged at the poles and drawn in at the

equator -- as Descartes had asserted -- the French scientific establishment had to admit (with keen disappointment) that observations made by their own countrymen indicated that the earth was actually bulged at the equator, just as Descartes's widely disparaged British rival Newton had predicted (King-Hele 89). Although they voiced no patriotic hopes of the sort expressed by Godin and Condamine and company when they set out on their eighteenth-century expedition to South America, the British astronomers Arthur Eddington and Edwin Cottingham were well aware that if the data they collected in 1919 from the Island of Principe confirmed the predictions of Albert Einstein on the gravitational bending of light, such confirmation would enhance the scientific status of a bitter foe, Germany, at the expense of the long-dominant science of their own country and its scientific titan, Isaac Newton. Perhaps such national chauvinism helps explain why even after Eddington and Cottingham reported data in close agreement with Einstein's predictions and at odds with Newtonian formulae, some British scientists (including Sir Oliver Lodge, principal of Birmingham University and Oliver Heaviside, winner of the Nobel prize in physics in 1906) still rejected Einstein's theory as "drivel" and as a perspective "repugnant to commonsense" (Brian 101-02). Social constructivists can, of course, explain such chauvinistic and hostile responses to Einstein very well. They can further explain why Nazi scientists within Germany attacked Einstein's theories as "Jewish science" (Brian 101-02). Because the empirical verification of Einstein's science brought with it considerable discomfort, these scientists simply tried to ignore it in ways that satisfied their "shifting and crooked" human desires. These scientific foes of Einstein sought refuge in a "hermeneutic truth" that explained away the data threatening their interests. All of this fits satisfactorily within constructivist doctrines. What does not fit so well within social constructivism, however, is the eventual success of scientists such as Eddington and Cottingham in winning virtually universal acceptance for Einstein's theories by wielding their empirical data against the hermeneutic illusions of skeptics. Ultimately, this data proved so potent that even scientists loyal to the Nazi regime -- including Ludwig Prandtl and Werner Heisenberg -- embraced and used Einstein's physics, despite the keen disapproval of party leaders (Brian 308). Given the murderous way in which the Nazis dealt with dissidents on even small issues, it is hard to see how German scientists such as Prandtl and Heisenberg were in any way engaging in a hermeneutic act that advanced their interests when they embraced Einstein's empirically verified science. Rather, it would appear that for the sake of its objective truth, such scientists accepted the real ideological discomfort such "Jewish science" occasioned.

With enough ingenuity and persistence, social constructivists could nonetheless represent the labors of Eddington and Cottingham, Prandtl and Heisenberg not as those of scientists who laid hold upon Einstein's theory as a guide to empirical reality but rather as those of members of an international hermeneutic community devising meanings that eluded the control of particular party and national elites. These social constructivists might even assert that despite the risk they ran within their national or party circumstances by doing so, these scientists actually reinforced the privileges of their gender, race, and class by helping to advance a rationalist and empiricist mode of discourse that has always favored affluent white males -- like themselves. Perhaps such social constructivist reasoning might persuade those who can see the numerous accomplished female and non-Caucasian scientists -- such as astronomers Maria Mitchell and Subrahmanyan Chandrasekhar and physicists Marie Curie and Chien-Shiung Wu -- as merely so many colonized minds, although such a view will strike many as terribly patronizing and condescending. But the true acid test for social constructivism comes out of what may be termed eschatological cosmology. Such cosmology is so "intensely uncomfortable to the human mind," so incompatible with any imaginable human interest -- regardless of nationality, gender, race, or class -- so potent as a "remedy for anthropocentrism," that it resists explanation within the doctrines of social constructivism. To be more precise, such cosmology resists explanation within the doctrines of social constructivism to the very considerable degree that those social-constructivist doctrines derive from the group politics of social identity. Put another way, such grim cosmology resists the doctrines social constructivists usually deploy to develop their sociology of knowledge. What recognizable group interests could scientists possibly be advancing in the "hermeneutic truth" that they represent as empirical truth -- or at least as an empirically verifiable hypothesis -- in predictions of

cosmic oblivion? Consider, for instance, the vista that UCLA chemist Lawrence Krauss opens for his readers when he explores the theoretical physics predicting that "even in an eternally expanding universe, life cannot persist forever" (278). In this grim perspective, "the very processes that created the matter that makes up the universe of our experience will one day slowly return our dust to nothingness" (281). Not only do the relentless formulae and data of astrophysics tell us that our planet will "certainly" one day be "uninhabitable" (227), but they also script a far distant time when: "all memory of the star that sheltered [our] planet ... for a brief 10 billion years will have long disappeared. The memory of the galaxy that housed that sun will have long disappeared. Even the light from all of the stars in the universe may have long disappeared ... one day a single proton in [a single] atom will go poof. Then ... [a] second proton will die. The process will continue until ... all atoms in the universe are no longer ... [When] protons and neutrons cease to exist, they may in turn decay into electrons and their antiparticle partners, positrons. By this time, the universe will be too diffuse for electrons and positrons to find each other in the desert of largely empty space" (282-83).

Long before astrophysicists ever offered such menacing predictions of the future, various homilists, preachers, and charismatics stirred widespread fear with prophesies of cataclysm. Such prophesies, however, always lent themselves to social constructivist interpretation because the prophets offered an escape, spiritual or temporal, usually through adherence to a church, party, or movement for which they spoke. In other words, their dire predictions served human interests in recognizable ways, so providing a comprehensible motives for the leaders -- usually, but not always, affluent white males -- of the hermeneutic dance these predictions choreographed. But when physicists now predict the utter dissolution of everything, they offer no escape. Indeed, Kraus writes resignedly of the impossibility of avoiding the "ultimately ... bad situation" which dooms all of human life (227). When scientists claim that their bleak cosmology results from the probing of objective reality with the most reliable mathematics verified through the most rigorous empirical experiments, they may not convince social constructivists. But how would social constructivists explain the work of these hopeless cosmologists? Such cosmologists steer entirely clear of the anthropocentric "myth of progress" for which Gray expresses such disdain. In the utter absence of any of the "shifting and crooked" human motives that Gray blames for deflecting science from the "disinterested pursuit of truth," science may truly offer the "remedy for anthropocentrism" Gray seeks. It is, however, precisely because it offers such a remedy to anthropocentrism that the science of cosmic despair defies explanation within social constructivism. For if it is "shifting and crooked" human needs produce science that as an invention that serves to satisfy those needs, then we must ask just what human needs could ever be satisfied by cosmological predictions of universal death. To be sure, social constructivists could make perfect sense of Friedrich Engels's rhetorical decision to exclude from his political theorizing the science that even in his day predicted a time when "the sun exhausts itself ... and finally there is not enough warmth for life itself ... [A]nd the earth becomes a dead, frozen globe, like the moon" (qtd. in Harrington 80). Social constructivists can even explain the willingness of some modern scientists to ignore available empirical data -- to the acute annoyance and vexation of physicist Stanley Jaki -- as they have tried "to give eternity to the universe" (as Jaki puts it) by formulating "steady-state" and "oscillating" models for the universe, models formulated in the utter absence of supporting physical evidence (78-79). In complaining about these colleagues' departure from a rigorously empirical science, Jaki draws momentarily close to a social constructivist perspective when he concedes that "perhaps it would be too much to expect [these scientists] to be utterly candid about their ... motivations" for inventing cosmologies that are not so ultimately bleak, not so "intensely uncomfortable to the human mind" (79). Because he recognizes how frequently "shifting and crooked" human motives prevent scientists from delivering "the remedy for anthropocentrism" that he so desires, Gray would see nothing novel in the invention of scientific models that deliver hope rather than experimental truth. These models do indeed seem to be semiotic creations intended for an interest-governed hermeneutics; they clearly are not empirically verified works of objective science.

Nonetheless, alongside the comforting cosmologies amenable to social constructivist explanations remain the cosmologies that are far too "intensely uncomfortable to the human mind" to fit

within social constructivist orthodoxy without severely straining its founding assumptions about human motivation. Social constructivists could, of course, simply concede that while their theory of meaning can account for many, perhaps even most, of the products of science, a few scientific theories simply elude explanation within their doctrines. Gray himself seems to allow for precisely such a position when he laments that because they are in thrall to "shifting and crooked" human desires, science will "will never be used chiefly to pursue truth" (28), while still holding out the theoretical possibility that scientists may occasionally defy those human desires by forcing mankind to confront the disconcerting truths that will explode their ancient anthropocentric fantasies. Generally, however, social constructivists do not draw such limits on the applicability of their theories. When social constructivists insist, as they do, that the "truth" (and the intrusive quotation marks are obligatory within social constructivist skepticism) of "any proposition" depends upon social hermeneutics and social agreement and consensus, they allow for no exceptions. In refusing to concede that some propositions might not yield to explanation within their theory, social constructivists adopt a posture very different from that of leading scientists, who admit typically that certain types of questions defy the limits of their theories. Although the distinguished biologist and philosopher of science Peter Medawar, for instance, claims that "science is incomparably the most successful enterprise human beings have ever engaged upon" (65), he still admits to a "limit to science," a limit evident in its utter "to answer childlike elementary questions having to do with first and last things -- questions such as -- 'What are we all here for?' ... 'What is the point of living?'" (59). Why do social constructivists -- unlike scientists such as Medawar -- admit to no limits on their theory of meaning? Social constructivists are simply working out the implications of their ultimate assumptions about the grounds of meaning.

The literature and culture scholar J. Hillis Miller exposes perceptively these assumptions when he notes that "the disappearance of God" from modern thought means the disappearance of an "extrahuman foundation for man, nature, or society" (30-31). "When God is annihilated," Miller elaborates, "at the same time man annihilates himself and annihilates also the world around him. He annihilates them in the sense of hollowing them of any substantial presence" (32). Bereft of any divine or transcendent ground of meaning, humans must make "human subjectivity" itself "the foundation of all things, the only source of meaning and value in the world" (32). This radical shift in the perceived foundation of meaning "bring[s] into existence a society which generates its own immanent basis for meaning" (34). If society has replaced the transcendent God of Scripture as the ground of meaning, in the way Miller perceives, then society has become a type of surrogate deity. And precisely because Society has emerged as a surrogate deity, social constructivism has acquired the character of a surrogate theology. As the theologians for a surrogate deity, social constructivists must do what theologians have always done -- namely, adduce arguments demonstrating the omniscience and omnipotence of their jealous god. To admit that social constructivism cannot account for some products of science (such as its bleak cosmology of ultimate dissolution) is to concede the inadequacy of Society as a surrogate deity capable of fully and completely "generat[ing] its own immanent basis for meaning" (Miller 34). To admit that social constructivism cannot account for that portion of science that offers a remedy to anthropocentrism is further to concede that social constructivism itself rests on thoroughly anthropocentric premises. Because its practitioners rarely make such concessions, social constructivism now threatens to become another "religious philosophy of modernity" of the sort that historical theologian Alister McGrath sees becoming "a totalizing worldview which demand[s] that all else give way to its claims" (232). Long before social constructivists such as Schmidt, Maturana, Lepenies, and others began disparaging the truth claims of science, scientists found themselves besieged by the representatives of a different religious philosophy justifying a different "totalizing worldview." Galileo in particular found himself in peril before the Catholic Inquisition precisely because he claimed for science an access to objective truth entirely outside of ecclesiastical understanding and control. For those who viewed themselves as the only legitimate human representatives of the omnipotent and omniscient God of Scripture, Galileo's claim was blasphemously presumptuous. Today's social constructivists would recoil, naturally, from any comparison of their challenge to science and the Inquisitors' persecution of Galileo. But because they have taken over a quasi-theological task on behalf of Society



as a surrogate deity, it was entirely predictable that a revisionist historian would do precisely what Catholic apologist Wade Rowland has now done: namely, defend the seventeenth-century actions of Galileo's prosecutors by appropriating the twentieth-century doctrines of social constructivism. Invoking a central social constructivist doctrine, Rowland indicts Galileo for having fallen into a serious error in his claim that "it is not in the power of any created being to make things true or false" (qtd. in Rowland 137). Galileo's prosecutors, Rowland argues, avoided this grievous error by realizing, as foolish Galileo did not, that "Scientists do not discover laws of nature, they invent them. Scientists do not observe 'nature in the raw' -- their observations are filtered through layers of subjective impression and social conditioning. Scientific 'facts' about nature are not preexisting truths, they are human constructs, the products of human minds. ... The truth that science 'discovers' is not objective and immutable, it is subjective and socially contingent" (137). Rowland thus rejects as philosophically and socially dangerous Galileo's attempt to advance his radical worldview (in which the earth and its inhabitants lost their traditional centrality) as objective empirical science entirely free of such social contingency.

Social constructivists may wish to repudiate Rowland's astonishing use of their doctrines. But Rowland clearly knows and understands those doctrines. What is more, social constructivists may find it difficult to establish cogent reasons for repudiating Rowland's application of doctrines that cohere only when part of a totalizing surrogate theology that occupies the entire cultural space of the traditional totalizing theology it has supplanted. While it may offend most social constructivists, Rowland uses their doctrines in ways that are both consistent and logically coherent. After all, the Catholic Church was Society in seventeenth-century Southern Europe and therefore exercised society's power to generate meanings through the social consensus it created through persuasion - and coercive terror. Social constructivists have much to teach about how society shapes and interprets the meanings of scientific enterprises. They can, with Gray, explain why "shifting and crooked" human desires often transform science into a support for socially palatable myths and illusions. They can explain, for instance, why some modern scientists cling to theories of an oscillating or steady-state universe as an alternative to the bleak cosmologies of universal dissolution. But unless they wish to take over the cultural role of Inquisitors and so provide legitimacy for past Inquisitors, perhaps it is time that social constructivists acknowledged that at least when they advance cold, dark propositions serving no discernible self-interest, scientists may indeed move beyond the boundaries of their theory of meaning.

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Author's profile: Bryce Christensen teaches writing and literature at Southern Utah University. His current research interests include the ethics of science, utopian literature, and the politics of the family. Christensen has published articles on cultural and literary issues in *Philosophy and Literature* (1982), *Christianity and Literature* (1986), *Renascence* (1988, 1991, 2002), and *Modern Age* (1996, 1998, 2001), and in various other scholarly journals. His book, *Divided We Fall: Family Discord and the Fracturing of America*, is forthcoming in the Fall of 2005 from Transaction Books. E-mail: <[christensenb@suu.edu](mailto:christensenb@suu.edu)>.