

## Response to Jay Bachrach's "Physics and Time"

William M. Kallfelz<sup>1</sup>

October 10, 2008

Jay Bacharach's essential points appear to be an extension of what he characterizes as "Goedel's criticism," viz. that Einstein's theories of relativity (both Special and General) entail no warrant concerning the objectivity of temporality. *Pace* McTaggart's metaphysical arguments against the reality of time (both real and apparent), Bachrach reminds the reader that "[although] Goedel regards the experiential A series [i.e., what can be tensed] as what we *mean*<sup>2</sup> by time...the objective Goedel-Einstein universe *has* no time...the intuitive, experiential A series still has [its] *place*; it simply does not apply to the objective Einsteinian reality."<sup>3</sup> (Bachrach, 2008, p. 4, italics added)

The extension of Goedel's criticisms, comprising the pith of Bachrach's claims, is apparent in the following passage:

[T]he adequacy of *any* picture we may have of the Goedel-Einstein world is so tenuous that it leads to contradiction. This does not preclude a scientific theory of such a world...[only] that we cannot come up with any picture of such things...In idealistic philosophical systems...mak[ing] a sharp distinction between appearance [here, the A-series] and reality *no picture of the reality is even adequate; the reality is simply indescribable*...However, the act of knowing such a reality is not...necessarily mystical, ecstatic or intuitive. The Goedel-Einstein [view] is an empirical, physical theory that *does* reveal the nature of the ideal world. (Kant would be uncomfortable with this.) (ibid., pp. 5-7, italics added)

---

<sup>1</sup> Ph.D., Committee for Philosophy and the Sciences Program, Department of Philosophy, University of Maryland at College Park, MD. Current employment: Lecturer, Department of Philosophy and Religious Studies, Central Washington University, Ellensburg and Research Fellow & Consultant, Center for Philosophy and Natural Science ([www.c-p-n-s.org](http://www.c-p-n-s.org))

<sup>2</sup> Recalling Hilary Putnam's (1975) seminal "The Meaning of 'Meaning'" perhaps the A series is an instance of what Putnam refers to as the "stereotype" component of meaning, whereas what our current, cutting-edge physical theories tell us depict the "essential" aspect thereof—i.e., the meaning of a term agreed upon by a sub-community of "experts" in a language community. (For example: the stereotype of the term 'water' is "clear, colorless, liquid" while its "essential" meaning-component is "H<sub>2</sub>O." In addition to stereotype and essential aspect, Putnam also specified "syntactic" and "semantic" markers: E.g., the respective syntactic and semantic markers for 'water' are: "common noun," "natural kind.")

<sup>3</sup> Or, in regards to Putnam's theory, as mentioned in n. 2 above, what the expert speakers characterize essentially about 'time' clashes with our 'stereotypical' sense of it in a fundamentally *epistemic* manner. This is certainly *not* true in the case of 'water,' despite the historical controversies concerning the discrete atomic/molecular (versus continuum-based) view of matter that raged for centuries (e.g., Boyle versus Descartes). To apply Bachrach's points concerning the role of "picturing" vis-à-vis the reliability of models, in principle one can "picture" water as a *discrete collection* of H<sub>2</sub>O molecules in a logically consistent and epistemically coherent manner, as contemporary high-school students of chemistry are of course taught to do. Nothing of the sort can be done in the case of 'time,' i.e. form any consistent set of picture(s) or model(s) of 'time' which would link up its essential to its stereotypical connotations, as Bachrach emphatically argues (2008: 4-8).

The last sentence in the passage signals what I would deem as Bachrach's "tempered" or "qualified" Kantian view.

I will not comment on the overall plausibility or persuasive force of Bachrach's argument—to the reader his conclusions stand or fall according the inherent plausibility of his methodological presuppositions concerning the nature of modeling and picturing vis-à-vis the activity of scientific theorizing,<sup>4</sup> as well as his overall tempered Kantian epistemic and metaphysical outlook. To me, his points as clarified in his essay, strike me *prima facie* as reasonable enough.<sup>5</sup> Instead, I will (briefly) summarize below some points of possible tension or concordant resolution (tension or resolution depends of course on the interpretative eye of the beholder):

1. Though I believe this to be a relatively minor point requiring some clarification, I mention it nonetheless in passing: It may perhaps prove to be a metaphysical half-truth to characterize the universe (in Block-World fashion) as "non-temporal;" *unless* what one means by it is to *include the temporal aspect*. In other words, viewing the matter from a metaphysical *plural-aspects* position<sup>6</sup>, temporality is a *feature*<sup>7</sup> of the universe, though the converse is clearly false. This notion of non-temporality should be distinguished from other instances thereon in which temporality doesn't appear at all (whether as an aspect or otherwise).<sup>8</sup>
2. Bachrach offers a compelling characterization of the Bohr-Einstein controversy along the lines of his claims, viz. "another way of seeing this disagreement is that one [Einstein] views causality in phenomenal terms; the other [Bohr] is not so bound." (p. 6) From this point he then goes on to extend his general points in the case of quantum mechanics: "[N]ot only no

---

<sup>4</sup> As clarified throughout his essay, especially in the Introduction, as well §§ I. – III.

<sup>5</sup> And reminiscent, I might add, in many ways to Suny Auyang's (1997) overall points and presuppositions as laid out in her book: *How Is Quantum Field Theory Possible?*, wherein she embarks on a project of interpreting quantum field theory within a similar "tempered Kantian" framework.

<sup>6</sup> As opposed to *substance pluralism*

<sup>7</sup> Characterized mathematically of course as the *ict* "axis" in Minkowski geometry.

<sup>8</sup> E.g., atemporal predicates.

adequate model is available for QM which incorporates particle and wave [viz. co-present position and momentum representations], but no precise phenomenal model is available for QM which selects and ignores the other alternative.” (pp.7-8) Two caveats are in order here: (2.a) The proposed analogous defect of QM may prove itself even *more* defective—hence evincing an asymmetry regarding Bachrach’s proposed symmetrical claims. There are many experts<sup>9</sup> in the field of the foundations of quantum theory, who deny that quantum systems possess a *state* whatsoever—that is to say *any* property by which one may (in principle) provide (*ceteris paribus*<sup>10</sup>) a complete description thereon. This is a *metaphysical* limit, not just an *epistemic* one, which serves to underwrite the analogous defect of consistently modeling quantum phenomena as mentioned by Bachrach. (2.b) Some of the latest research in quantum topology *may*, depending one’s interpretation of “quantum time,” trump the claims of global non-temporality (insofar as the aim of quantum topology is to *derive* general relativity as an “asymptotic” or approximate “limiting theory.”) If so, this would weaken the force of some of Bachrach’s conclusions; namely, that a contradiction would *always* result when seeking to (phenomenally) “picture” the universe. Though at the same time, Bachrach’s implied claims concerning no *particularly* unique way of modeling would still hold. In short, though the jury is still out (among the specialists) concerning the interpretation of “quantum time,” the implications of such a verdict would reduce Bachrach’s claims of *a priori* epistemic *limits* in modeling/picturing to a matter of *a posteriori* practical *limitations* thereon. An interesting claim, notwithstanding, I might add, in *either* case.

-WMK

---

<sup>9</sup> Carlo Rovelli (1996), David R. Finkelstein (1996, 2000, 2004, 2008), etc. Finkelstein (1996) characterized, as a matter of fact, the Bohr-Einstein debates to hinge on this question, i.e. whether quantum mechanical systems exhibit the “state” property.

<sup>10</sup> Echoing Nancy Cartwright here (1993, 1999) concerning the essential “hedging” activity constituting the nature of modeling, as alluded to by Bachrach as well.