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Invoking Cognitive Dissonance and the 'Abstract Machine': Toward a Process Informational Paradigm – Response to Three Commentators

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Introduction

This is a response to three highly engaged, critical comments on my recent book, *Quantum Holographic Criminology: Paradigm Shift in Criminology, Law and Transformative Justice* (2014). Whereas Bruce Arrigo and Johannes Wheeldon employ an external critique, Raymond T. Bradley makes use of an internal critique. Bruce Arrigo, a highly productive, innovator, and influential critical criminologist, uses the occasion to not only come to terms with the book's thesis, but to integrate it into further suggestive thought concerning the ethics of becoming. Johannes Wheeldon not only does a thorough critical comment on each of the chapters, noting three problematics, but also concludes with the value of its "cognitive dissonance" in contemporary criminology (from whom, respectfully, I have borrowed the notion in the title). Raymond T. Bradley, collaborator with Karl Pribram (who recently passed away, even as he wrote his last book at the age of 93, *The Form Within*), is an exceptional innovative scholar – whose groundbreaking work, unfortunately, for 40 years has remained on the margins, more so because of traditional paradigm constraints – has provided some critical reflections on the first half of the book (primarily chapters 1,2,3,4), leaving the integration with Deleuze and Guattari and others, as well as the application to criminology, law and transformative justice to others better versed in these respective areas. His work is especially provoking for better development of conceptions of transformative justice based not on Newtonian ontology of determinism, but on quantum and theory holography which provides the basis of bringing the subject back in as a potentially active and creative subject.

Bradley (2010) has had the occasion to publish a novel approach to the nature of secret groups, including terrorist groups (their forms of solidarity and communication). As one of the founding figures of a quantum holographic approach in the social sciences, particularly in sociology, he provides an overview of the key components, even as he stresses that he is more concerned with the holographic component. He is especially engaged with Chapter 4 on agency, and the development of the offered Schema QD, an inter- and intra-subjectively constituted subject.¹ He also provides five

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problematics (“issues”) with the book. He concludes with an integration of my Schema QD with his current work in progress, including “The Lens of Love: Holographic Eye of Universal Consciousness” and a forthcoming book, *Consciousness and the Eye of Love*.

Each author provides some problematics/critiques whose further engagement is suggestive for fruitful future work. To each author I owe much gratitude, even with some of the intense constructive criticisms offered. After all, it is through pointed critical discussion that we can move the criminological, legal, and transformative justice fields toward an alternative ontological and epistemological-based framework, the “process informational paradigm,” which questions the fundamental assumptions derived from a Newtonian-driven “classical materialist paradigm” that has imprisoned conventional thought.

My work applying quantum holography to criminology, law and transformative justice must be seen more as exploratory and a first approximation. There is much, much more to be done, as each of the commenting authors suggest. In no way should my brief snippets as to possible application to criminology, law and transformative justice be seen as definitive, complete theories. They are suggestive, transgressions of given boundaries of our contemporary classical materialist paradigm. They are more in the spirit of Deleuze and Guattari’s (1987) “war machine.” For those not fully acquainted with quantum and holography principles, especially interested scholars and developing graduate students, my work, as well as the work of Bradley, are a call for reconsideration of conventional thought, a shift to well-developed principles in other disciplines.

Graduate students often find themselves being socialized into the conventional paradigm practiced at their respective graduate departments which is often overly empirical and positivistic with little or no review of philosophy of science. I, for example, received my first master’s degree at John Jay College of Criminal Justice, but at the time (mid-1970s), it was perceived as a “cop shop,” only giving insider’s views of the pragmatics of fighting crime and the “thin blue line.” It was only through my own external reading, and a commitment to viewing the graduate experience as introductory to practitioner’s thought – those of insiders, often hardened by practical, street-level experience of fighting crime – that a realization set in that a new orientation was needed. Fortunately, I came across Richard Quinney’s *Social Reality of Crime* and Taylor, Walton, and Young’s *The New Criminology* while taking a summer course at my alma-mater which turned on the light. Hi and Julia Schwendinger’s “Defenders of Order or Guardians of Human Rights,” a later discovery, rounded off the key works that sent me off in a different trajectory than conventional graduate school often induces. Fortunately, while doing my Ph.D. work at School of Criminal Justice, SUNY at Albany –the leading “crim school” at the time that focused more on research and theory than practical experiences, whose “Albany model of criminal justice” was to influence the development of subsequent graduate schools in criminal justice – I was privileged to work with Graeme Newman, my thesis advisor, who was far from being a “critical criminologist,” but for myself and other left-leaning students, was incredibly supportive for doing scholarly work regardless of political persuasion. So, my message to graduate students, do not hesitate to go outside of the boundaries of the framework your own graduate program has pre-established. Seize the moment and develop the seeds of potential lines of inquiry that go beyond the bounds set by the program and the discipline in general but still being cognizant of the dominant orientation.²

¹ See Schema QD and its portrayal on the cross capp, pp. 17,19 in the *Journal of Theoretical and Philosophical Criminology*: <http://www.itpcrim.org/July-2013/Article-1-QHCC-Revised-Reformatted-Milovanovic-July-2013.pdf> One update that is found in QHC: $|I_i\rangle$, upper left corner, has been replaced with “discursive subject position.” See also Batiz and Milovanovic on “Research Gate” (2014).

² My own theoretical journey has led me to a central concern with postmodern theory, particularly chaos theory (dynamic systems theory), psychoanalytic semiotics, edgework, and catastrophe theory. In the 80s my work was more occupied with versions of Marxist analysis, with the realization of the importance of a structural interpellation model in late capitalism and subsequently a constitutive

Brief Tutorial on Quantum Mechanics (and the Wave Function) and Holography (and Interference Patterns)

It is probably useful, at this point, to briefly summarize what is fundamentally at stake in a paradigm shift. Two quick highlights will help the more unacquainted, one illumination for quantum mechanics, one for holography. Newtonian physics is ultimately about *objects* and *trajectories* in space and time. Objects are seen to have essences, with distinct boundaries and intrinsic properties on which forces act. Given a set of definable forces in 3-dimensional space (“initial conditions”) and a clockwork universe, with time moving linearly from past, to present, to future, a specific trajectory can be established (Newton’s $F=ma$). Pushing the logic, all is predictable by discovering the set of forces acting on objects. This is ultimately a deterministic universe. Quantum mechanics, on the other hand, questions the notion of essences of objects, linear trajectories, and our notion of space and time. Time is atemporal, we can have retrocausal effects; space is nonlocal – studies have clearly indicated that two things located far apart can still instantly influence each other (quantum entanglement). The Schrödinger equation of the evolution of a system stipulates that we have “clouds of possibilities” moving through space with probabilistic outcomes. Waves reflect potentialities, possibilities for expression. Everything can be represented by a wave function. Wendt (2015), for example, argues each person is a walking wave function. For the mathematically inclined it is the absolute square of the wave function that produces an instantiation of one amongst the potential possible states we call reality (identified as $|\psi|^2$ where ψ stands for psi). Following the much accepted Copenhagen interpretation in quantum mechanics, it is measurement/observation that “collapses” this wave function. The nature of an “object” has been redefined by the “two-slit experiments” which consistently show through a variety of experiments that the “object” appears in two forms: a wave form and a particle form. Normally, an entity is in a wave state until collapse. The two-slit experiments have a long line of study but they indicate that whenever you try and measure or observe some “thing” this observation itself changes the wave form to a particle form. Thus quantum mechanics explains the process involved in the collapse, even as its actual interpretation still baffles top thinkers. The theory works, but we don’t know why.

approach as being key frameworks for critical analysis in criminology and law. But, in the late 80s I began increasingly concerned with the structural implications of my work, even realizing more and more that there is a subject missing. My own personal experiences told me that agency makes a difference. From serving as a combatant in Vietnam (company point man, 1st Cavalry Division); work and volunteer experiences in a mental hospital for the involuntarily committed, scoutmaster of a “child retarded mental development” troop, prison inspector for the John Howard Association; college instructor for four years at the Queens House of Detention for Men, NYC; and a dormitory counselor at the since-closed notorious Spofford Youth Center, NYC. My reflections in the late 80s led me to rethink agency. This led me to Jacques Lacan’s work. At the time, little of his work, outside of *Écrit* and the *Four Fundamental Concepts*, incredibly dense and demanding work, were available in English. This led me to locate two sets of original transcribed material which I then needed to translate into English. Only then was this work useful for further thought about agency and how it can be connected to criminology and law. At the time, Lacan, more than any other author with whom I had engaged, seemed to have it right. But after some 15 years of sustained work, it became quite apparent that his work was overly oedipal in structure, with a rather passive Hegelian notion of “lack” and desire as its basis. This was too stifling. This led me to engagement with other postmodern approaches. Deleuze and Guattari’s work became quite central. Quantum and holography theory, however, seemed most relevant. I knew earlier, particularly in my “Dueling Paradigms” article that both were important, but at the time, had not researched the area in depth. But Deleuze, Guattari, and Bergson’s work led me to return to quantum mechanics and holography theory.

Briefly, for holography, the quickest way to conceptualize the process is by thinking about stones thrown in a pond, or two ships plying the seas, both leaving ripples that intersect. It is at this intersection point that interference waves (patterns) are created. Theoretically, the interference patterns themselves encode all information about the direction, of say the ship, its weight, direction of travel, speed, etc. (See Laszlo, 2007 on this example). This encoded information remains embedded on some recording surface. The question then becomes how to access and decode this information, and how to understand the nature of the recording surface. More sophisticated laboratory experiments explain this process by using two waves, one that is reflected off “objects” (“object beam”), the other, say a laser beam (“reference beam”). The two would be mixed (=interference pattern, where waves with corresponding high and low points reinforce), and the result recorded on some surface. On the surface it looks like just random scratches (think in terms of CDs, DVDs). (See also Bradley’s example in the enclosed commentary, Figure 2.) But if we shine a reference beam on that surface, the object reappears; in fact, anywhere one shines the beam one will find reconstructed the initial encoded image (nonlocality). In the field of optic science, an additional understanding has emerged concerning the idea of “optical phase conjugation.” This is a process by which a beam of light is reflected by a special mirror in a way that the beam returns along the very same pathway (time reversal, backward time referral, sometimes call the “conjugate wave”) producing a “standing wave” in the process. This conjugate wave encodes information returning to the point of initial emission. Marcer, Schempp, and Mitchell have adapted this idea in developing the notion of phase conjugate adaptive resonance (PCAR), by which they argue all “objects” emit wave forms that are received by some percipient who generates a returning wave along the same pathway forming resonance, an informational channel (See Cramer, 1986), and it is at the location of the initial emission that the image is instantiated in final form that we then see as “reality.” Bergson, in *Matter and Memory* (2002), written in 1896, had already anticipated something similar at work in perceptions. Thus, holography is about information – its encoding, decoding (transforming information to knowledge), transmission, and recoding. To contrast the linearity that seems to be suggested, Bradley (see his commentary) has developed the difference between classical and quantum holography. The latter is based on Gabor (1946) demonstrating how in dynamic, emerging, fluctuating energy flows at best we can isolate a “cut” of this flow in the form of a spacetime framed quanta of information that follows Heisenberg’s uncertainty principle; that is, this “spacetime constrained quanta of information,” a “logon,” is not a linear, deterministic construction but remains with a degree of uncertainty. This process is implicated at both the 4-dimensional macro world, as well as at the micro, subatomic and quantum world. We cannot make a neat split, as often suggested, between the macro and micro.

Quantum mechanics is the driving force for much of present day technology and promises the development of a mass-produced quantum computer that will produce a huge jump in computation powers.³ It would seem that with its introduction, a new orientation for users will begin to permeate basic thought processes. Holography theory (and PCAR) is the basis of the MRI; bats, dolphins and other animals use it to navigate their world.⁴

In sum, together, we have quantum holography that is the basis of the suggested (see *QHC*) “process-informational” paradigm that is an alternative to the Newtonian-driven, “classical-materialist paradigm.”

³ For a good overview in its use, see <http://arxiv.org/ftp/quant-ph/papers/0206/0206091.pdf>

⁴ For the use of holography in the MRI, see <https://eyedave4.wordpress.com/2010/04/01/holographic-mri-and-ct-scans-of-the-human-body/> and <http://www.diagnosticimaging.com/pacs-and-informatics/virtual-holography-next-step-3d-imaging> . In other medical area, see <http://www.bioopticsworld.com/articles/print/volume-6/issue-6/features/biomedical-imaging-3d-digital-holograms-visualize-biomedical-applications.html> . For some basic theoretical developments, see http://www.bcs.org/upload/pdf/quantum_holography.pdf

Response to Comments

Let me proceed to engage each of the three sets of comments. I would like to start with Johannes Wheeldon since his comments directly address the potential connections between the quantum holographic approach and traditionally practiced criminology. Bruce Arrigo's work includes some critiques but its main contribution is in the highly insightful integration and synthesis. Ray T. Bradley's comments focus more on theoretical developments in holography theory, with some acknowledgement and integration of quantum theory and sociological application, but suggestive for criminology, law and transformative justice for rethinking their underlying classical-materialist assumptions. Included in my response to Bradley are further responses to Arrigo and Wheeldon where some ecological space is shared. Thus each of the three provides a wider framework, or lens, by which my book can be critically assessed.

Wheeldon: Invoking Cognitive Dissonance (the "War Machine")

Wheeldon first notes and quizzes the use of isomorphism, not metaphor or analogy in the book, a question Bradley raised in his comments below. Wheeldon notes (p. 90) "it is used as something more than analogy or metaphor, but less than a concrete interdisciplinary application." Indeed "mapping" the core concepts of QH onto conceptualizations in criminology necessitates careful analysis. Admittedly, there is much more point-for-point mapping in my work to be done. Only some bare outlines have been offered to suggest an alternative ontological basis of theorizing. When Karl Pribram and Raymond T. Bradley use the metaphor of the eye being more like a "lens" that decodes the holographic field it is indeed a metaphor at one level, but at other levels, says something quite profound about percepts accessing and decoding information. Recall here, too, Sigmund Freud, in *The Interpretation of Dreams*, who likened his psychic apparatus to a microscope which can zoom in on phenomena, in the process bringing light to how ideas finally take on more discernible form. And recall Jacques Lacan, when asked about his extensive use of topology theory and in his late life, the Borromean knots, that his response was it was how the psychic apparatus operates, not metaphor.⁵

In this direction, many scholars who are beginning to integrate quantum mechanics, holography theory, and quantum holographic principles together, have stopped short in their work in grasping the full significance on their endeavors. Many of the leading scholars in the newly developed field of quantum cognition (see for example, Busemeyer and Bruza (2014), *Quantum Models of Cognition and Decision*) as well as in psychology such as Andrei Khrennikov's (2010, 2013) *Quantum Social Science* have argued for the "quantum like" functioning of the brain, even as their incredibly innovative, groundbreaking working is indicating it is more than "like." At best, their current position is often mentioned as being one of "agnosticism" as to the quantum brain model. Fortunately, Alexander Wendt's recent book (2015), *Quantum Mind and Social Science*, has bravely taken these authors to task on their reticence in following the logic of their argument to fruition.

Wheeldon does perceptively note (p. 92) that making use of isomorphism does entail careful analysis of the connectedness between the concepts of quantum and holography theory and application in criminology, law and transformative justice. My book begins this mapping, but must be read as suggestive in further developing this line of inquiry.

Next (p. 91), he discusses my attempt to integrate quantum mechanics with holography theory. There have been various developments of applying quantum theory, particularly in the area of consciousness studies and psychology. There have also been, as with Bradley, initiatives applying holography theory to the social science particularly on the nature of social solidarity, and more recently, connectedness to higher forms of consciousness. However, using both, outside of

⁵ István Diennes, following August Stern (1988, 1992), has also made the case for topological effects in his incorporation of quantum and holographic theory. See, for example, http://www.metaelmelet.hu/pdfek/The_consciousness-holomatrix-the_cornerstone_of_supe.pdf and <http://www.inco.hu/inco11/tudatk/cikk2h.htm>

cosmology/physics is rarer. Perhaps Steve Robbin's (2006, 2012, 2013, 2014) work is exemplary.⁶ He uses the early work of Henri Bergson, most notably, *Matter and Memory*, written in 1896, whose work Capek (1961, 1971) has already noted for its implicit connection to later developed quantum mechanics, as well as Gibson (1966, 1979) on "direct perception," in concluding (Robbins, 2006: 373) "the brain is a decoder; it is the reconstructive wave that is unpacking the 'code' in the holographic field." Even though he does see the importance of quantum mechanics, more fully developed by Capek in his comments on the early (1896) statement of Bergson, *Matter and Memory*, he, like Bradley, is primarily concerned with the holographic component. The quote above is also where I differ, in noting that it is the inter- and intra-subjectively constitutive role of the psychic apparatus, my Schema QD that produces a modulated frequency signature pattern that encodes all information about the person and leaves a permanent trace with any phenomena with which it interacts (holographically encoded at the quantum scale). Thus, in my book, the attempt is to integrate quantum theory with holography theory, something already taking place in cosmology theories. Cosmologists/physicists such as Gerard 't Hooft, Leonard Susskind, Jakob Bekenstein, and Raphael Bousso have developed models of holography based on their theoretical explorations of black holes, following Stephen Hawking's work, to show that all information in the interior of any bounded areas has information in one less dimension recorded on its boundary surface. This is one of the approaches I summarize in my book. Less "radical" is Laszlo's (2007) idea that all information is recorded in the "in-formation" field (Akashic field) within which we are immersed. And then off course it is Karl Pribram's (1991, 2013) approach, which Bradley follows, that primarily argues that the brain operates holographically, that information is nonlocally spread over the entire brain. More recently, Bradley has made more explicit his thoughts in considering Laszlo's notion of the "in-formation" field where memory also is stored.

Thus Wheeldon correctly notes that there are internal issues (different, contrasting approaches) in both quantum and holography theorizing. In my book I have taken the so-called Copenhagen interpretation that states that it is consciousness that collapses the wave function. Not all agree with this. David Bohm's (1983) theory, for example, does not include the collapse of the wave function. The "multi-universe" approach, too, does not include a collapse of the wave function, stating that the universe is constantly splitting up in all possibilities at any moment, and each becomes a "world" in its own. The holographic approach, as the above paragraph indicates (see my book, chapters 3, 4) reviews some of the main differences. Those entering a QH approach in criminology, law and transformative justice should note Wheeldon's concern that there are some marked contrasts in approaches in the field. And that is where much has yet to be done!

Another problematic raised is the practical. How can we actually deal with the "uncertainty principle" (Heisenberg) in criminal justice and how especially for practitioners? He rightfully notes, "in an era of uncertainty" (p. 93) (see also Jock Young's recent book, *The Criminological Imagination*) that often "policies designed to manage risk will inevitably be favored" (citing Hope and Sparks, 2000). We have already seen the ubiquitous ascendancy of "actuarial justice" as an approach in criminal justice. This uncertainty is certainly a struggle. Restorative justice began the movement toward an alternative response. Transformative justice goes beyond and seeks a more holistic approach that would accommodate to the uncertainty principle in using the useful components of restorative justice but expanding analysis to critiquing disciplinary mechanisms of political economy and to developing a social transformative agenda. But, as Andrew Woolford (2009), George Pavlich (2005), and others have argued, a fundamental deconstruction of identity categories employed by the criminal justice system as well as societal thought needs to take place, with an active

⁶ Robbins has mostly worked outside of the formal university and publishing setting preferring to provide his imaginative mind to engage in transgression of traditional boundaries. He is a Vietnam Veteran with a Ph.D. earned after his "grunt" days. We have had the occasion to directly exchange thoughts on his modeling, as well as some reflections on our Vietnam days.

reconstruction in considering change, chance, irony, contingencies, probabilities, and so on in our response to harm.

This also raises the question about how positive rather than negative change may arise, given the uncertainty principle. A reasonable direction can be suggested (possible hypothesis) by integrating: Rorty's⁷ notion of a "visionary leap of faith" and the "good prophet"; in combination with Einstein's (*Ideas*) suggestion of creative thought coming about after intense research and then, by sometimes an "irrational" jump, establishing a new set of postulates which then become the basis of further thought⁸; and by C.S. Peirce's (1965: 313-14) suggestion of "musement," "pure play," and "abduction" by which novelty is generated rather than stasis bound by inductive⁹ or deductive approaches. Of course, when referencing justice principles, scholars such as Dworkin following a much more "rational logical" analysis would find this approach disconcerting. We leave further discussion for future work. Patton (2000), too, has argued that we need to be vigilant to the potentials of regressive forms of harms of reduction and repression. Particular examples of symmetry breaking, or bifurcations have been presented by Patton (2000) in nonlinear legal break throughs, by Lefebvre (2008) theorizing how judges always are capable of deciding otherwise than via "subsumption," emphasizing purely linear deductive logic (taking place in the far majority of cases) and of developing creative alternatives (Consider, in the US context, *Brown v. Board of Education*; in the Australian context, the "*Mabo*" decision). In my book, I also integrate quantum and holographic principles to show how Lefebvre's thesis on judge's decision-making provides critical components of how "active recognition" (Bergson, 1896) generates creative alternatives.

It should be pointed out, too, that though Heisenberg's uncertainty principle is highly influential in quantum mechanics, an alternative model by Neils Bohr developed about the same time in mid to late 1920s; it's thesis is that it is not uncertainty, but an "indeterminacy principle" that is central. It suggests that it is not epistemology that is at stake, but ontology itself. See Karan Barad's (2007) remarkable book on this, *Meeting the Universe Halfway*. It is unfortunate that her impeccably well-argued points have not circulated nor have they been actively engaged even where cited in the social sciences. Even those from physics and cosmology disciplines have been negligent in engaging her work, more often focusing on some more traditional incorporation of Alfred Whitehead or William James. After six years of intensive research in doing my book, her work only came to me more recently, a statement about how buried is much innovative work. At any rate, we have no space here to more completely engage her line of thought and how it could impact criminology, law and transformative justice. We do, in the following, provide some suggestions. Her work raises issues on how reality is constitutively constructed by an agent and apparatus (measuring instrument). A recent article (Milovanovic, 2014), "Revisiting Societal Reaction (Labeling) by Way of Quantum Holographic Theory," which is an application of quantum and holographic principles to labeling theory, indicating how reality construction follows the principle of wave function collapse, could certainly be further refined using Barad's notion of "cuts" in flows producing not only a subject, but space and time itself.

To return to Wheeldon (p. 93), he does ask for more work on my offered "evaluative schemas" (*QHC*, 198) These distributive and retributive principles were presented as first approximations that responded to criticism that postmodern thought lacked normative (evaluative) theories.¹⁰ Certainly,

⁷ See Rorty, "The Banality of Pragmatism and the Poetry of Justice" discussed in Litowitz's *Postmodern Philosophy of Law*, pp. 145-155.

⁸ See, for example, Figure 1.2, "Nonlinear Integrative Thought" (Milovanovic, 2003) where it is suggested that a "transverse plane of engagement" may cut across various orientations and may lead to a bifurcation, a form of symmetry-breaking, suggested by Einstein.

⁹ Inductive approaches are too often still relying on a Newtonian framework.

¹⁰ The *distributive principle*, drawing from a number of progressive thinkers, including Marx's "need's principle," reads (*QHC*, p.198): "From each according to [her]/his abilities, to each, according to [her]/his needs' and desires; to and from each the active promotion of the power to effect and power

as he states (p. 93), “[t]here is more definitional work to be done here to allow for researchers and lay readers alike to comprehend how exactly the evaluative schemas as presented (2014: 194) might apply more generally.” Ah, but yet further future research! Yes, much more needs to be done. This evaluative schema was more suggestive, drawing from a number of progressive thinkers to rethink justice and possible principles with an eye toward responding to the extensive vacuity of integration of normative theory (responding to Litowitz’ call, 1997).

Wheeldon (p. 92) comments on chapter 4, which responds to the missing subject/agent in criminology, law and transformative justice and notes the density of the chapter. There is much to further integrate here. But the upshot is that Newton’s influence remains strong: determinism runs through the social sciences. Perhaps the “cultural criminology” approach, particularly in the use of edgework literature resurrecting the subject of passions, is in the right direction, but needs a new grounding in QH principles in order to escape the Newtonian assumptions still existing.

His final problematic is with the conclusion that “little critical self-introspection” (p. 93) exists in the text. Yes, there are many approaches to both quantum and holography theory, as noted in chapter 3. And much of these are in tension. Karan Barad (2007) has poignantly analyzed the difference between Heisenberg, Bohr, and Einstein’s position on the nature of reality itself, which needs to be revisited. In my book, in retrospect, I do see a tension between Heisenberg use and Bohr’s approach which states that reality itself does not exist outside of the measurement apparatus in interaction with its environment. Heisenberg was willing to accept there are objects and that uncertainty exists in defining them: we can only precisely know momentum *or* location, but not both. Bohr would argue that there is no object to begin with; it only appears (is instantiated) within a complex, relational realm, where all phenomena contribute constitutively to the end result (Barad’s “agential realism,” and “agential cuts”). Wheeldon does suggest a fascinating paper to do relating Smolin’s (2007) critique of the nature of the disciplines with how funding and policy creation are constantly reified around the same, unexamined assumptions (citing Robinson (2012: 28). This is yet another call for a critical paper to be done.

Arrigo’s Relational Ethics

Moving onto Bruce Arrigo’s comments. He, too, argues for the importance of bringing the subject back in. Rather than evaluating my book’s main thesis directly, he provides some creative integration of three approaches, including a quantum holographic approach. From Plato he derives a “consciousness of,” from previous work of Arrigo on psychological jurisprudence, “consciousness for,” and from my version of quantum holography, “consciousness in.” His overall aim (p. 72) is to shed light on “becoming more fully human.” He blends these three approaches into a suggestive composite statement.

to be affected; tempered, as much as possible, by the promotion of differences and antirepresentationalism, and subject to genealogical evaluation of forces.”

The *retributive principle*, again drawing from a number of scholars (see *QHC*, p. 198) reads: “A retributive justice evaluates: degree to which measures deliver a transparent message of disapproval in a least-restrictive, collaborative, transparent, and transformative form; active and meaningful participation of those directly affected by harm, with involvement, as much as possible, by those indirectly affected; opportunities for ongoing reconceptualization of victim, offenders, community, networks and other social assemblages, and their implementation into practice; where employment of incarceration, prioritizing respect, concern, and redemption scripts and practices; diminuation of subjugation and domination in institutions and social practices (assemblages), and privileging active, molecular lines of flight; the holistic reintegration of excessive investors in harm with presumption of equal moral worth; and degree to which our distributive evaluative ethic is co-determinative in the responsive process – all subject to genealogical evaluation of forces.”

To clarify, my approach is built, in part, on Bergson's (1896) *Matter and Memory*, where he advocates "consciousness *in*" "something." This is a marked departure from phenomenologists who insist on agency's orientation as "consciousness of." Building on Bergson, *QHC* develops a model of the subject that is constituted by various inter- and intra-subjective relations.¹¹ It is neither a transcendental ego, nor a determined subject, but remains "floating" between the two, at times when pacified (see Matza, 1969) appearing very much like a determined subject, at other times, capable of transcending even the most compelling forces of the occasion. There are, in short, both passive and active forms of agency, which both Wheeldon and Arrigo recognize in my work. Bradley, in his comments below, however, overly stresses (incorrectly) what he perceives as the passive forms in some of my work. In my use of quantum theory, each of the four main components of Schema QD are eigenfunctions; at any momentary instantiation, the collapse of the wave function, we have specific eigenvalues, or specific values for each of the four key components of the subject depicted as four corners of a Möbius band (see note 1). Thus the person/agent has diverse potentials, only some of which are instantiated (collapse of the wave function). The four components of the Möbius band include: ego, Other, ego-ideal, and community generalized other. The Möbius band is a topological construction that is the center of another rather fascinating topological construction, the cross-cap, which exists in more complete form only in four-dimensional space. We also note that two other key components exist: discursive subject positions as well as an abstract generalized other. The four components of the Möbius band exist in relation to each of the other, forming a matrix of values. For example, we have the ego-Other relation: the ego being the total picture one has of oneself through the eyes of the Other, the person present or imagined through whose eyes one sees oneself.¹²

The composite value of the various relations is represented by a distinct signature wave encoding this information. These wave forms are constantly emitted outward in all directions. Bradley's idea of a "bio-emotional attentional wave" can be better specified as a modulated Schema QD matrix signature wave. Bradley's approach has an implicit model of a subject but does not go so far as delineating a moral and ethical social agent.¹³ Bradley's model, in my view, can be greatly expanded by incorporating a model such as Schema QD. Elsewhere he does begin rudiments of integration of the work of Piaget into a formulation of what might constitute a moral/ethical social subject. My book explains how using PCAR (phase conjugate adaptive resonance), developed by Marcer, Schempp and Mitchell, incorporates this signature wave. Phase conjugation is established between

¹¹ This modifies Lacan's position in *Écrit*, where he posits a Schema R. My model de-oedipalizes and quantizes his model, while also building on desire as production following Deleuze and Guattari and Bergson's notion of *élan vital*, rather than "lack." See also Schrödinger's *What is Life* for a discussion of negentropy. Freud's early notion of libido, revised and de-oedipalized by Jung, is in a similar direction. Alexander Wendt (2015) provides a strong case for a "quantum vitalism," which I find especially appealing. The point being that rather than a lacking subject, the agent is guided by a continuous adjustment to ever higher levels of differentiation, each leading to more completeness/fullness of potentials that inhere in being human. Quantum coherence is equivalent to momentary unities, or dissipative structures, that, after collapse to a particular instantiation, produce the "objects" we observe, becoming the basis of action.

¹² Emmanuel Levinas (1969, 1998) is very central in the conceptualizing of the Other, as well as Martin Buber's notion of "I-thou" and "I-it" relations. Barad (2010) also sees Levinas' work on the Other as key in her "justice-to-come."

¹³ The beginnings of such a model can be found in an incipient stage in their co-authored work (See Pribram and Bradley, 1998). In contrast to their use of "I" and "me," *QHC* draws more from George Herbert Mead's difference between the "I" and "me," where the former is more spontaneous, impulsive, and somewhat unpredictable, and the latter, the various discursive positions we may assume.

incoming encoded wave forms and signature wave forms. The four inter-relational components¹⁴ shape the eventual perception-image to emerge, thus providing the grounds for a moral and ethical subject. The signature wave, unperturbed, has an “idling speed”; with perturbation, or in an active form, the four inter-relational components shape, and are shaped in an emergent process, during which various memory images are accessed in the ZPF (zero point field, Laszlo’s “in-formation” field). QH would argue it is via phase conjugation. In my book I build on this to argue that the various memory images remain in a state of superposition, and following Penrose and Hameroff’s (2012) work, exhibit momentary quantum coherence.

More recently, I have built on Bradley’s important statement specifying the play of emotionality by way of input from the heart, which is by far the provider of much more intense wave forms. The heart is more than just a pump. In his work he has drawn from empirical studies to indicate that the heart reacts to incoming wave forms prior to the brain and prior to consciousness. We can then envision (the full pathway is still to be further theorized) that the heart wave form is a source of what Freud in *Interpretation of Dreams* referred to as “hypercathexis.” At a critical threshold value, following Penrose and Hameroff (“orchestrated reduction,” “OR,” 2011), a collapse of the quantum coherence state (collapse of the wave function which was a composite of the various superposed memory images) occurs producing one perception-image which is then projected back to the source of emitting phenomena, and there producing “reality.” Here Cramer’s work (1986), a transaction interpretation, is relevant for integration. Thus, all with which we interact is left with a trace of our signature wave. It is encoded permanently at the quantum level as interference patterns (holograms). The perception image is a “logon” (Gabor, 1946); in so much that it is a “cut” from the flow and flux of energy. This “cut,” following Heisenberg, allows one to either know the particular position or the momentum. Clarifying one is always at the cost of knowing less of the other. Thus “snapshot criminology” attempts to show how a static universe exists, whereas QH indicates systems in movement, in flux, in complex inter-relational active form that generates various quantum superpositions, entanglements,¹⁵ and momentary quantum coherent states.

The twist in the Möbius band represents a movement from “inside” to “outside.”¹⁶ Following the borders of the Möbius band with scissors, according to Lacan (1977), produces a figure-8 cut. This is the “cut of the subject,” or in Barad’s (2007) model, an “agential cut” in the flux/flow. The cross-cap is a composite of an infinite number of possible figure-8 cuts. At the same time that a perception-image is instantiated from the several in superposition, an “I” emerges which can insert itself in discursive production, further shaped by discursive subject positions that have, via iteration, become what Gibson (1966, 1979) calls “invariance structures.” In other words, an optic array (consider Bradley’s projector example in his commentary, Figure 2, p. 102) encodes these invariance structures, in line with Foucault’s historical analysis of “technologies of the self.” “Choice,” too, can be seen as an emergent. It arises at the very same moment as the perception-image, the “I,” as well as, according to Barad’s (2007) and others, even space and time.

To return to Arrigo’s synthesis. A key contribution he makes is to apply Gabor’s notion of logons, as further clarified by Bradley, in the notion of “overlap with the future,” and argues how it brings out a necessary component of being and becoming. “Consciousness for” suggests that an image of future possible states develops which then work on the present.¹⁷ Indeed, quantum theory is atemporal: time does not flow from past, to present to the future. It can work backwards, the idea of backward time referral. Cramer’s (1986) transactional interpretation shows how information from

¹⁴ See note 1 for its diagramming.

¹⁵ For some empirical studies, see the summary and ongoing work by Radin (2006, 2013).

¹⁶ See note 1 as to its visualization.

¹⁷ By “calming down” conscious and subconscious processes we develop access to future states, argues Pradhan (2012: 643-644). We part ways, however, in his discussion (p. 644) that knowing the future will then determine the present, a deterministic view, by bringing in the work of Gabor (1946) to suggest uncertainty still remains in the construction of logons in the present.

the “present” flows backward to the source of an emitter in constituting it there. Similarly with the PCAR model. Necessarily, for transformative praxis, with Arrigo, is the development of images of what can be, which then can guide the present toward its realization. Here there is backward time referral from the future to the present. But how are these images of what-can-be, established? And are they deterministic forces linearly committing an agent to its realization? As to an ethics, Nietzsche, and so too Spinoza provide a hint of a direction with their respective notions of affirmative action and joyful actions/passions. What deepens and fulfills one’s journey of becoming are experienced as joyful passions; those that are not, sad passions (see *QHC*, 194-197). It does seem that we need further engagement at this point with Wendt’s (2015) notion of a “quantum vitalism” whereby a becoming is rooted in dissipative structures via quantum coherence which is momentary created producing the imagery for the what-can-be. We can also draw from Bradley’s work (see his commentary), following Karl Pribram’s “image of achievement,” that are offered as providing some direction. This image, Bradley says, “precedes purposeful acts. Pribram (1991, Lecture 6) describes how the execution of an individual’s action in the material world is controlled by a neurological image (an internal representation) of achievement, a ‘target.’ A plan is a way to achieve: a mentally constructed target object to which the consequence of a program of action are directed, and against which the results of actions in the program are compared (emphasis in original).” And further, employing both classical holography (describing the necessary image processing) as well as quantum holography (accessing holographically encoded group information, interference patterns and recognizing Gabor’s notion of logons), Bradley notes how pattern matching between the plan and habitually occurring consequences in a “feedforward process” is compared until a match is found (see Bradley’s Commentary, Figure 7). This certainly can be integrated with Arrigo’s idea of *consciousness for*.

However, Bradley mentions this to explain how stability or constancy of group boundaries is maintained. More recently he is developing a model that begins an explanation for Arrigo’s *consciousness for* dynamic by incorporating my schema QD in a torus-shaped topographic field (see his Commentary, Figure 9). His model argues that “the heart plays an essential role not just a communicator of information within the body, but also, and importantly for our purposes here, as a *nonlocal* communicator of physiological, psychological, and socio-emotional information between and among individuals – including information between people and animals (Bradley, 2012; Tomasino, 2014).” (We shall return to Bradley’s more recent work in the final section.) The key, then, for an understanding of *consciousness for* is recognition of the nonlocal nature of the dynamic which allows instant communication (see also Radin’s extensive review of the empirical research, 2006, 2013). Nonlocality knows no linear time, nor time itself.

To return to Arrigo’s integration, our *consciousness in* phenomena rests on a very different foundation than Plato’s “consciousness of” and Arrigo’s “consciousness for.” The key question is therefore: can the three be actively integrated, given their underlying ontological frameworks. Plato, of course, was not aware of quantum mechanics or holography theory. Less compelling is the use of *consciousness of* than *consciousness for*, the former rehashes dependency on classical-materialist assumptions inherent in much phenomenological literature. *Consciousness in* and *consciousness for* both assume a relational connectedness. *Consciousness of* implies separation, distancing.

Toward this end, integrating Foucault, Deleuze, and Guattari’s work, particularly the latter’s notion of the “abstract machine” and the former’s notion of “technologies of the self” is useful in clarifying how agency is pacified and how objectification takes place (e.g., *consciousness of* the subaltern without necessary feelings of interconnectedness). In my diagram of Schema QD, “discursive subject positions,” the various discursively preconstructed roles existing in a social formation, are implicated in Foucault’s “technologies of the self.” It could very well be, following the cosmologist’s Holographic Principle, that this information is embedded on the boundaries of the socius. Thus just as with Bradley’s example of a projector (see his commentary), this information is transmitted constantly in optic arrays, following Gibson, but in encoded (holographic form). We are bathed in this whenever we

enter these bounded regions. Exciting research in critical geography¹⁸ is giving us new insights as to the nature of niches, but still remains without QH integration. This will surely be the basis of some innovative future research.

A final comment on Arrigo's article concerns the notion of "choice" and reference to Jean Paul Sartre. Space limitations dictate only a few words here. Quantum and holography demand rethinking the nature of choice, responsibility, and accountability. QH does open up greater latitude for "will" as an operator in the collapse of the wave function. However, "will," is an emergent in spacetime configural, eventing, ecological niches. Consider for example, sitting at this computer writing this essay. Not all words are anticipated, but seem to flow. I did not consciously "will" every word; rather, with Lacan, they are often anticipatory, and with quantum holography, seem to entail ongoing accessing my memory store in the ZPF. How precisely this more subconscious or unconscious flow (selective accessing) takes place is still subject to some research. Emergent word flow implicates emerging agency in the process. Signifiers that are given instantiation act in a performative role in further collapsing the wave function to generate the next signifier (Lacan's (1977), an anticipatory dimension of speech production where the "signifier represents a subject for another signifier." But Lacan, without using the language of quantum mechanics, also recognizes the retrocausal time dimension, the "retrograde," where only by a return to the beginning signifier do we grasp all signifiers up to some pause in a meaningful manner. This implicates, too, the shaping influence of Schema QD situated in political economy, given existing discursive subject positions, and a general abstract other (macro normative order). Arrigo's work is exemplary in working with different ontologies in pointing to the uneasy tension with which agency exists and a person's struggle to become more fully human, less a subject of harms of reduction and harms of repression, both contributing to and the effect of a "people yet to come," and to use Barad's useful conception (2010), a "justice yet to come."

Bradley's Quanta and Bonds

To move on to Raymond T. Bradley's comments. Bradley embraces the direction of *QHC* in promoting a paradigm shift, away from a Newtonian-based classical material paradigm toward a more quantum-holographic informed process informational paradigm. He is especially complimentary on chapter 4 dealing with agency. He integrates this work with his ongoing research in developing a more sophisticated analysis of the potentials for a universal consciousness. He also raises five issues (pp. 99-100) which bring out differences between his and my position. Although we do differ on certain points, it should be pointed out, these are more ongoing discussion points which have substantially aided my contemporary theorizing about QH. He leaves to others to comment on the application (chapters 5, 6) to criminology, law and transformative justice as well as much of the integration in chapter 3. Wheeldon and Arrigo, as we have seen above, have started this discussion. Although, as we will remark, Bradley's last section on the role of the heart and its wave form is critical literature in the further development of transformative justice. His own work does include some application of quantum holography to terrorist cells (Bradley, 2010) which is indeed highly original, provocative and has huge potential for redefining the study of terrorism. On this note,

¹⁸ The idea of "event spaces" offered by critical geographers could usefully be reformulated as "eventing ecological space or niches." See Woodward *et al* (2012). Here, logons are continuously in process. This would also be more in accord with Alfred Whitehead's (1925, 1929) work. More recently, Draper and Polizzi (2015; Polizzi and Draper, 2013) have developed a model for prison psychotherapy based on the centrality of the event, particularly as to "openness and "closedness." In our view, this is suggestive for a quantized and holography approach. That is, the event is a dynamic state (4 possible instantiations have been offered), and the wave function can collapse differently in each, producing one construction of reality and a directionality for therapy. "Holographic reprocessing" (Katz, 2005) can then be more comprehensively engaged or less so. Productive work remains in this integration.

too, *QHC* (152-54) offers some quantum holographic application to Cottee and Hayward's (2011) study of terrorists explaining the edgework component of much of its phenomenological and existential nature.

Bradley's quite extensive work in this area spans some 40 years including collaborative work with Karl Pribram, but yet, given the dominance of Newtonian-based theorizing in the social sciences, little has made its way into the dominant journals, with little engagement with its creative theorizing. The field is poorer for it. Bradley's work includes quantum mechanics by way of Dennis Gabor's use of Heisenberg's uncertainty principle in explaining a "spacetime bounded quanta of information," the "logon." Gabor received a Noble prize for his work in holography theory. Otherwise, Bradley remains more committed to holographic principles. In Chapter 3 of *QHC* I have listed four key approaches in quantum holography. Bradley is in the first, along with Gabor and Pribram. The other broad orientations are by Laszlo, Bohm, and by cosmologists Susskind, 't Hooft, Bekenstein, Maldacena, and Bousso with their version of the "Holographic Principle." There are some substantial differences among these orientations, and indeed, some cross over too. I will not review these differences here. But it is to say that the field is not uniform and is ripe for much scholarly development (in response to Wheeldon's critique of tensions in the field).

Let me organize my remarks by commenting on, in order, his initial thoughts in integrating my Schema QD with his own contemporary studies, five issues raised, and then come back to his current research including synthesis of my chapter 4 on agency.

Welcomed is Bradley's integration of chapter 4's offering of an inter- and intra-subjectively constituted moral/ethical social subject. Unfortunately, the social sciences are conspicuously vacuous as to agency, more specifically the nature of consciousness and the efficacious, creative agent. Much in Bradley's previous work has provided an implicit model by employing the works of Piaget and others. More recently, in the context of developing an intriguing notion of access to a universal consciousness he has returned to the question of agency, particularly in incorporating Schema QD. Alexander Wendt's (2015) recent book, *Quantum Mind and Social Science*, also highlights the importance of bringing agency back in,¹⁹ although he focuses mostly on a quantum mechanics approach, and only in the last quarter²⁰ of his book does he makes connections with holography theory. Of course, future work assuredly will develop the relationship in greater detail. Barad's work (2007; 2010), although an exciting departure making connections between quantum theory and the social science,²¹ only implicitly suggest the "internal" dynamics of the agent, referring more to agency in a context of "agential realism."²² It can quite readily be integrated with Schema QD as both describe how a "cut" of possible "reality" is constituted. In this view, the "I" of discursive production, perceptions images, and one possible reality emerge concurrently in spacetime flux.²³

¹⁹ Fruitful engagement can take place by contrasting Karen Barad's (2007) *Meeting the Universe Halfway* with Wendt's position, although he draws substantially from many of her points. Whereas Wendt develops the idea that the human being is a "walking wave function," Barad develops the idea of "agential realism," more based on her interpretation of Bohr as well as integrating the works of Michel Foucault, Emmanuel Levinas, Donna Haraway, and Judith Butler.

²⁰ Especially pp. 228ff.

²¹ Karan Barad has a Ph.D. in physics and only later became more philosophical in her approach.

²² Barad (2007) provides alternative conceptualizations of the agent as related to reality construction, "agential realism," and an alternative to "inter-action" of "intra-action." The latter term, she argues, directly confronts the baggage associated with inter-action of independent agents (objects): "...the notion of intra-action recognizes that distinct agencies do not precede, but rather emerge through, their intra-action" (ibid, 33) and "...intra-action' signifies the *mutual constitution of entangled agencies*" (ibid. emphasis in original), "...determinate entities emerge from their intra-action" (ibid, 128).

²³ Deleuze (2003: 26), coming from a different direction, has noted this concurrent development. "Consciousness becomes a fact only when a subject is produced at the same time as its object, both

Bradley's model brings in a critical component, often downplayed in the literature, that of emotionality, particularly in his analysis of how the heart is a source of bio-emotional waves that respond to incoming perturbations prior to activated brain waves, and prior to consciousness. In chapter 4 of *QHC*, and more recently in my collaboration with theoretical physicist Zoltan Batiz (Batiz and Milovanovic, 2014), this idea of affection and emotionality has been recognized as a key in understanding the working of consciousness and the "cut" of the subject. Much work remains in this direction. A reasonable direction noted in chapter 4 and in work with Zoltan is integrating a "vitalism" that not only provides an alternative principle of desire to that of Lacan's more passive "lack," but more inclusive of emotionality, an agent with feelings, emotions, passions, and intensities.²⁴ We could build on the work of: Freud's notion of libido, revised (sexual components of desire reduced dramatically) by Jung; Bergson's notion of *élan vital*; Deleuze's revision of *élan vital*, a vitalism that includes the notion of movement toward continuous differentiation and new temporary unities in the form of dissipative structural forms of stabilities; Schrödinger's notion of negentropy; Spinoza's contrasting of "joyful" v. "sad passions"; and Nietzsche work on affirmative action. Useful, too is further integration on the work of Denzin (1984) on the inter-relational forms of emotionality, Jack Katz's (1999) statement on emotionality as enactments in social interactions, and Steven Lyng's (2005) notion of edgework. Much, again, needs to be done along these lines. These integrations can be substantially benefited by engaging Bradley's work on the bio-emotional nature of attention and accessing group norms, but also in the work on a potential, nonlocal access to a universal form of consciousness. We will return with some final words in concluding this section. Let us move to the five points Bradley raises for discussion.

Evidence

The first issue Bradley (p. 103) raises is "the question of evidence." He first provides a useful synopsis of his past and current work to situate the issue. He then notes a lack of engagement with his work prior to 1998, including his book. The perspective developed in *QHC* assumes that his post 1998 work is further refinement and development of his earlier work. There is indeed continuity from prior to 1998 to present. Key insights developed in his earlier work are refined in more recent work. But, in passing, one core area in *QHC* that does engage this earlier work, concerns his insightful development of the relationship of flux and control (see *QHC*, 172-178) in structuring the logon. It was questioned in term of the usage of "control" to represent "a hierarchical order...a system of social constraints" (Bradley, 1998: 128, 130). In his model, logons, or spacetime constrained quanta of information can be located at the intersection of these two orthogonally situated variables (Commentary, RB, Figure 5, p. 10). He argues that the ideal for stability, following his empirical study of communes, is at the intersection of high control and high flux. Alternative to this, discussion in *QHC* was presented (pp. 173-178) that applied more dynamic systems theory, Deleuze and Guattari's notion of "assemblages," and Delanda's (2002) further development of assemblage theory, to suggest that forms of dissipative structures would "live" more in looser forms of "control," as recently suggested in book length form in Eugene Holland's (2011), *Nomad Citizenship*. Holland's notion of "nomadology," more based on an improv jazz model of making music,²⁵ is suggestive for inclusion of a looser form of "control" from which potentials are more fully fulfilled.²⁶ Deleuze and

being outside the field and appearing as 'transcendent.' Conversely, as long as consciousness traverses the transcendental field at an infinite speed everywhere diffused, nothing is able to reveal it. It is expressed, in fact, only when it is reflected on a subject that refers it to objects."

²⁴ Wendt's (2015) recent book also suggests a "quantum vitalism."

²⁵ More improv jazz than a symphony orchestra player, more soccer than American football, more the game of GO than chess.

²⁶ Recently, my band in which I play the didjeridu, opened up for a Dali Lama presentation at Loyola University. With some 4,000 in the audience, we had no idea what we would play for 20 minutes; for we play more in the spirit of improv jazz, without a formal leader of the band, nor a script.

Guattari's (1987) call for a "permanent revolution" is also in this direction. These directions could make use of a revised version of Bradley's model toward a "reconstructive nomadology" (*QHC*, 178) and the basis of a transformative justice (*QHC*, chapter 6). At the minimum, his notion of hierarchy needs to be problematized. Perhaps the work of critical geographers would be useful interlocutors.

Further, as to the critique of "evidence" lacking, it should be noted that Arrigo's included commentary notes the importance of engaging in "thought experiments," and indeed he notes *QHC* is one example of a productive thought experiment.²⁷ I'm fine with that. Wasn't Einstein engaged in thought experiments before he developed his ground breaking work on relativity? Didn't the key developers of quantum mechanics in the 1920s extending to the discussions surrounding the "EPR paper" (1935), actively engage in "thought experiments" in order to further develop a fundamental insight? Perhaps when one does suggest a paradigm change the thought experiments will be followed by sensitive models for collecting data, and here in QH a very different methodology is needed. And, as Karan Barad (2007) has argued, any apparatus (measurement device) we set up will provide a different "cut" of reality. We must go further in this direction. Quantum cognition theorists, too, have argued that "context" is most important as to the collapse of the wave function. Thus context, apparatus, instantiated "object" and perception images, and agents – all are constitutively implicated in the construction of "data." The question raised by Bradley concerning the necessity of including more "evidence" remains outstanding. Surely stimulated scholars and advanced graduated student will begin to consider a paradigm shift and develop alternative methodologies which can test the theoretical argument developed in *QHC*.

An alternative methodology would move away from classical probability, logic and rationality to one based more on quantum mechanics. A number of contemporary studies are indeed moving along this direction (see Busemeyer and Bruza, 2014: 2-7, 88-89, 347-348; Pothos and Busemeyer, 2014; Khrennikovo, 2010: chapter 2),²⁸ and when fully recognized in criminology, would certainly confront contemporary empirical studies rooted in the classical material ontology found abundant in such prestigious journals as *Criminology*.²⁹ This alternative methodology re-situates a person as a key factor in the collapse of the wave function, not a passive entity subject to definable forces and projected, linear trajectories. For example, there has already been work done on decision-making and how quantum probability and logic better explains the process. Busemeyer and Bruza (2014: 2-3), for example, oppose a classical framework and provide an application to jurors. Before a decision is made (guilty, not guilty) an indefinite state exists where the potential is for either verdict to be instantiated. As they say, "you are in a superposition state that leaves you *conflicted, or ambiguous, or confused* about the guilt status" (ibid. 2). Thus there is no formal trajectory already in place, "but a smearing of potentials across states that flow across time" (ibid. 3). This is the wave function in movement following the Schrödinger equation. Once the juror has decided, uncertainty no longer exists, the collapse of the wave function is complete and an "object" is instantiated (guilty!). Thus "the wave nature of an indefinite state captures the psychological experience of conflict, ambiguity, confusion, and uncertainty; the particle nature of a definite state captures the psychological experience of conflict resolution, decision, and certainty" [Guilty!] (ibid.).

This work, primarily applying quantum mechanics, however, has not integrated a viable notion of a moral and ethical social self. It too often references some "abstract ego" but doesn't give us more

²⁷ Albert Einstein as well as the key developers of quantum mechanics in the 1920s were highly engaged in developing these thought experiments, which later, with the development of technology have been operationalized for fruitful study. One needs not rehearse the great discoveries based on doing thought experiments.

²⁸ For an accessible tutorial, see: <http://plato.stanford.edu/entries/qt-quantlog/>

²⁹ See for example how a quantum mechanics orientation differs in studying responses to surveys, particularly how "order effects" can be better explained (Wang et al, <http://www.pnas.org/content/111/26/9431.full> ; <http://www.sciencedaily.com/releases/2014/06/140616151347.htm>

information about what is in the “black box” (“agnosticism” as to the existence of a quantum brain). Nor does it employ holography to suggest how particular memory images of a juror are accessed, decoded, and interact with the shaping forces of Schema QD in producing the final collapse of the wave function. On the other hand, suggestive work has and is taking place with face recognition, jury decision-making, and witness recollections. The recently much publicized police killings have witnessed considerable trouble with contradictory “eye witness” testimony. A possible study here would be to apply the principles of quantum mechanics, as has taken place in jury decision making, witness recollections and face recognition, but critically going beyond merely stipulating an “abstract ego” as a placeholder. Schema QD and quantum holography could be integrated to indicate how the nuanced agents, that we are, further shape these decisions.

Relation Between QH and Quantum Mechanics

A second problematic raised by Bradley is the “relation between quantum holography and quantum mechanics. Bradley questions (Commentary, RB, p. 116) my use of electromagnetic waves³⁰ (hereafter EM) in communication, though he himself uses the notion with considerable frequency in the context of the “heart’s magnetic field” (see pp. 127-130), and also his recently theorized and highly thought-provoking “Illustration of the Heart’s Magnetic Field – A Torus” (see Commentary, RB, Figure 11, p. 129). Bradley correctly reminds me, however, that an EM is but one form implicated in “communication.” My statement that social reality construction works via an EM wave, appears early in *QHC*, unfortunately, without a context. By context, I assume a political economy that following critical criminologists’ various works (Young’s, 2011), all too often is restrictive in allowable “bands” of communication, rendering the rational logic as meaningful, the emotional and various forms of non-verbal communication as less rational/logical. I also assume in this context a political economic order that systematically creates differences that lead not to higher forms of potentials for humans and social organization, but rather renders restrictions and serves power group interests (harms of reduction, harms of repression, see Milovanovic and Henry, 2001). The emotions, affect, passions, intensities are often commodified in capital logic devoid of their full expressive potential. In this sense, Deleuze and Guattari (1983), in their book *Anti-Oedipus*, are quite correct in criticizing models such as Jacques Lacan’s that base desire on an ontological basis of lack. An alternative model being developed by Bradley lends itself to infusing theorizing in transformative justice with a quantum holographic basis and potentials for universal communication driven by both the intensities of the emotions and the formalism needed for communication in given discourses. The notion of an alternative discourse is not fully examined by Bradley. I have argued elsewhere in various writings on the nature of given language structures as being more or less providers for the expression of desire. Thus Bradley is quite correct to point out that electromagnetic wave forms can be envisioned in more restrictive fashion, and that other frequency bands exists. Critical

³⁰ For those less familiar with what constitutes electromagnetic radiation, see:

http://missionscience.nasa.gov/ems/02_anatomy.html;
<https://www.physicsforums.com/threads/what-are-electromagnetic-waves-made-of.512618/> ; for P. Gariaev’s notion of biophotons as carriers of information as connected with DNA, and as the basis of nonlocality, see, P.P.Gariaev, G.G.Tertishny, A.M. Iarochenko, V.V.Maximenko, E.A.Leonova <http://www.emergentmind.org/gariaevi3.htm> (“We believe that the phenomenon of Quantum NonLocality is used by biosystems on a chromosome level as one of the key factors of self-organization.”); see also <http://www.laserpuncture.net/anglais/gariaev.pdf>; for some introductory, non jargon summary of biophotons, see <http://www.drjoedispenza.com/blog/health/biophotons-the-light-in-our-cells/>; an introduction to the application of this research to therapy can be found at <http://www.earth-association.org/articles/biophotons-as-the-agency-of-rapport-in-regression-therapy-by-rafael-couto-melsert/>; for a statement concerning “dark biophotons,” <http://vixra.org/pdf/1309.0052v1.pdf>; see also the relation between sound and visual fields in the discipline of acoustic holography, <http://encyclopedia2.thefreedictionary.com/Acoustic+holography> .

criminologists and those developing a transformative justice are challenged to theorize how an alternative socius may better allow a wider frequency band and various forms of communication.

I also use EM in a more general fashion, as has been recognized by many physicists being more a semantic placeholder for a more sophisticated “deep or more fundamental theory” recognized in the field of quantum electrodynamics (QED).³¹ Marcer, Schemmp, and Mitchell, in turn, have also recognized that all human sense organs operate by similar dynamics of phase conjugate adaptive resonance (PCAR). EMs have most commonly been seen as based on photons, real or virtual, as vibratory, oscillating, excitations (see footnotes 30,31). There is also considerable scholarly analysis to indicate that EMs, as constituted by photons (quanta) are therefore related to quantum waves (Hameroff and Penrose, 2014: 55-58). One discipline of “wave genetics” argues that DNA communicates by “biophotons” (see Gariaev and collaborators in this area, footnote 30). To return and respond to Bradley’s critique, the quoted work from *QHC* does stress the “social construction of reality” being implicated primarily by communication channels established by EMs. Social constructions of reality, however, going back to Richard Quinney’s classic work, the *Social Reality of Crime*, are selectively constructed by various shaping (disciplinary) mechanism found in a political economy. Thus, the way “objective” reality is instantiated is very restrictive in excluding many disenfranchised voices, the “shadow” to use Arrigo’s point in his commentary above, and also found in Arrigo and Milovanovic (2009.). Yes, indeed, Bradley’s critique *is* the point; that indeed the social construction of reality often excludes other forms of communication, other desires, intensities, emotions, passions, affections, etc. These are relegated secondary status to formal rationality and logic. Only recently have we witnessed in the work of edgework theorists, cultural criminologists, and work on the emotions³² its centrality and efficacy. Indeed, in chapter 4 of *QHC* I do engage this literature, in recognition of Bradley’s and collaborator’s work on the heart form as a generator of bio-emotional waves that register inputs prior to the brain, and prior to consciousness. I extend his work by suggesting a quantum vitalism consistent with Wendt’s (2015) recent book, particularly in the notion of a bio-emotional driven modulated Schema QD matrix signature wave. In this view, what contributes to the collapse of the wave function, that is the initial superposed memory images as a response to incoming stimuli/perturbations, is a form of what Freud, in *Interpretation of Dreams*, called a “hypercathexis,” by which a threshold is reached which collapses the wave function, somewhat in accord with Penrose and Hameroff’s (2011) notion of an “orchestrated objective reduction.”³³

On another point, it is not that I, as Bradley incorrectly criticizes (p. 117), wholeheartedly integrates Stapp’s model in the use of the idea of “nature’s choice” in terms of “yes-no” (dichotomous) answers. Stapp’s work was only a review and suggestive as to the possible steps in how the collapse of the wave function may occur. Necessarily, as I have attempted to show, we must rethink this key idea and provide the necessary adaptations in formulating new conceptualizations.

³¹ "Quantum Electrodynamics (QED)." *World of Earth Science*. 2003. Retrieved August 28, 2015 from Encyclopedia.com: <http://www.encyclopedia.com/doc/1G2-3437800491.html> (“...QED asserts that electromagnetism results from the quantum behavior of the photon, the fundamental ‘particle’ responsible for the transmission electromagnetic radiation,” and for their relations to light, “... according to QED theory the forces of electricity and magnetism (i.e., the fundamental electromagnetic force) stem from the common exchange of virtual photons between particles and only under special circumstances do photons become observable as light.”)

³² See for example the work of Jack Katz (1999), *How Emotions Work*, and Norman Denzin (2007), *On Understanding Emotions*. For cultural criminology, see the work of Ferrell, Hayward and Young (2008) *Cultural Criminology* as well as Jock Young’s last book (2011), *The Criminological Imagination*. For edgework, see Steven Lyng (2005), *Edgework*. See also Cottee and Hayward’s (2011) application to terrorist identities.

³³ This would clarify, too, Delanda’s (2006) model of how varied, unique threshold values operate that are the basis of further action.

Bradley also brings up the idea of nonlocal connections/communication that seems to be omitted in discussion of EM. A useful response can be found in works cited in footnotes 30 by Gariaev and collaborators. However, Bradley does provide a significant contribution with his work on the nature of intuition (2006, 2007, 2009) and more profoundly still, in his recent work on accessing a universal consciousness (see last section of his commentary and his forthcoming book). The classical-materialist paradigm cannot explain this kind of instantaneous communication (quantum entanglement) that defies the otherwise assumed upper speed limits of transmissions recorded by light waves (see also Radin, 2006, 2013). Criminology, law and transformative justice theorizing must integrate some notion of the intuitive beyond purely materialistic analysis. Quantum holography offers some of the conceptual tools, via Bradley's work on intuition and general theorizing in quantum mechanics on the nature of nonlocal instantaneous communication, quantum entanglement, and outcomes. Criminologists revisiting twin studies with this alternative paradigm may begin a more fruitful discussion?

A final point brought up by Bradley (p. 119) is that it is not by way of a collapse of the wave function but a "matching" (harmonic resonance) process that produces (instantiates) the final perception image. Recall, in *QHC* it was argued that, inspired by Bergson, that a number of memory images are accessed via PCAR from the in-formation field and become momentarily superposed (a quantum coherent state that is unstable when subject to "measurement"). Following the notion of a hypercathaxis, the additional input from the heart's bio-emotional wave, overcomes a threshold value (again, following Penrose and Hameroff's "OR" model); a collapse of the wave function produces a final image that is projected "out there" along the standing wave between the percipient and emitter to produce reality as we experience it in our everyday reality. Bradley (also noted in Staretz and Mitchell, 2011), again, argues instead that it is a "matching" process that produces the harmonic resonance that registers as "reality." In my view, it is both. There is matching and there is a collapse of the wave function. Harmonic resonance in itself does not necessarily collapse the wave function but offers a higher probability that it will occur, following Schrödinger equations of the evolution of some system. Further, this "matching" process, as presented by Bradley (and Staretz and Mitchell) provides no input from some moral and ethical social agent, although it seems somewhat implicit in Bradley's work. In *QHC* it is the shaping forces explained in Schema QD (four components in relation of the Möbius band, an abstract as well as community generalized other, and historically constructed discursive subject positions), perturbed by ubiquitous bio-emotional waves from the heart, that together generate a hypercathaxis that produce an instantiated perception image. At the same time the image is finalized, a subject in the form of an "I" which can insert itself in discursive construction is also produced. Both are emergent events. Bradley, as well as Staretz and Mitchell have substantially extended our understanding of the process of a finalized image, but we need the basis of a social moral/ethical subject which is crucially contributory to the final product. This makes the subject/agent an active agent, not passive contrary to Bradley's perception of some of my work.

Further, he argues (p. 119) that there are two distinct aspects of information processing. Agreed. One by which "configural aspects" (connected to the work of Gabor) concerns *minimizing uncertainty*; the other, the "comprehension aspect" (more connected with Shannon and his digital model) in *reduction of uncertainty*. In my view, following schema QD, both are included. Gabor's notion of logons, "spacetime constrained quanta of information," produce degrees of uncertainty following Heisenberg; Shannon's model produce a final state concretized in our semantic and discursive constructions. For example, in law, what is often a complex, relational, dynamics, emerging, and contingent state of affairs, producing moving images are framed by legal practices into distinct static snapshots which can further be litigated by practices of subsumption (Lefebvre, 2008) and deductive logic. Thus, legal principles act as an axiomatic system in which, by way of syllogistic reasoning and deductive logic, "Truths" are created (equivalent to Shannon's notion of a digital reality). Alternatively, a more amorphous, transforming reality in flux is better described by

Gabor's logons where some more amorphous meaning is only momentarily constructed, necessary for ordering everyday interactions.³⁴

Collapse of the Wave Function

A third problematic (p. 116) concerns the collapse of the wave function "and its application to decision/action." His main contention is that "human consciousness and, in particular, the neuropsychological processes involved in cognition and decision, *cannot* be reduced to quantum physics" (p. 117). Bradley's position is in line with many of the most prominent scholars in the field of "quantum cognition." The latter generally are agnostic as to a quantum mind and at best argue there is likeness or metaphor involved. However, on this point, see particularly Wendt's (2015) wholesale rejection of a "quantum like" brain; the brain, rather is a quantum brain and each of us are "walking wave functions." The thesis in *QHC* is more in accord with Wendt's view and draws much from empirical and ongoing work by Penrose and Hameroff. The extensive research by Hameroff and Penrose (see the most recent, 2014 where they also reply to critics) supports the quantum workings of the brain. Here, Bradley also sides more on agnosticism ("Although it may turn out that Orch R is true...", p. 17). It is correct to argue for more evidence. But the evidence provided by Hameroff and Penrose is substantial. Although I add, contrary to Hameroff and Penrose at this point in their thinking, in Chapter 4 of *QHC*, instantiated perception images are products of both quantum and holographic principles. This is the task: to integrate the two more comprehensively.

Bradley, too, incorrectly suggests *QHC* is about metaphor or analogy (p. 117). As Wheeldon noted from his reading of *QHC* and comments in this symposium, there was specific mention that it is not metaphor or analogy, but isomorphism. We part ways with Bradley's position on this point (although his point critically brings out the need to better explain more mappings, as Wheeldon suggests), certainly an ongoing project in the QH application to criminology, law and transformative justice. Wendt (2014) is also more focused on the holographic part of quantum holography. In the last quarter of his book, however, he indicates that holography theory is an essential component. His future work, from personal exchanges, will continue this integration. In my Schema QD I have endeavored to show the work of both quantum mechanics and holography theory. Any discussion of consciousness and agency must recognize that the human eye responds to even one photon, bringing the discussion right away to the realm of the quantum. And contrary to many traditionalists who insist that Newtonian physics adequately explains all at the macro level, and quantum mechanics at the subatomic level, a sharp divide, emerging research in the last twenty years plainly argues this is not so. This Bradley has convincingly shown in the context of Gabor's logons that cut across "levels."³⁵ In Schema QD it was demonstrated that an instantiated perception image from the many possible in superposition entails a collapse of the wave function. It was also argued that by employing PCAR we acknowledge that information, including memory images are encoded holographically in the ZPF and boundary surfaces.

He further misconstrues (p. 117) that *QHC* concern is with the collapse of the wave function is "more consistent with Shannon's (1949) concept of reduction of uncertainty, than it is with Heisenberg's principle of uncertainty for quantum systems." He uses my review of Stapp's work to support this idea that what is implicated is the digital realm, not a sinusoidal realm. As I mention earlier, he misconstrues my review of Stapp's work as the one I am precisely employing. My

³⁴ Barad (2007) has provided an alternative view. Not interaction, but "intra-action," she argues, preserves the fundamental indeterminacy of "objects" following her read of Bohr. We should make use of the term "phenomena," not objects. There is much engagement that needs to be done with her work.

³⁵ The question of "levels" is being actively theorized by critical geographers (see, for example, Woodward *et al*, 2012). Barad 2012a, p51; see also 2007) has argued "scale is also not a straightforward concept, and notions of 'macro' and 'micro', like 'past' and 'future', are not nested or ordered in simple ways."

summary of Stapp's key position was only a review, as was also the case of Penrose and Hameroff's "OR" model. In my own integration and further development I have integrated some of the components of each, but not in the direction of seeing the world as being fundamental digital. Perhaps more in line with the position in *QHC* additional insights can be gained by drawing from Barad's (2007) focus on Bohr's uncertainty principle. "Cuts" do initiate particle forms, the digital realm, at particular moments of measurement, but phenomena quickly tend to recede back to wave form with a trace of the encounter. In the excerpted quote (p. 117) there is a clear statement that the potentials from which a collapse of the wave function produces one instantiation, one perception-image, entails more than "yes-no" options. Following Bergson (2002) and his "cone" and "circuit diagram" and incorporating it into a QH view, it was demonstrated that various competing perception-image become superposed and only one becomes instantiated after the collapse. In the courtroom we do witness, for example, the range of possibilities reduced to a digital realm of yes-no answers. Schema QD suggests that the perception image is shaped by the work of the listed components of the Möbius band, along with discursive subject positions and abstract generalized other. Above we also suggested from *QHC* that a bio-emotional wave form that Bradley advocates originating from the heart as the largest transmitter of wave form is the mechanism which hypercathexis effects (borrowing Freud's term).

Bradley questions my use of Stapp's notion of "nature's choice" at work in the second collapse of the wave function in my schema QD model. This Don Quixote tilting falls short of the point (perhaps more a fault of insufficient development of this point on my part). My rendition of "nature's choice" is directly connected with Heisenberg's uncertainty principle³⁶ to suggest "logons" are constructed as perception images during the PCAR process and argues there is no precision in the final image instantiated. There is uncertainty in taking "snapshots," or "cuts" of the otherwise quantum flux. These objectifications, particle forms, are but selected possible instantiations from a range of possibilities. Schrödinger's equation of evolution of a system has already suggested that this flux is more a "cloud of possibility" (suggested by more than a few adherents), a wave form, and only with the collapse of the wave function do "objects" appear. Traditional criminology and law privileges these snapshots, overlooking the relational and processual determinants. In my article (see Milovanovic, 2014), "Revisiting Societal Reaction (Labeling) by Way of Quantum Holographic," there is a demonstration that the collapse of the wave function could be shown to be at play in how the person engaged in problematic behavior is eventually provided a label that has effects for subsequent action.³⁷ The juvenile is, following Wendt, a walking wave function, an entity with many potentials. Deviance is but one of many possibilities to be instantiated, as Matza in *Delinquency and Drift* as well as in *Becoming Deviant* has shown in his idea of the "episodic" nature of delinquency, whereby the juvenile is neither committed or in a total free state, but often is found oscillating between the two.

Bradley (p. 118) argues that contrary to *QHC*, "at the 4-dimensional macro-scale world of the social actor...the laws of classical physics and dynamics of complexity theory that are determinant here." He cites the idea of self-organization at work rather than quantum statistical laws at play. In my view this has been set up as a debatable contrast. As the field of quantum chaos shows, the two can be reconciled.³⁸ Quantum statistical laws rather than classical statistics and logic have clearly

³⁶ An alternative construction, developed by Karen Barad (2007) would begin with Bohr's contrasting view of an "indeterminacy principle." This more provocative version has it that "objects" do not exist in themselves. Heisenberg's view is that there are objects out there but our ability to precisely determine the momentum and location at the same time cannot happen. Barad's view is that the "Bohrian cut," equivalent to the "figure-8 cut" employed in the construction of schema QD, is what momentarily provides a snapshot, or "objective" form.

³⁷ See also Quinney's (1970) notion of action patterns [DM, discursive subject positions] created which become the basis of adaptation, often leading to secondary deviance.

³⁸ For an orientation to quantum chaos, see Gutzwiller (2008).

been shown to be efficacious in macro level decision making (see for example Busemeyer and Bruza, 2014). This again shows that the divide between the quantum theory cannot be confined to just the subatomic realm; it has real effects in our everyday decision making.

Bradley (p. 118) concludes this section with a discussion of “retro-causal effects.” Citing a recent study he suggests that an “already ‘known’ future state” can effect a present state, and thus it is not the role of a dice throw at work (Einstein’s quip directed toward quantum theory, that “God does not play dice,” although Bohr’s retort was “Don’t tell God what to do”). But a dice throw has a very precise meaning in a quantum probability model (see again Busemeyer and Bruza, 2014). Thus even a future “known state” does not assure that it will linearly determine the present state.³⁹ This does bring us to Arrigo’s notion of “consciousness for” expressed in his commentary on *QHC*. Thus even if we do develop a “blueprint” for some end state, Heisenberg’s uncertainty principle would show that it will not necessarily be retro-causally instantiated. Patton (2000) and so too Pavlich (2009) have made a strong case for activists not to develop blueprints but rather *orientations* for *future* possibilities.⁴⁰ This is, consistent with Bradley’s previous papers, why classical holography differs from quantum holography, in that the latter is not linear and opens up space for choice. I take Arrigo’s comments in this symposium to be consistent with advocating “orientations” not blueprints in his “consciousness for” thesis.

Memory Storage

A fourth issue (p. 119) is “the location of the holographic memory store and the question of agency.” There are several versions of holographic theory; the four more prevalent versions summarized in *QHC*, chapter 3, include those inspired by: Gabor, Laszlo, Bohm, and cosmologists). Bradley’s and Karl Pribram’s model is more connected with the work of Dennis Gabor, although it has been productively extended by Bradley. They both ultimately see memory storage being located within the confines of the physical brain, be it nonlocally. Question here would be, if we do abide by the notion of “nonlocality,” generally accepted by quantum theorists, then why confine memory storage only to the confines of the brain? Bradley, in his commentary has since moved away from this strict version toward a mixed model that he tells us was implicit in his theorizing. The second model, particularly the work of Irvin Laszlo (1999, 2007) and others, suggests memory storage is located “external” to the brain, in the “in-formation” field, the ZPF (zero point field is).⁴² In other

³⁹ See also Pradhan (2012) and how the future “determines” the present in a more linear way which we earlier rejected. There is otherwise much productive discussion of how *information* is converted to *knowledge*, how for example forward emitted wave forms encode information, but is the reverse direction in PCAR, the “advanced wave” that information is translated into knowledge.

⁴⁰ Karan Barad’s (2007) work is in this direction arguing that an ethical subject can contribute to the expansion of potentials, but which one will eventually be invoked only can be understood by her model of “agential realism” whereby a measuring apparatus and agent are co-implicated, that is constitutively, in the subsequent “Bohrian cut” (my figure-8 cut building on Lacan) that instantiated a “reality.”

⁴¹ There has also been recent discussion concerning quantum entanglement, how nonlocal entities may instantaneously “communicate,” in the suggestion that it is perhaps by way of wormholes. Given the highly prominent work by the authors of the first citation, the physics community listens.

See: Maldacena and Susskind (2013), “Cool Horizons for Entangled Black Holes” <http://arxiv.org/pdf/1306.0533v2.pdf> ; see also, Raamsdonk (2010), “Building Up Spacetime with Quantum Entanglement,” <http://arxiv.org/pdf/1005.3035v1.pdf> ; for an accessible summary, see *Science Daily* (2013), <http://news.mit.edu/2013/you-cant-get-entangled-without-a-wormhole-1205> ; and Cole (2015), “Wormholes Untangle a Black Hole Paradox.” *Quanta Magazine* <http://news.mit.edu/2013/you-cant-get-entangled-without-a-wormhole-1205>

⁴² “Events, images, and other items recalled in long-term memory are not stored in the brain; they are only accessed by the brain from an ambient field” (Laszlo, 1995: 100).

words, we are immersed in a field of energy; at the quantum level, things are constantly emerging and dissipating. This field also encodes information. Holographic storage in this field is huge. One sugar cube size has been estimated to be able to encode all the information from the Library of Congress. Holography, recall, is about interference patterns, much like two ships leaving a wake in which all information about the ships are encoded (Laszlo's example). Or much like intersecting ripples left by two stones thrown in a pond. This information is recorded within the interference patterns. Slight changes in frequencies produce new encoded information. In Bradley's earlier model, with Pribram, all information (memory storage) is located within the confines of the brain as "Fourier descriptors," Bradley (p. 120). A "read out" is by way of PCAR.

Laszlo's model of memory storage is also consistent with the anticipatory work of Bergson,⁴³ in (2002[1896]) *Matter and Memory*. There, Bergson makes a case that memory storage cannot be reduced to the confines of the brain, since the brain is an image itself (suggests holographic image). He (p. 148) asks the key question directly: "we cannot hinder ourselves from asking *where* memories are stored up." He dismisses (pp. 126, 148, 151-152, 237) the possibility of the brain as a receptacle of memory storage.

"... our body is nothing but that part of our representation which is ever being born again, the part always present, or rather that which, at each moment, is just past. Itself an image, the body cannot store up images, since it forms part of the images, and this is why it is a chimerical enterprise to seek to localize past or even present perceptions in the brain: they are not in it; it is the brain that is in them" [DM, consciousness *in* something] (Bergson, p. 151).

And further (p. 149) "...the brain, insofar as it is an image extended in space [DM, "nonlocality"], never occupies more than a present moment: it constitutes with all the rest of the material universe, an ever renewed section of universal becoming." He concludes (pp. 151-152, emphasis in the original) with: "...this special image which persists in the midst of the others, and which I call my body, constitutes at every moment...a section of the universal becoming. It is then the *place of passage* of the movements received and thrown back, a hyphen, a connecting link between the things which act upon me and things upon which I act – the seat, in a word, of the sensori-motor phenomena."

The question then becomes one of accessing this memory store.⁴⁴ In *QHC*, following the ground breaking work of Marcer, Schemp, Mitchell, and others more recently, the use of PCAR accounts for how this memory store is accessed.⁴⁵ Bradley, incorrectly, concludes, to which we also responded earlier, that *QHC* provides a passive model of the brain. Just the opposite. Bergson's insightful work of 1896 argues that both passive as well as active recognition practices prevail, even though habits account for much of our activity.⁴⁶ The brain can be conceptualized as a quantum holographic

⁴³ See also Capek (1961, 1971) where Bergson's work was situated in the development of contemporary physics (quantum theory). See also the ongoing work by Stephen Robbins (2000, 2002, 2004, 2006, 2007, 2010a, 2010b, 2012, 2014).

⁴⁴ See also recent developments by Anton Vetlugin and Ivan Sokolov (2014) in providing an explanation for quantum holographic memory and its addressability: <http://phys.org/news/2014-10-quantum-holograms-atomic-scale-memory.html> . See also the work of Perus (2000, 2003).

⁴⁵ Memory storage extends to how the human lexicon is stored. Quantum cognition theorists often embrace a version of a "spooky action at a distance" model for accessing the interconnected nature of the lexicon. However, they are mute as to storage. We argue it follows the same dynamics suggested by holography and PCAR. See Marcer, Schempp and Mitchell (in references) on accessing this information. An article in progress (DM) develops a quantum holographic approach to semiotics.

⁴⁶ In law it has been well recognized that the majority of cases are of the "easy variety," they can be readily subsumable under some principle of law (axiom) and then via deductive logic and syllogistic

“transducer” following the work of Marcer and Schempp.⁴⁷ Robbins (2006: 372), too, has conceptualized the brain as a decoder, “a modulated frequency wave engaging the field.” This notion has been integrated in *QHC* but expanded to include other components in Schema QD and the bio-emotional wave from the heart, in indicating the more active nature in the process. Bradley acknowledges this more comprehensive statement (p. 120) but has reservations: “this is a novel hypothesis still awaiting rigorous empirical investigation” (citing Marcer and Schempp own admission, 1998: 237). Quite correct. Much more needs to be done. *QHC* presents integration and synthesis of various contributions in developing a model cumulating in Schema QD. It is suggestive, a first approximation. Future work awaits. But the bottom line is that we need to bring agency back in. Criminology, law, and transformative justice theorizing have lacked a bona fide statement concerning agency. The notion of storage, access, decoding information and constructing information based on PCAR can be both passive (i.e. habits), or creative acts. Schema QD provides the basis for an ethical, moral social subject in this process.

Bradley (p.120) questions the lack of specification of the “internal” necessary workings of the brain in *QHC*. This is a serious call for more theoretical work as well as empirical work. It is not that Pribram’s considerable contributions of the holographic nature of the brain are dismissed in *QHC*, but rather that they need to be re-thought to include components such as Schema QD⁴⁸ and better connected to the idea that memory storage itself is not in the brain (or, perhaps partially so in the form of short term memory as Bradley in personal communication has suggested as a possible direction for more thought). Following Bergson, Deleuze and Guattari, as well as recent theorists Alexander Wendt and Karan Barad, all support the idea that responsibility, will, and an ethics are still the shapers of the collapse of the wave function. This entails a rethinking of notions of cause, interconnectedness, fundamental nature of “objects,” space, and time itself. Newtonian ontological assumptions are not sufficient to answer these questions. A process-informational paradigm shifts epistemological and ontological constructions to the realm of the quantum and holographic.

We turn to the possibility that an alternative model of memory storage may exist. Bergson, did not have the benefits of recent developments in holography theory, particularly as developed by the cosmologist’s version of the “Holographic Principle” (Susskind, ‘t Hooft, Maldacena, Bekenstein, and Bousso). This more provocative version⁴⁹ was developed in the mid-1990s from the studies of black holes, and in particular, responding to Stephen Hawking’s earlier work on what happens when something falls into the black hole (what happens to the information?). To cut to the chase (see *QHC* for fuller development), it is now assumed by many key players in cosmology and even in string theory, with some sophisticated mathematical support, that the boundary area, or event horizon, of a black hole encodes in one less dimension all the information, all the happenings of the interior (often called the “bulk”). Thus our 3-D space dimensional world is actually encoded in 2-D on the surface or boundary.⁵⁰ By “boundary” we are not suggesting a physical surface area; rather, this is a mathematical construction, but shows with much mathematical precision, how information and its limits of storage exist.⁵¹ To jump ahead as to the implications, Susskind, in his book *The Black Hole*

reasoning a linear conclusion in law can be established, some “Truth” (see Lefebvre, 2008). The “hard cases,” however, demand a more active form of recognition and judgement, acts of creativity, or leaps.

⁴⁷ Bergson (2002: 30), however, produces some confusion when he likens the brain to a “central telephone exchange.”

⁴⁸ And the basis of yet newer synthesis as I am sure Karl would have wanted.

⁴⁹ This is the claim that the world we perceive is a hologram and we are merely projections.

⁵⁰ Return, for a moment, to Plato’s parable of the prisoner chained in the cave only seeing a 2-dimensional reflection on the wall, because of a fire pit beyond him. Cosmologists turn this on its head. The 3-D person is a projection from information encoded on the 2-D screen (cave wall).

⁵¹ Future research needs to be done to indicate the relationship of information storage on the boundaries with storage in the ZPF; perhaps, as Bradley in personal communication suggests for

War, provides an example, after he had several lively personal discussions with 't Hooft and concluded that the boundary area of his office encodes all information found in the interior; that is, everything that ever happened in the confines of this area has left a permanent holographically encoded trace on the boundary. So too, he tells us, when we visit the Notre Dame cathedral in Paris.⁵²

By extension, in *QHC* suggested was the possible use of this reasoning to explain the physicality of social group boundaries. Boundaries are often mentioned in the sociological literature, but the question of their “physical” nature is vacuous.⁵³ A hypothesis put forward in *QHC* is that we can rethink various studies in criminology by such authors as Shaw and MacKay, Sutherland, Matza, Miller, and others in terms of boundaries and the bulk interior.⁵⁴ A further hypothesis, following some work by Gibson (1966, 1979) on “invariance structures,” “direct perception,” and “optic arrays” as the carriers of information is that due to quantum fluctuations in the boundary surface area various optic arrays (see Bradley’s demonstration of an optic array in his commentary, Figure 2) are ubiquitously generated. “Invariance structures” are stabilities, consistencies over time (Robbins, 2000, 2006, 2014). We extend this idea to optic waves emanating from the boundaries. If we then accept the idea that each optic array encodes holographic information, then we ask how agents within the interior decode information that is constantly raining upon them.⁵⁵ Consider, for starters,

thought, seeing the confines of the brain as the repository of short rather than long term memory and the ZPF for long term memory? Perhaps for guidance, recall Freud’s struggle in *Interpretation of Dreams* as whether inscriptions in the mnemonic system is duplicated in the unconscious sphere? And of course, we are cognizant of the notion of nonlocality indicating that there are, ontologically speaking, no separations.

⁵² Adds a bit more thought to the adage “If these walls can only talk.” Perhaps they do!

⁵³ Bradley’s ongoing work does assume a “socioeffective field,” a field of overlapping resonating wave forms producing interference patterns (harmonic resonance), the basis of commonalities in the “bulk.” The question here would be, if we also assume some boundary distinguishing an inside and outside (insiders and outsiders) what is the nature of this boundary itself? If we employed the reasoning so far, we would have to establish some relationship between the “inside” (the “bulk”) and boundaries themselves. Returning to an earlier point, how is this information on the boundaries communicated to the bulk? And how from the bulk to the boundaries?

⁵⁴ *QHC*, chapter five, also provide some suggestions in applying QH to Edwin Sutherland’s idea of “neutralizations” existing in a work culture providing one component toward explaining embezzlement; we can also apply the QH approach to Sykes and Matza’s classic study of “techniques of neutralization” indicating how information (here, neutralizations or rationalizations) are embedded on the boundaries of the ecological niches frequented by juveniles (e.g., some street corner settings). Of course we are not suggesting that juveniles decode in a linear way information embedded on the boundary (classical holography), but more along the lines of Bradley’s quantum holographic approach which relies on Gabor and Heisenberg’s uncertainty principle. We add that the actual instantiated perception image in the construction of social reality is further shaped by the dynamics of Schema QD.

⁵⁵ At a recent mini-conference (August 24, 2015) held at the KTH Royal Institute of Technology in Stockholm which included some three dozen key thinkers on the so-called “information paradox” (does information about an entity that falls in the black hole get lost completely?), Stephen Hawking proposed that first, information about the entity will be holographically encoded on the boundary or event horizon of the black hole by a process of “super translation,” and second, information about the entity entering the black hole and disintegrating is actually returned. But he cautions, returned “in a chaotic and useless form. For all practical purposes the info is lost” (see, <http://www.washingtonpost.com/news/speaking-of-science/wp/2015/08/25/stephen-hawking-believes-hes-solved-a-huge-mystery-about-black-holes/>). It is still unclear as to how different this approach is from that of 't Hooft, Susskind, and Bekenstein. On the second point, in the context of

Robbins (2006: 373): “the information in the field-wide, dynamic interference pattern the wave is picking out and specifying [DM: recall his statement that the brain is a modulated frequency wave itself that decodes the field it is traversing] would be precisely the invariance laws or invariance structure described by Gibson.” We can employ PCAR, the notion of a quantum holographic transducer, and my offered modulated schema QD signature wave.

Take for example, Walter Miller’s classic study of “Lower Class Culture as a Generating Milieu of Gang Delinquency.”⁵⁶ “Focal concerns” can be envisioned as holographically embedded information on the boundaries. They become the basis of decoding practices. Reality construction is implicated. Various perception images are constituted as well as an “I” that appears that become the basis (the “center”) of further action. An individual and an object both are momentarily instantiated (the “cut” of the subject). I have also extended this analysis to a more recent study of the relation of street codes, gangster rap music, and identities, with possible violence outcomes (Kubrin, 2005; *QHC*, 140-150). Both classical holography as well as quantum holography principles are involved in the analysis (following Bradley’s call that both need to be invoked). Similarly, when Deleuze’s engagement with Kafka’s work⁵⁷ mentions an “abstract machine” of law as the creator of identities and realities, we can reconceptualize in terms of QH. Think in terms of the boundaries of the legal arena and how information is relayed in myriad of ways, from layout of the courthouse, visual effects generated by architecture, the use of legal language and syllogistic reasoning, restrictive discursive subject positions (rigid identities with a constrained discourse for each), appropriate demeanor, etc. When Deleuze and Guattari (1987) explain the notion of “point of subjectification” as a process by which identities are constructed, we can see how in law, particular identities and realities are constantly being reified and other possible identities and realities remain part of the wave function of possibilities. Bohr would use his concept of “complementarity” to indicate how any objectification exists with a shadow of other potentials that could be remaining in the wave form. The various “cuts” taking place in more hierarchical political economies cumulatively reify dominant conceptions, and most often disenfranchise the poor, minorities, and other marginalized. To follow our conjecture on the role of boundaries, we would hypothesize that these “cuts,” or logons are then holographically encoded in the ZPF and on the boundaries. Perhaps a hypothesis of a double inscription is worthy of further analysis. But this information, following Bradley’s distinction of a quantum rather than a classic holography, is the basis of iterative practices producing yet new logons.

Thus, we suggest that Bradley’s model, more recently focused, or made explicit, assuming Pribram’s holographic brain model as well as components of the notion of holographic storage in the ZPF (in-formation field), can be further augmented by extending his analysis that optic arrays emanating from the boundary surface area encode holographic information which are constantly being decoded within the bulk by active agents. Schema QD further specifies how the moral, ethical social agent accesses, decodes, and create a projected reality “out there” seen as the real. We are of course in disagreement with Gibson’s “direct perception” and in accord with Karl Pribram’s critique (2003); that is, Gibson discounts the shaping factors that the agent her/himself introduces

our hypothesis, perhaps this information coming back from the black hole indeed has some order and can be decoded.

⁵⁶ I make no truth claim as to his work, only use his theory as an example in employing QH.

⁵⁷ See Bogue’s insightful comments, 2003: 59-90. Useful here, too, is Agamben’s (2009) discussion of an apparatus, which in its functioning can be accommodated to the notion of an abstract machine. “...I shall call an apparatus literally anything that has in some way the capacity to capture, orient, determine, intercept, model, control, or secure the gestures, behaviors, opinions or discourses of living being” (ibid, 14). Both abstract machine and apparatus produce subjectification. Barad (2007) makes extensive use of this to indicate the “intra-action” of the agent and apparatus. Draper and Polizzi (2015) have shown how in their form of prison psychotherapy, a “desubjectification” can take place in their event model (4 types).

and the uncertainty principle behind the construction of spacetime constrained quanta of information (logons).

Bradley, building on Pribram, has also provided insightful commentary on how “images of achievement” materialize (p. 122). This does, in retrospect and with Bradley’s admonition (p. 122), qualify somewhat my statement that Bradley “does not offer a sustained, in-depth, statement of agency itself.”⁵⁸ Employing the logic of Schema QD in the context of the cosmologist’s version of the Holographic Principle, we can see how these “images of achievement” are shaped to a considerable degree by holographically encoded information in optic arrays unique to particular ecological eventing-niches. The uniqueness of each person’s Schema QD signature wave, and the uncertainty principle (Heisenberg, Gabor) assures that “direct perception” does not exist, but rather higher probabilities of certain “images of achievement” follow the shaping work of Schema QD. Left to itself in the passive mode of recognition (Bergson), habitual action follows (e.g., Matza’s (1969), pacified subjects acting as the script dictates. But in the active, creative form, new instantiations have higher potentials of realization. In *QHC* we apply QH to Lefebvre’s book, *The Image of Law*. He was primarily concerned with how judges decide by employing the work of Bergson and Deleuze. We reconceptualized to show how active, creative practices (“leaps,” to use Rorty) can generate entirely new law, such as in: *Brown v. Board of Education, 1954* (bases for the development of affirmative action); *Griswold v. Connecticut (1965)* (“right to privacy”); and *Mabo v. Queensland (1992)* in Australia, overturning legitimation claims by the use terra nullius, and re-instating native title of aboriginal people as was the case in the Canadian context, *Delgamuukw v. British Columbia (1997)*. What we added to Figure 9 and 10 in Bradley’s comments is that it is not only “pattern matching” and harmonic resonance that finally materializes in some form of action plan, but that harmonic resonance must further be understood in terms of the Schrödinger equation specifying how an otherwise “cloud of possibility” in movement reduces, probabilistically to an instantiation (object rather than wave form). But of course, we also do show how Schema QD contributes to the shaping of these probabilities in constituting the moral and ethical social subject. Thus, in need of integration in Figure 9 and 10 is some conception of an active, creative subject, such as mapped in Schema QD. Of course, following Matza’s classic, *Becoming Delinquent*, there are times where the subject is pacified, and in this state often indeed follows the scripts of the moment, in short, reification.

Schema QD, the Heart’s Magnetic Field and the Interconnectedness of Humanity

This leads us to the fifth and final area of discussion by Bradley, “Milovanovic’s Schema QD Model” (RB, 127-130). The last several pages of Bradley’s commentary based on his recent insightful work in progress offer some intriguing integration of Schema QD with his own model of the interconnectedness of all, predominantly by the effects of the heart wave form. This is highly original, and there is much further productive work to be done. This material directly implicates research in developing a transformative justice. It contributes fundamental insights toward the development of normative theories that try and evaluate the origins and efficacy of, to draw from Spinoza (see *QHC*, 194-97),⁵⁹ “joyful” over sad “passions” and Nietzsche’s “active” rather than “reactive forces.”⁶⁰ What Bradley is offering is a new dimension in transformative justice to include “bio-emotional energy” as being a key in a group’s solidarity creating a “socioaffective field.” And (Commentary, RB, p.128) that “there is a psychophysiological bases to the topography implied by Milovanovic’s speculations.”⁶¹ This “topological mapping” also addresses Wheeldon’s question as to the use of

⁵⁸ Bradley’s work (Pribram and Bradley, 1998) on the “I” and “me,” and his integration of Piaget’s work is left undeveloped, surely the basis of future work.

⁵⁹ See also the astute development by Lefebvre (2008: chapter 8) on Spinoza’s passions. In *QHC* this was subject to a modification by use of QH.

⁶⁰ Fundamental reading here is by Deleuze (1983).

⁶¹ Topology is often seen as a “rubber math”; that is, it is interested in surfaces that are bent, twisted, deformed, but not cut. Cutting produces bifurcations, or symmetry breaking. For an

isomorphism in *QHC*. Bradley supports the case of an isomorphism here. He then shows how the Möbius band can be drawn on a torus⁶² which is illustrated in his commentary, Figure 11, as diagramming the “heart’s magnetic field.”

Note too, that he is making a case for the dominant role of the heart in producing a heart wave field that directly communicates emotions not only to the body and nonlocally, but also with “the heart fields and the brains of those around us” (pp. 128, 129) via a generated electromagnetic field. He cites several empirical studies that have shown how the heart is more than a pump, but is the basis of a bio-emotional wave that reacts to incoming perturbations prior to the brain registering them, and prior to consciousness. The heart carries encoded information on emotions. In *QHC*, we provide the hypothesis, building on Bradley, that this bio-emotional wave form must be seen as an essential part of the Schema QD signature wave.⁶³ Thus, perception images are infused with passions and emotions. Unfortunately, formal educational training in the context of a disciplining political economy elevates the formal rational side and utilitarianism and downplays the significance of the emotional side and the role of creative emergents often energized by the passions.

Bradley (p. 129) then argues that “the socioaffective field, the wave fields of socio-bio-emotional interactions, are harmonically attuned across a spectrum of frequencies, reflecting each member’s role in the group’s collective experience...[and that] the bonds of group attachment generate a collective hyper-state in which the heart fields of the individual members are socially synchronized to create an emergent bio-emotional field of energy.” These relations are portrayed in his Figure 11. On p. 130 he directly integrates my Schema QD. He views it as clarifying or specifying how “slices” or cross-sections (“figure-8 cuts” in *QHC*, following the suggestions of Lacan) contain not only an instantiated perception image, a concurrently emerging “I,” but also “an encoded image of the moment-by-moment instantiation of the collective as a whole.” The latter configural-image dimension adds a substantial contribution in the development of Schema QD and is welcomed as a key addition.⁶⁴ A key question here, undoubtedly ripe for Bradley’s inquisitive, creative mind and future development, is to specify more precisely how change takes place. It remains somewhat implicit in his modeling. He has already made a convincing argument that both classical holography (deterministic in nature) and quantum holography (inherently infused with uncertainty) assure that “logons” instantiated are not correspondences, but vary somewhat. Small differences as we know

accessible introduction, see Barr (1964) and Carter (1995). For some excellent visuals, see chapters 35-48: <http://web1.kcn.jp/hp28ah77/index.html#chapters> For the relation of the Möbius band to the torus, see chapter 36. For the cross-cap, see:

http://web1.kcn.jp/hp28ah77/us27g_crsp.htm Jacque Lacan’s extensive works used considerable topological constructions ranging from the torus, Möbius band, Klein bottle, cross cap, Borromean knots (see Ragland and Milovanovic (2004), *Lacan: Topologically Speaking*). When questioned, he insisted that this is not analogy but is precisely how the psychic apparatus operates. There has also been provocative theorizing in a topological consciousness applying quantum and holography theory by Istvan Dienes following the works of August Stern (1988, 1992). See Dienes:

<http://www.inco.hu/inco11/tudatk/cikk2h.htm> ;

http://www.metaelmelet.hu/pdfek/The_consciousness-holomatrix-the_cornerstone_of_supe.pdf

⁶² See chapter 36, note 48.

⁶³ Bradley (p. 128) stresses the “dyadic combinations” in Schema QD. It should also be stressed that the totality of dyadic combination produces a matrix whereby different values of each and of the matrix emerge in contextualized interactions producing a distinct modulated Schema QD signature wave. In this view, too, following Jacque Lacan (1977), we witness a decentered subject: the subject/agent, he tells us, is stretched out to all four corners, simultaneously. Thus it is erroneous to believe, as in liberal humanist thought, that identity merely resides in the “I” or the “ego.” These are, rather, relational concepts.

⁶⁴ For further development, see his forthcoming book, *Consciousness and the Eye of Love*, Auckland, NZ: New Zealand The First Light ebook.

from dynamic systems (chaos) theory, via iteration produce disproportional effects. We could extend this form of symmetry breaking by including a discussion on the effects of the unique signature wave of each entity that, even though having an attractor state, an idling speed in a relatively unperturbed state, is modulated and emerges in interactions. There is variability. Group norms, then, are never precisely replayed but iterated. This too adds bio-emotional energy to ever new states of far-from-equilibrium conditions. More work needs to be done in symmetry breaking, bifurcations, and iterative effects.

Arrigo's comments are quite appropriate at this point, particularly the relevance of a "consciousness of" and "consciousness for." The latter is a projection into the future, a directionality toward ever more completeness of being human. My suggested two approximations (*QHC*, 198; see also N. 10) concerning justice principles (retributive, distributive) could be conceived as orientations, not blueprints. Bradley's latest work is suggestive as to how possibly Arrigo's two forms of consciousness can be synthesized. Bradley's suggests not only the wherewithal of an emergent "bio-emotional field of energy" and how it becomes the basis of solidarity and information communication through PCAR and harmonic resonance, but also how a more holistically based coherence can be the source of intuitions (see Bradley's work on intuition, 2006, 2007, 2009) for things-yet-to-be, a possible "justice-yet-to-come" (Barad, 2007, 2010), a "people yet to come," following Deleuze and Arrigo's integration.

Bradley (p. 130) offers an explicit statement of what was implicit in my dynamic model of Schema QD: "the trajectory of continuous movement on the Möbius band's surface is an energetic field that radiates around a central locus (the individual and group) in all directions." And that in his integration, "slices" ("figure 8 cuts") are "cross-sections – Fourier slices."⁶⁵ This "slice" generates, as previously developed, not only an emergent "I" (that can take up residence in discursive production), a perception image (an object instantiated with distinct qualities and boundaries), but also and a welcomed expansion, "an encoded image of the moment-by-moment instantiation of the collective as a whole." Thus this contributes to our understanding of the construction of social reality as an ongoing, contextualized, relational, iterative process.⁶⁶

Bradley's (p. 130) last point, seemingly drawing somewhat from the cosmologist's version of the "Holographic Principle," suggests that the torus surface is an information storehouse, "an encoded holographic store of the entire repository of all events, processes, and interactions at that frequency, which is readily accessed by phase-conjugate-adaptive-resonance (PCAR) with the unique energetic, signature associated with each object." This, too, is a welcomed synthesis. There is much here to ponder for theorists researching the contours of a possible transformative justice as an alternative to our failed "criminal justice" and rather limiting, sometimes reifying, "restorative justice." Our (*QHC*, 198-99; see also, above, note 10) offering two principles of justice, as first approximations,⁶⁷ can

⁶⁵ For those topologically challenged, it would be welcomed to see Bradley's "slice" visually diagrammed in his Figure 11.

⁶⁶ Bradley's work also has some bearing on environmental criminology, green criminology, and for an environmental justice. He has argued that his approach is not only about information communication amongst human beings, but also extends to people and animals (p. 129). Space limits further discussion here, but a productive line of inquiry would be to engage Bradley's work here with that of Stacy Alaimo's (2010), *Bodily Natures: Science, Environment, and the Material Self*. Alaimo engages both Karan Barad and Ulrich Beck's work on the "risk society" in developing an environmental ethics. She does point out, in her idea of "trans-corporeality," that because of the inseparable interconnection between human and non-human, what we do to the environment will in turn have effects on us. In this context the issue of environmental racism becomes visible.

⁶⁷ And Wheeldon is on mark in pointing out that much more definitional work is needed. Hopefully, the two offered justice principles, responding to much criticism directed to activists and postmodernist in their lack of a normative basis, is a provocation for much more thought on a more posthumanist notion of agency, cause, and responsibility.

find a QH basis in the recent work conducted by Bradley. Returning to Wheeldon's commentary for a moment. The challenge will be to map, following isomorphism, each component of the two principles of justice directly to QH concepts. This is an alternative to the contemporary criminal justice system that is based on a Newtonian ontology. It promises to provide key insights for resurrecting agency, will, a quantum vitalism, the values of creative production, and consciousness *for* along the lines suggested in Arrigo's commentary.⁶⁸

The collapse of the wave function can take place otherwise; not a collapse in the direction of minimizing potentials and channeling them into capital logic and its attendant legal fetishisms, but to collapse of the wave where alternative potentials are actualized (the work by Arrigo on the "shadow" is implicated). Of course, as our offered "retributive principle of justice" suggests (p. 199 and see note 10), "...all [is] subject to genealogical evaluation of forces." Contemporary empirical studies in criminology, as often presented in top criminology journals such as the *Journal of Criminology*, pride themselves with their formalism. Their fundamental ontological basis is Newtonian, with its logic of determinism, positivism, a mechanical clock-work universe, devoid of a creative agent. It is time for engaging the field⁶⁹ of quantum probability theory and quantum logic rather than classic logic/probability.⁷⁰ Those doing "quantum cognition" have already embraced the task. Why hasn't the field of criminology? Why, at the minimum has there not been active engagement with the principles well accepted in quantum and holography theory? Quantum theory has been identified as the most successful theory ever developed by humankind. Newtonian physics can at best be seen as

⁶⁸ In this direction, too, Barad's (2007) book as well as subsequent work (see 2010, 2012a, 2012b) provides an alternative (more Bohr's, "indeterminacy principle" than Heisenberg's, "uncertainty principle") model as the basis of a posthumanist ethics and a "justice-to-come." She maps the insights of Derrida and Levinas as to the responsibility to the Other as the key component of her agential-based ethics and responsibility. Space limits fuller development here, but her work warrants careful examination for those theorizing transformative justice. She argues (2010: 265), for example, "responsibility is not an obligation that the subject chooses but rather an incarnate relation that precedes the intentionality of consciousness. Responsibility is not a calculation to be performed. It is a relation always already integral to the world's ongoing intra-active becoming and not-becoming. It is an iterative (re)opening up to, an enabling of responsiveness".

⁶⁹ At this point, higher learning institutions where the study of quantum mechanics and its applicability to the social sciences is taking place include: Department of Psychology and Brain Science, University of Indiana; the Center Leo Apostel (CLEA) associated with the Free University of Brussels; and the School of Management's recent (2014) concentration in the "Institute for Quantum Social and Cognitive Science - IQSCS, see <http://www2.le.ac.uk/departments/management/research/units/iqscs> ; see, also, the opening inauguration lecture announcement, <http://www2.le.ac.uk/departments/management/news/iqscs-inaugural-lecture-15-october-2015>. The main aims listed are: "development of a unified quantum-based perspective in which the results of different disciplines can be properly placed together," "interdisciplinarity," and "wide-ranging dissemination of scientific knowledge." Raymond T. Bradley is also developing a research institute in Auckland, NZ that would concentrate more on quantum holography, not just quantum mechanics and its applications in the social sciences.

⁷⁰ For a particularly cogent and accessible explication of quantum decision making, Wendt (2015: 157-173) It does not rely on a fixed nature of objects, the ability to precisely identify the boundaries and components of some entity, linear causation, precise trajectories in space and time, forward moving time, etc. All these concepts have to be fundamentally rethought. The challenge will be for both those well-versed in the classical materialist paradigm and its Newtonian-based ontological presuppositions to engage the alternative. Graduate students working toward their dissertation, driven by empirical methodologies are especially challenged to think otherwise than traditional graduate school indoctrination. Cease the moment!

a special case. And it will not do to dismiss quantum theory by arguing it is only for the sub-atomic. The literature is beyond that. Let's get on with the task!

In transformative justice we need to be sensitive to various "levels" that constitutively are implicated in social reality construction (see *QHC*, chapter 6). Lori Katz's (2005) work on "holographic reprocessing" as a fundamental strategy for dealing with various traumas that have remained rigidly encoded deals with real, everyday suffering. In her view, traumas, holographically encoded, can be revisited directly and changed.⁷¹ It is one consideration for alternative forms of therapy.⁷² These "micro" responses must also, in a transformative justice, be combined with addressing change in political economy. Useful directions have been articulated in the direction of "nomad citizenship" (Holland, 2011), perhaps a form of a "slow motion strike" (*ibid.*), and a "commonwealth" (Hardt and Negri (2009). This will be the work of a "war machine" (Deleuze and Guattari, 1987), not in the sense of advocating a violent war, but challenging the very basis of knowledge production, and suggesting orientations and strategies toward a "permanent revolution," a "justice-yet-to-come" (Barad, 2010),⁷³ a humanity-yet-to-come.

Conclusion

There is much to do. A quantum holographic approach in the social sciences is in its infancy. Quantum mechanics has already witnessed some groundbreaking work,⁷⁴ a Trojan horse that is in the incipient stages of spawning a paradigm shift to a process-informational paradigm. It cannot be ignored. Including a holographic approach substantially revises future developments. Quantum cognition theorists, more recently, here and there, are beginning to extend the inclusion of holography. We have seen some similar developments in theoretical physics with string theory in particular, with the inclusion of a holographic principle by leading thinker Edward Witten, who some compare to a present day Einstein. The three sets of comments on *QHC* have raised some valuable discussion points with which we have been productively engaged. Certainly, specifying the contours of a process informational paradigm benefits from such dialogue. My deep appreciation to the three responders for the meticulous care and analysis of *QHC* and raising questions for further development.

⁷¹ It would seem research in quantum mechanics and holography on backward time referral of information and quantum erasure effects would suggest that the past can be changed and thus directly implicates holographic reprocessing as a useful therapy for dealing with traumatic events. This is contrasted with Barad's (2012a: 47, see also 43) alternative position that the past is permanently encoded on bodies ("changes to the past don't erase marks on bodies; the sedimenting material effects of these very reconfigurings – memories/re-member-ings – are written into the flesh of the world." She makes an argument that past, present and future are constructs ("*the past was never simply there to begin with and the future is not simply what will unfold; rather, the 'past' and the 'future' are iteratively reworked and enfolded through the iterative practices of spactimemattering...*") (*ibid.*, 44, italics in the original, neologism hers). Those in QH certainly would find this challenging for further thought in holographic reprocessing. For some empirical studies on backward referral and some anomalies as to the implications for free will, see Libert (1992, 2002, 2004, 2006).

⁷² See also footnote 18. Draper and Polizzi's (2013, 2015) prison psychotherapy model can be the basis of productive quantum and holography application.

⁷³ Barad (2012a: 46) bases her notion on Jacques Derrida.

⁷⁴ In addition to book-length treatises in applying quantum holography in the social sciences, there is a growing list of researchers in quantum mechanics and its application to consciousness studies, most notably in such journals as *NeuroQuantology*, *Consciousness Studies*, *Journal of Mind and Matter*, *Journal of Studies in History and Philosophy of Modern Science*, even as many argue that the brain is "like" a quantum brain, but not necessarily a quantum brain. The latter will change with the weight of continuous evidence to the contrary.

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