ISSN 2045-5577

ORDER: GOD'S, MAN'S AND NATURE'S

Free Will, Laws of Physics and Contexts

Robert C. Bishop

Associate Professor
Department of Physics
Wheaton College

Oxford Order Project Workshop (May 2010) Draft: 27 December 2010

Free Will and the Mechanical Picture of World

Traditional free will debates appear to be attempts to make sense of human choice and action in a realm of ordered causes. However, this realm of ordered causes usually is understood as deterministic cause and effect chains. This understanding of the realm of ordered causes can be traced back to the 17th when the mechanical world picture was constructed and proceeded to become the dominant picture of the material world. The mechanical world picture proved to be very fruitful to natural philosophers, so much so that extending it to other domains such as that of human action was very inviting. This picture is congenial to thinking of world as an interacting network of cause and effects. Furthermore, the mechanical world picture probably is the most graspable and concrete image of order humanity has ever devised.

The key to the mechanical world picture is that the laws of nature mediate or bring about all that happens. Robert Boyle articulates this key...matter as inert and laws as governing all motions of matter. Whether one views the laws of nature as ordering the causal chains of cause and effect or views these causal chains as the subjects signified by laws is immaterial to the central point of the mechanical picture.

Though this mechanical picture of the world has largely been replaced in the natural sciences with the advent of theories like the special and general theories of relativity, quantum mechanics and evolution, it still appears to be the dominant picture shaping our approaches to understanding human action. In particular, our contemporary free will debates continue to take place within the framework of the mechanical world picture.

Physicalism

It is against this background that the idea of physicalism developed, roughly the view that mental events and states are really physical events and states.[1] Free will debates engage in this mechanical-physicalist picture. That being the case, the relevance of the determinism (or indeterminism) of natural laws to free will ultimately depends on the causal closure of

[1]This is not to suggest that Boyle, Descartes and other 17th architects of the mechanical world picture viewed the mind as being mechanical or material, but only that the mechanical world picture played an important role in framing a way of thinking about the world that eventually led to physicalist doctrine.

physical:

COP: For any distinct times t_1 and t_2, the physical event $e(t_1)$, together with the fundamental physical laws, causes the (chances of) physical event $e(t_2)$.

Although CoP makes no mention of anything but physical events and laws, the principle can be construed in two ways: (1) Physical events determine physical events simpliciter (i.e., no matter what other events, processes or factors might be present). And (2) in the absence of nonphysical influences, physical events will proceed typically. This is to say that if there are no nonphysical interventions, the physical event $e(t_1)$ plus the fundamental physical laws will produce the physical event $e(t_2)$ in usual fashion, provided the system in question remains appropriately isolated during its evolution from t_1 to t_2. I have argued elsewhere that this latter typicality condition construal of CoP is the appropriate one (Bishop 2006b). The upshot is that CoP can only tell us what typically happens in particular kinds of contexts.

Let me sketch some of the reasons why CoP only has force as a typicality condition.

Prima Facie Nonphysical Influences Shaping Physical Realities

First there are numerous examples of *prima facie* nonphysical influences that make a difference to how physical features of reality behave. Consider social policies such as elementary and secondary school integration in the US that led to the busing of students across towns to change the racial populations of public school. Such policies are nonphysical entities yet they resulted in buses–physical objects–moving in different patterns than they would have without those policies. Or consider ethical values such as the sixth commandment against murder or respect for the rights of others. Such ethical values are nonphysical entities yet they result in guns and knives–among other kinds of physical objects–moving in different patterns than they would absent those ethical values. Finally, consider scientific theories such as general relativity and quantum mechanics. Such theories are nonphysical entities yet they result in scientists' pencils, chalk, calculators and computers–physical objects–moving in different patterns than they would have absent those theories.

The Qualified Nature of Physical Theories

A second reason why CoP only has force as a typicality condition is the qualified nature of physical theories. Everywhere we look in physics (and other physical sciences) we see always see laws, symmetries and properties always qualified or heavily idealized e.g., (Teller 2004). Moreover, the experimental methodologies of natural science are built on ideas of isolation and manipulation, where we remove or otherwise control intervening factors. This is one reason why it is so difficult to achieve successes even in highly controlled laboratory experiments. The qualifications built into our theorizing and lab manipulations usually require very highly controlled contexts to elicit the expected behaviors. There is no reason to expect CoP to have anything other than the same qualified character.

Causal Cooperation and Context

A third reason why CoP is at best a typicality condition is that the physical laws in question always have a contextual character. Consider some simple examples. Newton's first law of motion states that every body continues in a state of uniform motion unless acted upon by an external force. This is a typicality condition for force-free motion of bodies. If an external

force is present, the first law does not rule it out; rather, it only says what happens when external forces are not present.

Or consider Newton's second law, $F = ma$, where F is Newton's gravitational force. According to a causal sufficiency reading, F provides a sufficient cause of apple's falling from the tree provided the stem has broken. But suppose I stick my hand out and catch the apple. I have just intervened in this causal sufficiency. Newton's second law plus gravity no longer provide causal sufficiency necessitating apple's fall to ground. More fancifully, consider an iron apple. Apply an appropriate electromagnetic field, and the apple will levitate in mid air. What happened to supposed causal sufficiency of the gravitational force? No laws of nature violated, nor was the iron apple's behavior overdetermined. The gravitational and electromagnetic forces balanced in a cooperative manner to bring about a new effect. The upshot is that force laws have a contextual character.

The contextual and cooperative nature of physical forces shows up in all domains of reality. For example, isolated neutrons are unstable with a half-life of eleven minutes. However, when bound in a nucleus they are stable with a half-life on order of millions of years. In isolation, quantum mechanical laws alone are typically sufficient to determine the behavior of atoms. However, biological constraints like chirality associated with DNA and histones composing chromatin along with natural selection largely determine development of DNA sequences of base pairs (i.e., the structure and shape of the chains of molecules composing DNA). Genes express themselves differently in isolation than in the presence of other genes in a biological system and different environments–the causal effects of genes are entirely context-dependent! Finally, in the absence of other psychological and social conditions, the central nervous system is capable of controlling arm movements. However, in a voting context, my values and what I feel is at stake cooperate with or shape the specific raising of my arm.

The bottom line is that context matters at least as much as laws and forces because laws and forces always have a context into which they must come to expression. In other words, context is crucial to conditioning how laws, forces and properties take concrete form. Hence, CoP's significance depends on the context in which it comes to expression–the principle only says what happens in the absence of influences beyond fundamental physical laws and properties.

Contextual Emergence

The attitude of many metaphysicians seems to be CoP or bust! That is to say, if CoP fails, then there is little hope for a comprehensible, ordered realm of causes. But to view the alternatives to CoP as mystery or magic is clearly an overreaction. One fruitful alternative to this false dilemma is a framework called *contextual emergence* (e.g., Bishop and Atmanspacher 2006; Allefeld, Atmanspacher, and Wackermann, 2009; beim Graben, Barrett, and Atmanspacher 2009; Bishop 2010a, b).

The basic idea of contextual emergence is as follows.[2] An ontological (epistemic) reduction of features of domain *A* to those of domain *B* is where the properties (descriptions) of *B* are and necessary and sufficient for properties (descriptions) of *A*. In contrast, ontological (epistemic) contextual emergence of features of domain *A* from those of domain *B* is where the properties (descriptions) in *B* need to be combined with properties (descriptions) of *A* to produce a set of jointly necessary and sufficient conditions for relating features of *B* to the emergent features of *B*. An example of contextual emergence is molecular shape in chemistry (Bishop 2005b, 2010c). Quantum mechanics provides necessary conditions for the existence of molecules, but no sufficient conditions for either explaining or producing molecular structure. Instead, quantum mechanics must be supplemented with a contingent context from the domain of chemistry that breaks numerous key symmetries, introduces a separation between the motions of nuclei and electrons as well as induces stability conditions for persistent configurations of atomic components of molecules. Quantum mechanics plus this contingent context yields jointly necessary and sufficient conditions for molecular shape.

Temperature is another example of a contextually emergent property (Takesaki 1970; Bishop and Atmanspacher 2006). This observable arises through transitions from classical point mechanics (molecules) to an ensemble of molecules (statistical mechanics) to a rich context for such ensembles (thermodynamics). The first transition involves an observable associated with the mean kinetic energy of a system of *N* particles. Using this observable, the expectation value of the kinetic energy can be defined in a suitable limit (Compagner 1989). The second transition–typically glossed as the claim that the thermodynamic temperature of a gas is the mean kinetic energy of the molecules constituting the gas–presupposes thermodynamic equilibrium, which is a contextual condition defined through the zeroth law of thermodynamics, but absent from the domain of statistical mechanics. Thermal equilibrium represents a stability condition in the domain of thermodynamics that is implemented through a distinguished set of states, the Kubo-Martin-Schwinger (KMS) states.[3] These KMS states induce a contextual topology in the state space of statistical mechanics based on features in the thermodynamic domain that are absent from the statistical mechanics domain.

Contextual Emergence and Laws

On the contextual emergence view fundamental laws never determine everything by themselves (Bishop 2010c, submitted). Of coursed detailed specification of the initial and boundary conditions are needed for any law-governed behavior to be realized, and there are very interesting issues here (Wilson 1990). What usually is overlooked is that fundamental laws come to expression in concrete contexts whose constraints not given by fundamental laws. The primary role fundamental laws play is to define possibility spaces, while concrete initial and boundary conditions plus contexts constrain these possibilities (Bishop 2010a,b,c).

---

[2]Contextual emergence was originally formulated epistemically (Bishop and Atmanspacher 2006), but the framework has been extended to an ontological version Bishop 2005b, 2010a). Here I indicate both ontological and epistemological versions of the framework but mostly focus on the ontological.

[3]They are distinguished because the KMS condition characterizes the structural stability of such states against local perturbations.

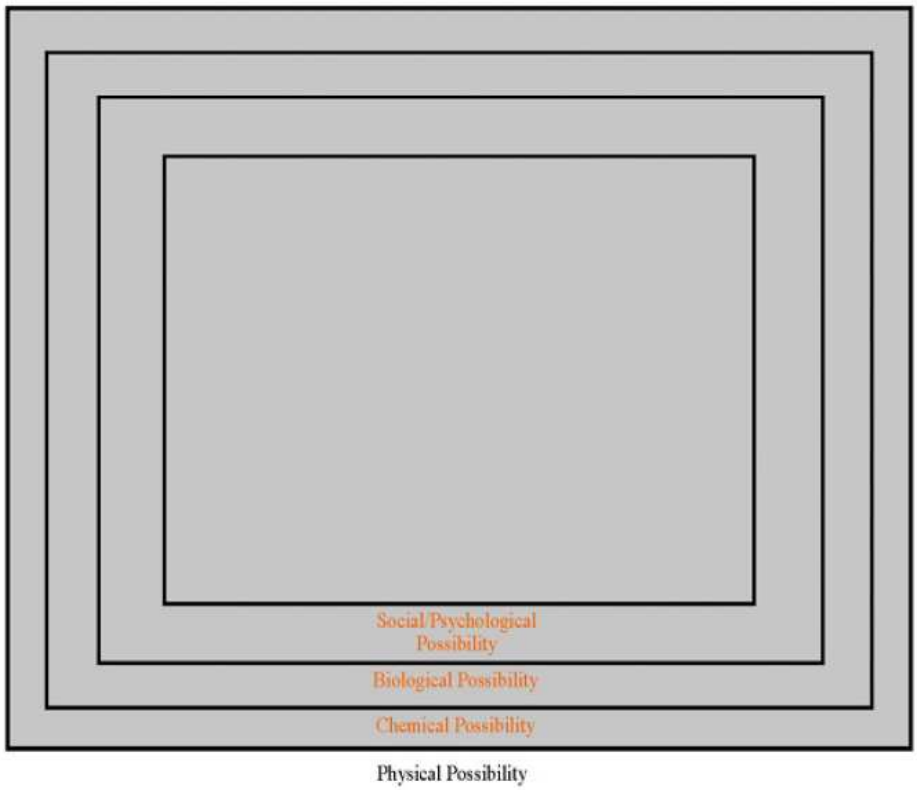

Figure 1 Nested possibility spaces defined by physical laws and qualified by contexts from different domains.

In the absence of any other causes, the laws of physics supply conditions defining the space of possibilities for matter's behavior and interactions. Chemical, biological, psychological and social contexts further constrain this fundamental space of possibilities (Figure. 1). It is legitimate, then, to speak of chemical possibility, biological possibility, and so forth along with physical possibility. The former domains do not violate the space of physical possibility. In other words, chemical and biological domains never produce possibilities outside the physical space of possibilities because physical laws are part of the set of jointly necessary and sufficient conditions for concrete actualisations of concrete material possibilities. Put differently, biological, psychological and social possibilities are always consistent and cooperate with fundamental physics. Such possibilities, however, are never fully determined by the laws of physics laws alone. This is what CoP as a typicality condition means.

Here are some examples. While the physical space of possibilities establishes basic constraints on the motions and behaviors of molecules (e.g., they cannot violate gravity), the chemical bonds, chiral shape of DNA and warping of DNA around chromatin in combination with the genomic environment, physical body and ecological niche determine the activity of

so-called coding regions of DNA molecular chains. While the physical space of possibilities places relatively mild constraints on the motion of arms, my feel for what is important in a voting context dictates when and how I will raise my arm (e.g., reluctantly or enthusiastically). While the physical space of possibilities sets various constraints on the possible motions of metal bodies, the blueprints of designers, plans of engineers and intentions of human operators enable metal formed into buses, trains and planes to execute precise the motions that they do.

Context partially defines what the cooperative effects of the entire set of necessary and sufficient causes will be. In other words, contexts shape, influence and mediate networks of sufficient causes into appropriate outcomes. Hence, natural laws are not the sole mediators of phenomena of our world as so many metaphysicians assume. Physics may provide many of the necessary conditions for physical actions in our world, but does not provide jointly necessary and sufficient conditions for human free will and action.

Free Will and Contexts

In spaces of physical, chemical and biological possibility, contexts generally mediate the actualizations of possibilities by embodying and enacting constraints and conditions. Examples would be nonlinear dynamics found in fluid flow, gene networks and neural dynamics. In the social arena, contexts always mediate action through supplying meaning and understanding. Examples would be cultural forms of deference, courtship norms and consumerism.

All of these cases have something in common. The contribution of contexts to the actual behaviors in these various domains is not a matter of efficient cause-effect relations alone. Rather, there are various kinds of inter-domain constraints and affordances. This suggests we need to broaden our range of thinking regarding causation beyond the notion of efficient causation which is still the dominant paradigm for thinking about free will. For instance, we need to further explore ideas like constraining causation, top-down causation, among other things, as well as even final causation in the social realm.

Suppose you are in a faculty meeting discussing a controversial decision. You argue eloquently for the position that seems to make most sense to you, that appears to reflect your own best values and what you feel is at stake. Afterwards, you leave the meeting feeling good about the whole matter and how vote turned out. Later over drinks you recount events to a friend and responds, "Gee, that's not how I see it at all!" Your friend proceeds to cast fresh light on the issues, mentioning perspectives and values you had failed to consider and you find yourself thinking about what she has been saying. Did you have the best sense of what was really at stake? Were you really honing in on your true desires? You find yourself wondering if you genuinely lived up to your own best values and perhaps even rethinking those values. Whatever the outcome of this conversation with your friend, you have been changed. You may retrench and harden your defenses. Or you might enrich your sensibilities. The steady accumulation of such influences over time in and through the context of relationships adds up to much of the reality of our lives.

Clearly in such cases as this conversation with your friend, a host of necessary conditions from the physical, chemical and biological domains have to be in place. There are tables,

chairs, rooms, drinks, human bodies, voices, and such that would not exist with out those conditions. Yet, the possibilities for meaning and action are not determined by those conditions alone. A number of contextual features have to be added into the mix to get meaningful human action. For instance, the background knowledge you, your friends and colleagues have acquired over a lifetime of living in particular communities and families, various social norms for expected behavior, and actually caring about how another person sees a situation important to us, to name a few. These kinds of contextual features combined with the "lower-level" necessary conditions yield concrete possibilities for free will and action.

Free Will, Determinism and Context

Finally, if CoP is a typicality condition, what are we to make of determinism as in free will/determinism debates? Like CoP, determinism turns out to be mostly a contextual affair. Even if our most fundamental theories of physics turn out to be deterministic, without CoP those theories tell us dreadfully little about what the possibility space for human action is like because the domain of physics does not determine outcomes in the social domain. Neuroscience uses both deterministic and stochastic descriptions depending on the purposes of the investigators and the kinds of questions they explore. There is no clear preference of one type of description over the other; instead, it is a matter of pragmatic choice (Atmanspacher and Rotter 2008). In general in physics and other domains, stochastic and deterministic descriptions can be transformed into each other, so the choice of which description to use is primarily pragmatic (e.g., Primas 2002). Moreover, deterministic and stochastic descriptions do not settle the underlying ontological issues regarding whether the processes being described are deterministic or indeterministic (Bishop 2002, 2010c). Our descriptions are contextual because the ontology of the processes we study is contextual.

The tendency of compatibilist approaches to free will is to underestimate the restrictive force of determinism, while the tendency of incompatibilist accounts is to overestimate the benefits of indeterminism (Bishop 2009, forthcoming). Contextual emergence suggests that whether free will is compatibilist or incompatibilist is a contextual affair. Physics, biochemistry, neurophysiology, persons, groups and culture provide some of the necessary conditions for the existence and exercise of human free will and action. The key question is what particular conditions do contexts for action contribute so that sufficient conditions for persons to choose and act in particular ways deserve to be characterized as free? In other words, what conditions enable freedom and what kind of freedom is being exercised in which contexts? Inquiry along these lines is likely to suggest that the traditional framing of free will as compatiblist or incompatibilist may be inadequate.

A proper understanding of approaches to free well as different from each other as Daniel Dennett's (2003) and Robert Kane's (1996) could benefit from elucidating and assessing the contexts in which determinism or indeterminism may be more relevant for the type of free will being exercised. The kind of freedom exercised when choosing your favorite chocolate cake for dessert from the menu seems to be significantly different than the kind of freedom exercised in choosing between two equally compelling and exciting job opportunities. Although the necessary conditions for each of these scenarios to exist may have a significant degree of overlap, the very different contexts add significantly different conditions for the sufficiency of possible courses of action, the choices to be made and the kind of freedom at

issue.

Why Think Contextual-Emergent Picture Is Plausible?

Here are three reasons to think that the contextual-emergent picture is plausible. The first is the nature of the order we observe, experience and engage. Laws of various domains and theories descriptive of those domains of reality appear to overlap and interpenetrate one another in the qualifying kinds of ways that contextual emergence highlights. This is reflected in theoretical and experimental practice in physics, chemistry, biology, and neuroscience among other disciplines. The natural order is far more subtle than any mechanical picture can grasp.

Another reason the contextual-emergence picture is plausible is theological. According to the doctrine of Creation in the Christian tradition, creation has contingent rationality (Gunton 1998; Torrance 2005). It is contingent not only because it is utterly dependent on God for its existence, but creation is also contingent because in God's freedom and love God could have made it different than it is. It is rational because creation has been given its own nature–order–and intelligibility. Part of what grounds this contingent rationality is a Trinitarian view of action in creation which is mediated in numerous ways (Gunton 1998). Divine action is mediated through divine command structuring the order of creation. Divine action is mediated through the incarnate Son sustaining and superintending everything that happens in creation *according to its nature*. Divine action is mediated through the Holy Spirit enabling everything in creation to become what it is called to be *according to its nature*. Finally divine action is mediated ministerially: God works alongside and through creation *according to its nature* so that it participates in its own becoming. In other words, natural laws are not the only mediators of events, processes and actions in creation. Hence, the determinism or indeterminism of natural laws are not the only relevant factors determining outcomes as creation becomes what it is called to be. Similarly, natural laws are not the only relevant factors in our choices and actions. There is a whole slew of enabling conditions spanning from the domain of physics to our embodiment to our relationships to the Spirit's enablement.

A third reason to think the contextual-emergent picture is plausible is that the self and the character of meaningful human action is contextual (Taylor 1989, 1995; Richardson, Fowers and Guignon 1999; Bishop 2007). Among our embodiment, relationships, social involvements, cultural affordances and prohibitions, and our ever growing interpretations of all these things is found the stuff that makes up who we are as people who can act meaningfully (Richardson and Bishop 2001, 2002). We live in a historical and cultural context spanning across our past to the present and into the future that is partly responsible for constituting the self that we presently are. Early in our lives, our identities are shaped–one could use the word determined–by the family, cultural and social traditions in which we grow up. Simultaneously, we are always engaging and interpreting these traditions that, to some degree, involves reconstituting ourselves resulting in a dynamically growing view of our contexts for action.

Concluding Remarks

The ghost of the mechanical world picture has haunted free will debates for too long. It is time we excise that ghost and get on with project of discerning the conditions enabling

various kinds of free will in our world. Part of that project is getting clear on the nature of the order of the world is and a framework like contextual emergence can help with this aspect. Part of the project of clarifying the conditions enabling various kinds of free will is recognizing and exploring the role of contexts in enabling meaningful human action. There is much work to be done on the various respects in which free will is a contextual feature of our world that arises through the interplay of physical and biological conditions, culture, the relationality of self and other, the powers of thought and action that we are enabled to have, and our interpretations of all these things.

References

Allefeld, C., Atmanspacher, H., and Wackermann, J. (2009), "Mental States as Macrostates Emerging from Brain Electrical Dynamics," *Chaos* 19: 015102: 1-12.

Atmanspacher, H. and Rotter, S. (2008), "Interpreting Neurodynamics: Concepts and Facts," *Cognitive Neurodynamics* 2: 297-318.

Bishop, R. C. (2002), "Deterministic and Indeterministic Descriptions," in H. Atmanspacher and R. Bishop (eds.), *Between Chance and Choice: Interdisciplinary Perspectives on Determinism.* Thorverton: Imprint Academic, pp. 89-113.

Bishop, R. C. (2004), "Nonequilibrium Statistical Mechanics Brussels-Austin Style," *Studies in History and Philosophy of Modern Physics* 35:1-30.

Bishop, R. C. (2005a), "Anvil or Onion? Determinism as a Layered Concept," *Erkenntnis* 63: 55-71.

Bishop, R. C. (2005b), "Patching Physics and Chemistry Together," *Philosophy of Science* 72:710-722.

Bishop, R. C. (2006a), "Determinism and Indeterminism," in D. M. Borchert (ed. in chief), *Encyclopedia of Philosophy, Second Edition*. Farmington Hills, MI: Macmillian Reference, Vol. 3, pp. 29-35.

Bishop, R. C. (2006b), "The Hidden Premise in the Causal Argument for Physicalism," *Analysis* 66: 44-52.

Bishop, R. C. (2007), *The Philosophy of the Social Sciences*. London: Continuum.

Bishop, R. C. (2008a), "Downward Causation in Fluid Convection," *Synthese* 160: 229-248.

Bishop, R. C. (2008b), "Chaos," *Stanford Encyclopedia of Philosophy*, http://plato.stanford.edu/entries/chaos/.

Bishop, R. C. (2008c), "What Could Be Worse than the Butterfly Effect?", *Canadian Journal of Philosophy* 38: 519-548.

Bishop, R. C. (2009), "Contemporary Views on Compatibilism and Incompatibilism: Dennett and Kane," *Mind & Matter* 7: 91-110.

Bishop, R. C. (2010a), "Whence Chemistry? Reductionism and Neoreductionism," *Studies in History and Philosophy of Modern Physics* 41: 171-177.

Bishop, R. C. (2010b), "Free Will and the Causal Closure of Physics," in *Visions of Discovery: New Light on Physics, Cosmology and Consciousness*, R Chiao, W. Phillips and C. Harper (eds.), Cambridge University Press, 601-611.

Bishop, R. C. (2010c), "Metaphysical and Epistemological Issues in Complex Systems," in C. Hooker (ed.), *Handbook of the Philosophy of Science. Volume 10: Philosophy of Complex Systems*. Amsterdam: Elsevier, pp. 119-151.

Bishop, R. C. (forthcoming), "Chaos, Indeterminism, and Free Will," in R. Kane (ed.), *The Oxford Handbook of Free Will, 2nd ed.*. Oxford: Oxford University Press.

Bishop, R. C. (submitted), "Excluding the Causal Exclusion Argument against Nonreductive

Physicalism," *Journal of Consciousness Studies*.
Bishop, R. C. and Atmanspacher, H. (2006), "Contextual Emergence in the Description of Properties." *Foundations of Physics* 36: 1753-1777.
Compagner, A. (1989), "Thermodynamics as the Continuum Limit of Statistical Mechanics," *American Journal of Physics* 57: 106-117.
Dennett, D. C. (2003), *Freedom Evolves*. London: Allen Lane.
beim Graben, P., Barrett, A., and Atmanspacher, H. (2009), "Stability Criteria for the Contextual Emergence of Macrostates in Neural Networks," *Network: Computation in Neural Systems* 20, 178-196.
Gunton, C. (1998), *The Triune Creation: A Historical and Systematic Study*, Grand Rapids: Eerdmans.
Kane, R. H. (1996), *The Significance of Free Will*. Oxford: Oxford University Press.
Primas, H. (2002), "Hidden Determinism, Probability and Time's Arrow," in H. Atmanspacher and R. Bishop (eds.), *Between Chance and Choice: Interdisciplinary Perspectives on Determinism*. Thorverton: Imprint Academic, pp. 89-113.
Richardson, F. C. and Bishop, R. C. (2001), "Physique, sciences humaines et fin des certitudes." in D. Driebe and I. Prigogine eds. *L'homme devant l'incertain*. Paris: Editions Odile Jacob, 337-358.
Richardson, F. C. and Bishop, R. C. (2002), "Rethinking Determinism in Social Science," in H. Atmanspacher and R. Bishop (eds.), *Between Chance and Choice: Interdisciplinary Perspectives on Determinism*. Thorverton: Imprint Academic, pp.425-446.
Richardson, F. C., Fowers, B. and Guignon, C. (1999), *Re-envisioning Psychology: Moral Dimensions of Theory and Practice*. San Francisco: Jossey-Bass.
Takesaki, M. (1970), "Disjointness of the KMS States of Different Temperatures," *Communications in Mathematical Physics* 17: 33-41.
Taylor, C. (1989), *Sources of the Self*. Cambridge, MA: Harvard University Press.
Taylor, C. (1995), *Philosophical Arguments*. Cambridge, MA: Harvard University Press.
Teller, P. (2004), "The Law-Idealization," *Philosophy of Science* 71: 730-741.
Torrance, T. (2005), *The Ground and Grammar of Theology*, Edinburgh: T&T Clark.
Wilson, M. (1990), "Law Along the Frontier: Differential Equations and Their Boundary Conditions," *PSA 1990, Vol. 2*, pp. 565-575.