Commentary on Hodgson's Target Article in JCS.

Hodgson aims to present a scientifically and philosophically respectable defense of the claim "that free will exists and is inconsistent with determinism." His argument depends upon an important claim made and defended in Hodgson (2002). That claim is that nature has two different kinds of processes: quantitative processes and qualitative processes. Quantitative processes are based on *mathematical descriptions*, and can be general. They can be deterministic and/or random, but can merely *constrain*: they may leave certain options open. Qualitative processes occur only under special conditions, and allow agents/subjects to grasp or feel whole gestalts, and make judgments that are influenced by these feelings. These judgments can influence *selections* that can choose between options left open by the quantitative process.

In the target article Hodgson elaborates upon his earlier argument by stating and defending nine propositions. The linchpin is Proposition 5, which asserts that "the subject makes an effective non-random selection between the available alternatives, based on these non-conclusive reasons, albeit not determined by rules or laws of nature."

Hodgson's arguments supporting Proposition 5 are, as Hodgson himself admits, "difficult." For example, Hodgson gives an argument based on evolution to support his contention that there is in the selection process an element "that is not accounted for by strict rules of any kind." He says "If choices were in fact determined by algorithms, such as evolution-selected computation-like procedures, which *as algorithms* need no help from conscious judgment, and could indeed be hindered by conscious interference, there could be no plausible explanation of why evolution selected in favor of brains that, at considerable expense in terms of complexity and energy-use, support conscious processes." However, this argument does not justify, or even support, the conclusion that the selection processes cannot be "accounted for by strict rules of any kind." What it is difficult to understand is how such a selection process could produce pertinent determinate actions or beliefs without any rules. On the other hand, this argument certainly does buttress the idea that the selection process needs to give real causal efficacy to our thoughts, ideas, and feelings *themselves*, in order for these *qualitative* feature of reality to have a non-redundant functional role in the unfolding of the world, and hence a reason to exist and to evolve.

Hodgson's thesis is incompatible with the truth of classical physics, in which all physical activity is fixed deterministically from initial conditions. Thus Hodgson appeals to quantum mechanics (QM). However, he creates unnecessary difficulties by asserting both that that the selection process is "inconsistent with determinism" and is "nonrandom," and that "according to QM, any determinism is mere randomness." This combination of claims means that he must reject not only classical physics but QM as well. However, the main problem with the idea of free will since the time of Isaac Newton has been its incompatibility with basic physical theory. Proposing a solution that conflicts with basic physical theory is *not* the scientifically respectable thing to do. However, there is no need to reject QM. Rather, the principles of QM provide a solid scientific foundation for the existence of Hodgson's two processes, provided the condition that the qualitative process not be governed by rules of any kind is rescinded.

Orthodox QM has *three* processes: the locally deterministic Schroedinger equation, the random "choice on the part of nature," and the process called Process **1** by von Neumann. This process **1** is absolutely essential, and it involves an element of "choice." It constitutes the major departure of QM from classical mechanics, *because it brings actions selected and performed by human agents directly into the fundamental structure of the theory.* The causal roots of these choices are not specified by the theory. Nor are there any statistical constraints on these choices. They are, explicitly, "Free Choices," not in the strong sense that the theory dogmatically asserts that they have no causal roots at all, but in the weak sense that contemporary orthodox QM treats them as *free parameters.* This official silence of contemporary QM on the causal roots of Process **1**, coupled with the fact that *in practice* the causal roots of each Process **1** selection involve a conscious decision by a conscious agent, makes the identification of Hodgson's qualitative process with von Neumann's Process **1** a plausible possibility.

Orthodox Copenhagen QM is formulated in a realistic and practical way. It is structured around the activities of human agents, who are considered able to freely elect to probe a system of interest in any one of many possible ways. Bohr emphasized the freedom of the experimenters in passages such as:

"The freedom of experimentation, presupposed in classical physics, is of course retained and corresponds to the free choice of experimental arrangement for which the mathematical structure of the quantum mechanical formalism offers the appropriate latitude." (Bohr, 1958: 73)

The fact that the causal roots of these “free choices” *are not specified by contemporary QM* stems from the fact that in the original Copenhagen formulation of quantum theory the human experimenter is considered to stand outside the system to which the quantum laws are applied. Those quantum laws are the only precise laws of nature recognized by that theory. Thus, according to the Copenhagen philosophy, *there are no presently known laws that govern the choices* made by the agent about how he or she will act upon the quantum system that he or she is probing.

The introduction of choices made by participating agents directly into the basic structure of the theory constitutes a profound change in the principles of physics. It is greatly celebrated and much discussed, and is epitomized in Niels Bohr’s dictum that “ in the great drama of existence we ourselves are both actors and spectators.” (Bohr, 1963: 15 & 1958: 81) The emphasis here is on “actors”: in classical physics the human agents were treated essentially as spectators. But orthodox Copenhagen QM is formulated only within the context of agents acting on systems and observing what happens. The choices made by the agents as to how they will act play an essential role in the extraction from the theory of predictions pertaining to the outcomes of observations, *and these “free choices” can strongly influence the course of physical events in the observed system.*

These “free choices” are normally experienced as being determined by a thought or idea, such as a desire to test some theory, or to determine some parameter. There is no rational reason, at this point, and no basis in contemporary physics, to doubt the very strong intuition that our thoughts, ideas, and feelings are part of the motive forces behind these “free choices.”

The second part of the tripartite quantum process is “causal.” It is specified by the Schroedinger equation of motion, and is locally and globally deterministic. Von Neumann calls this causal component Process **2**.

The third process in contemporary QM is ruled by “chance”. Dirac called this process a “choice on the part of nature.” It picks out, in way governed only by a statistical rule, a definite outcome of the probing action selected by Process **1.**

In orthodox Copenhagen QM the agent is taken to include not only his own physical body and stream of conscious experiences, but also his measuring devices. His actions and resulting observations – as represented within his stream of consciousness – are described in a language that allows him to communicate to colleagues what he has done and what he has learned.

The agent acts intentionally upon the system being probed in order to elicit an experiential feedback that can be recognized. The agent’s choice of action specifies a reduction of the state of the system being examined into two subsystems, one corresponding to the occurrence of the recognizable positive feedback, the other corresponding to the non-occurrence of that response. This theoretical structure allows the actions and feedbacks, described in terms of experiences residing in the stream of consciousness of the agent, to become correlated to physically described properties of the system being examined. That connection is the basis of science.

This Copenhagen formulation is pragmatically useful. But it is not suitable for analyzing the connection between the experiences of an agent and his physical brain. That is because the brain and body of the agent are, in the Copenhagen scheme, not parts of the physically described system. However, John von Neumann (1932/1955) formulated QM in a way that allows (the quantum counterparts of) all of the particles in the universe to be included in the physically described part of the theory, with only the streams of consciousness of agents being described in terms of the way we experience objects, intentions, and feelings.

In this von Neumann form of QM the brain of the agent becomes the system being examined by the experientially described agent. But the theory is still pragmatic in the sense that no commitment need be made about the ontological character of either the physically described system or the stream of consciousness. The physically described system is treated as an objectively existing system, even though it effectively represents knowledge, information, and tendencies for experiential mind-brain events to occur. Each event in a stream of consciousness is an experiential event that occurs in conjunction with a physical event in the brain of the experiencing agent. Whether this puts consciousness inside the brain of the agent (identity theory) or outside it (duality) need not be specified: science can proceed without an ontological commitment on this issue.

The original Copenhagen formulation considered science to be a human endeavor, and it accorded human beings a special place. Von Neumann's theory includes the Copenhagen theory within it, in the sense that von Neumann showed that *in the special cases where the Copenhagen human-based rules apply* the von Neumann formulation gives, for all practical purposes, the same predictions as the Copenhagen rules. However, the von Neumann form can, in principle, be applied also to cases where the agents are non-human. This allows one to begin to develop a theory of the evolution of consciousness. However, that entails developing a better understanding than we now possess about the special conditions under which Process **1** events occur. A first step in this development is to address these points by elaborating upon von Neumann's theory already for the case of human observers by breaking the silence of the theory on the causal roots of the Process **1** free choices. This can be done by introducing hypotheses, or new postulates, that equate von Neumann's Process **1** to Hodgson's qualitative process.

For person's accustomed to thinking of physics, and the laws of nature, in *classical* terms the idea of introducing fundamental dynamical rules based on experiential qualities may seem far fetched. If, following Isaac Newton, one considers the world to be made of "solid, massy, hard, impenetrable, movable particles" (Newton, 1721) that move in accordance with immutable deterministic laws that fix the entire course of history from initial conditions, then the idea that experiential qualities enter in a non-redundant and non-eliminable way into the flow of physical events may seem to be irrational wishful thinking. But quantum phenomena show the concepts of classical physics to be inconsistent with the observed behavior of the world. Copenhagen QM replaced that classical materialist conception of the physical world by an essentially "idea-like" structure. The physical state represented "our knowledge," rather than a material structure. Von Neumann's generalization of the Copenhagen version of QM features a physical world that, although treated as objectively existing, retains the features that had led Bohr, Heisenberg, & company to claim that the quantum state represented an idea-like reality rather that a material one. In view of this un-sought entry of idea-like qualities into the basic structure of the theory it is no longer irrational to suppose that idea-like qualities may play an basic role in the dynamics, particularly in connection with the essential Process **1** whose causal roots are not specified by the theory, but which *seems* to be influenced by our thoughts and feelings.

In von Neumann QM the state of the universe specifies propensities (probabilities) for events to occur. Each such event has a quantitative and a qualitative side. It is represented by a mind-brain event that, on the physical side, actualizes, as a unified whole, a spatially extended complex informational structure instantiated in the brain of the agent, and on the experiential side is a conscious experience that grasps as a gestalt a characteristic *quality* of that informational structure. Since these qualitative parts of reality enter into the events that tie our minds to our brains, it is not unreasonable to suppose that the qualitative elements enter also into the Process **1** that instigates these mind-brain events?

Of course, a priori reasonableness is not enough in science: a scientific theory must deliver some goods. Some consequences in psychology and neuroscience of pursuing this line are described in Stapp (2001, 2003), and are, in my judgment, encouraging.

Hodgson's final aim is to provide a scientifically respectable and rational theory of personal responsibility. It might be argued that making Process 1 deterministic undermines the concept of personal responsibility. Indeed, Hodgson's insistence that the qualitative process be both non-deterministic and non-random was meant to rescue the concept of personal responsibility from the argument that a person cannot be held responsible for any action that was already pre-determined before he or she was born, or was determined by random choices beyond his or her control. However, personal responsibility is rooted not in the *ultimate* causes of an agent's actions but in the *immediate* causes of those actions. It is rooted in the nature of the agent that selects and performs that action. It stems from the capacity of the agent to grasp and understand the consequences of its actions, and from its physical capacity to act in accordance with the freedom accorded to it by its inner nature, and in particular by the *qualitative process* that allows its action's to be controlled by sufficient willful effort (Stapp 2001, 2003). The personal responsibility of a human being arises from his or her nature as a human being: as an agent that is able to grasp and be moved by the meaning of the complex informational structures that have been instantiated in his or her brain by the sequence of mind-brain events whose mental sides constitute his or her stream of consciousness. It arises from his or her character as the thinking, reflecting, selecting and physically efficacious agent that deep intuition proclaims him or her to be, as contrasted to the essentially mindless automaton ruled by local mechanical process that nineteenth century philosophers, and even some twentieth century philosophers, mistakenly claimed him or her to be.

In view of these considerations I believe that Hodgson's arguments can be strengthened at a critical point by accepting quantum mechanics fully, and expanding it, and weakening the unnecessarily strong condition that the selection process cannot be "accounted for by strict rules of any kind."

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References.

Bohr, N. (1958). *Atomic Physics and Human Knowledge.* New York: Wiley.

Bohr, N. (1963). Essays 1958/1962 on *Atomic Physics and Human Knowledge.* New York: Wiley.

Newton, I. (1721). *Opticks*. 3rd ed. London: Printed for William and John Innys. p. 375/6.

Stapp, H (2001). "Quantum theory and the role of mind in nature." *Found. of Phys*. 11 1465-1499.

Stapp, H. (2003). "Neuroscience, atomic physics, and the human person" in *Mind, Matter, and Quantum Mechanics*, 2nd Ed. Berlin & New York: Springer. Ch 12.

Von Neumann, J. (1955/1932). *Mathematical Foundations of Quantum Mechanics.* Princeton: Princeton University Press. (Translated by Robert T. Beyer from the 1932 German original, Mathematiche Grundlagen der Quantummechanik. Berlin: J. Springer) Ch VI.