



Is Science Compatible With Free Will? (Part 1)

Quantum Physicist Speaks on Science, Freedom, and Faith

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Through the use of quantum experiments, the prejudice that exists against the possibility that spiritual principles such as God, angels, and the human soul govern the visible world can be overcome.

This according to Antoine Suarez, a Swiss quantum physicist, philosopher, and bioethicist, and editor of the recently published book: "Is Science Compatible with Free Will? Exploring Free Will and Consciousness in the Light of Quantum Physics and Neuroscience." The book is a compilation of papers that were first presented at a conference of the Social Trends Institute, which took place in Barcelona in October, 2010 and that Suarez was involved in organizing. The authors have updated their contributions, taking account of the conference discussions and the research of the last three years.

In an interview with ZENIT, Suarez, who is director of the Center for Quantum Philosophy in Zürich, and academic leader of the Bioethics program of the Social Trends Institute in Barcelona, New York, spoke about the aim of this book:

ZENIT: What motivated the conference, and the subsequent editing of the book: "Is Science Compatible with Free Will?"

Suarez: The book collects papers by authors coming from different disciplines (Quantum physics, Neuroscience, Economics, and Philosophy). The presented perspectives range from those focusing on the scientific background, to those highlighting rather more a philosophical analysis. However, all chapters share a common characteristic: they take current scientific observations and data as a basis from which to draw philosophical implications. The result is a stimulating interdisciplinary approach combining scientific strength and philosophical profundity.

My motivation to organize this conference and to edit the book was to discuss the idea that science today is compatible with phenomena governed by non-material principles like, for instance, free will and consciousness. This idea is supported by experiments demonstrating the so called quantum nonlocality, in particular two experiments I proposed in the years 1997 and 2010. These experiments have been realized in the lab of Quantum Optics at the University of Geneva by Nicolas Gisin and his Group, and the results have been published (2002, 2003, and 2012). The experiments confirm that quantum phenomena cannot be explained by invoking only material influences, that is, signals propagating in space-time. And what is more, the basic principles ruling the material world like the conservation of energy require a non-material coordination, otherwise they would not hold.

ZENIT: The title of the book asks whether science and free will are compatible. Could you explain for our readers why the compatibility between science and free will could be called into question? What is the argument that free will and science are not compatible? What argument could you make that they are?

Suarez: There are two main arguments against the compatibility of science and free will:

The first one regards the assumption that the laws of nature are deterministic. Already the philosopher Immanuel Kant remarked in his Critique of Pure Reason that "freedom is opposed to the natural law of cause and effect." My actions are governed by the dynamic of my brain, which is obviously part of nature:

If all what happens now in nature could be completely explained by what happened before, then all what I do would be actually predetermined since the Big Bang, and my free will would be an illusion.

Thus, if one keeps to free will, quantum indeterminism seems to be good news. Nonetheless, it is often objected that quantum indeterminism is entirely "random" (without any order or plan), and therefore is itself contrary to purposeful behavior, and hence incompatible with free will. However this is a prejudice and a misconception about the principles of quantum. This point is discussed in several contributions in the book edited by Peter Adams and myself.

The second argument against free will comes from neuroscience and has to do with the interpretation of experiments proposed by Benjamin Libet. In these experiments one measures the electroencephalogram of subjects who are asked to perform at will a wrist flexion. The readiness potential in the brain considered to be responsible for the movement sets on about 300 milliseconds before the time the subject says to have taken the decision to flex. The argument amounts to state that we are not responsible of our actions because when we are first aware of the wish or urge to act our brains have already unconsciously decided to act. This argument is also discussed in detail by different contributors in our book, in particular in light of the discovery of mirror-neurons. According to this fascinating result when I observe you flexing your wrist the neurons firing in my brain are the same that fire when I myself flex my wrist (even if at the moment I observe your movement I myself do not perform any movement). This result shows that activation of premotor and motor cortices cannot be considered a sufficient cause to make an actual movement, even in a case where the subject is supposed to perceive the action in a state of awareness. With even more reason, in the case of Libet's subjects who are supposed to lack awareness of the action they perform, the readiness potential lasting about 300 milliseconds until the subject is aware of his/her wish to flex should not be considered a sufficient cause for the flexing of the wrist the subjects perform. The readiness potential alone does not cause the flexing, but is only an unconscious causal preparation of the "conscious proximal decision" to flex: One could think that the fact that the flexing happens depends of the subject's "conscious proximal intention" not to voluntarily inhibit the flexing.

We reach the conclusion that Libet's experiments refute neither free will nor personal responsibility, but rather demonstrate that human consciousness and purposeful free will are limited.

In summary our book is one of the first books to discuss, at the same time, the implications of quantum physics, Libet's experiments and the neurophysiological finding of mirror neurons for free will, consciousness, and more in general for the possibility of non-material agency in our world.

ZENIT: You speak about the non-material character of free will -- outside of space and time. How is it possible to study something which is not material through scientific methods and theories?

Suarez: This is really a key question. The very characteristic of the quantum experiments is that they show correlated events that cannot be explained by any material link or signal propagating in space time. One can describe what happens in these experiments by means of a comparison: Suppose that physicist Bob in Geneva throws a fair coin and simultaneously his colleague Alice in New York throws another fair coin, and each of them register the results (head or tail). Bob's results in Geneva seem to build a pure random sequence: 50% heads, and 50% tails, and also Alice's results in New York seem to be random distributed. Then Alice and Bob meet together, and after comparing their results they observe the following astonishing fact: when Alice gets head, Bob gets head as well, and conversely, when Alice gets tail, Bob gets tail as well. That is, Alice's results and Bob's are perfectly correlated. Now on the one part we can exclude that there is a signal traveling from say Geneva to New York that carries encoded Bob's result and makes Alice's coin to produce the same result. The reason is that this would require a signal traveling at a velocity faster than the speed of light, and we know by relativity experiments (like Michelson-Morley, 1887), that all signals propagating in space-time cannot travel faster than light. On the other part we can exclude (by means of a mathematical theorem discovered by the physicist John Bell) that the coins were preprogrammed in advance to produce the same result. Consequently, the correlations cannot be explained neither by a direct link at the moment of throwing the coins nor by a common cause in the past, that is they cannot be explained by any information propagating in space-time.

The very basis of experimental science is that "correlations cry out for explanation" (like the famous physicist John Bell stated). However, the amazing thing is that the observed quantum correlations cannot be explained by any observable causal chain in space-time. Quantum correlations are a paramount example of an experimental result that cannot be explained by material influences. We can conclude that what is seen is not made out of what is visible ("visible from invisible", in accord with Hebrews 11:3). Thus, on the basis of the available observations, for reasons of consistency, we have to admit the existence of a non-material domain which is inaccessible to direct observation.

Actually your question refers to a mental barrier that plays an important part in today's crisis of Christian faith: the prejudice that it is impossible that spiritual principles like God, angels and the human soul govern the visible world. And as you see quantum experiments can help to overcome such a barrier.

[Part 2 of this interview will be published Thursday]

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