Raphael Neelamkavil

Causal Ubiquity in Quantum Physics

A Superluminal and Local-Causal Physical Ontology

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Preface

The present monograph attempts to overcome a one-century old opinion in some circles of Physics and Philosophy of Physics. This highly variegated tendency holds that generally Quantum Mechanics (QM), Special Theory of Relativity (STR) and particularly the experimental solutions of the Einstein-Podolsky-Rosen (EPR) paradox render some regions of the micro-world non-causal. I wonder how the other regions of the same world can remain causal and not really connected to these "non-causal" regions. Some scientists and thinkers take the "non-causal" regions of the QM world as non-committed ('acausal') to causal ubiquity. Some at various periods have gone to the extreme of saying that the ontological nature of things quantum-physical is variously "probability", "probabilistic causality", "randomness", "freedom", etc., which are ontologically much different from the Universal Law of Causality, which does not take care of these realities in its usual definitions.

Surprisingly, none of these scientists and thinkers endeavors to connect causation and non-causation in the matter-energy field of real physical existence or to show the structure of connection or lack of connection between them. Nor does any of them write off causation or non-causation from the scene rationally. The radical standpoint represented by the present work is to be understood as engendered by the mind-boggling paradoxes which the questions of non-causality and acausality in QM present to sciences of all description, in particular to scientific ontology and philosophy. Can one create a reasonably systematic ontology merely from epistemic-cognitive concepts like "probabilistic causality", "causal probability", "random causality" etc. without there being something processual that is called non-causal? What sort of a process then is the non-causal?

I use arguments and results from Philosophy of Physics, Metaphysics, QM and STR. The thrust is on contributing my own general ontological solutions to the problem of QM causality via reinterpretation of the EPR paradox, some stipulations in STR and many concepts in QM in general. For this purpose *I develop a somewhat broader notion of the Universal Law of Causality* for Physics and Philosophy – which I would claim to be realistically acceptable in QM too, if the essence of non-causality may be exposed as impossibly ontological and physical-ontological.

Accordingly, the following comment about the theme is in place. I draw from various results of micro- and macro-physics. This does not pose the threat of superficiality of treatment, because we deal not with all these disciplines in their entirety, but with a specific theme (realist causal ubiquity in QM) across these disciplines. The choice of the theme renders copious use of sources from the afore-said fields feasible. The extent of them used does not make the work unnecessarily technical for philosophers. Nevertheless, the work may as well be recommended for physicists interested in categorial foundational questions in physics. Chapters 9 to 12 deserve their special attention.

Given the personal origin of many reflections here, a few statements about them follow. (1) The basic QM arguments here took shape while I did Master in Philosophy, where I attempted to work out a set of systemic categories for a General Ontology and Scientific Ontology that (a) think beyond Physics, Cosmology and various contemporary Metaphysics, and (b) critique the foundations of Kant, Wittgenstein, Husserl, Heidegger, Whitehead, Quine, Gödel, Armstrong, analytical ontology and postmodern anti-metaphysics. (2) My critique of the criterial velocity in STR took shape as I did Bachelor in Philosophy, where I read enough on imaginary-valued superluminal velocities. In the present work I use these two directions of my critiques to develop an all-pervasively causal micro-physical ontology in view of later developing what I call 'General Gravitational Coalescence Cosmology' (see Bibliography). If I have not found in other authors such arguments as in the present work, I do not try and find out related ideas to make references to them in order to substantiate my reflections.

The main general-ontological and physical-ontological notions of causality are introduced in the initial chapters – beginning with a debate from the very introductory chapters on and around the Law of Causality. Then I proceed to concentrate on a spectrum of questions of concern to causality in QM as such. The concluding chapter ends with recapitulated final arguments in favour of causal ubiquity in the QM world. Clear distinction is made between the ontological Law of Causality that applies without conditions to all that exists, and specific laws of causality applicable to regions of reality with conditions specific to regionally discoverable causes and effects, where too the Law of Causality should hold without conditions. Discussion of the points of distinction between them is made to yield causal all-pervasiveness in QM, (1) provided something processually real (and not a miraculous "nothing") exists in the so-called "non-causal" moments in EPR entanglements, and (2) if real-valued superluminally local-causal propagations are allowable in STR. I have kept this line of arguments in mind throughout, and *have not presupposed, for the QM world, causal ubiquity*

as given by the Law of Causality, before detailing a sufficiently probable and solidly causal-ontological solution to the EPR paradox (Chapters 9 and 10).

I defend the freedom taken here to critically accept or general-ontologically evaluate the notions and theories discussed when I refer to authors from whom I humbly diverge or with whom I converge in philosophical opinion. Postponing such comments until we reach appropriate sections or chapters can burden us with hectic cross-references and disturb smooth presentation and understanding of the arguments. Moreover, as I cite a physicist or philosopher, I presuppose the state-of-the-art in QM and something of what we discuss later in detail. On the other hand, I give some of the causal preliminaries of the work in each chapter, wherever found apt, for completeness of the arguments, so that independent reading of the chapters does not go unprofitable. In this sense, later mentions of already discussed points may not be deemed repetitions. Some may find some sentences a bit too long and complex – this is my way of writing as I try to include various possible "questions and answers" together and be succinct.

I present my reflections as radically as possible, so a similar reaction may be aroused in the form of critiques. The hope is that the discussion is kept alive, and gets as broad in range as possible. Perusing this book, if the interested reader opines that I question the validity of the logical-positivistic mathematical instrumentalism and ontological validation of probabilistic causalism in QM, I shall feel rewarded. The radical attitude against partially non-causal physical ontology has at least this to aspire for. I welcome critiques by e-mail and promise to respond at the earliest possible occasion.

The present work has developed out of my Ph.D. work in Philosophy of Physics at Jñāna-Dīpa Vidyāpīṭh (JDV), Pune, India, under the guidance of Prof. Job Kozhamthadam, Professor Emeritus and former President of JDV. He is a physicist-turned-philosopher of science, a pioneer in various science-religion dialogue initiatives, visiting professor at many institutes, and the founding- and current Chief Editor of *Omega: Indian Journal of Science and Religion*. I thank him in appreciation of his erudite and empowering guidance, and for accepting two extracts from the thesis for two consecutive articles in *Omega* as the final requirement for obtaining the degree.

The distinguished Readers of the dissertation deserve my thanks: (1) Prof. Stephen Jayard, Professor in Philosophy of Science, a physicist-turned-philosopher at JDV, visiting professor at International Institute of Information Technology, Hyderabad, and Sogang University, Seoul. (2) Prof. Saju Chackalackal, Professor of Philosophy and President of Dharmārām Vidyā Kṣetram (DVK – my MPh *Alma Mater*), Bangalore, formerly Chief Editor of *Journal of*

Dharma, Director of the Indian Regional Programme of Globethics.net and visiting professor at many institutes. Critiques by both these Professors have improved the present work.

I wrote a three-part Ph.D. dissertation on "The Possibility of Causal Ubiquity in Quantum Physics, Cosmology and Scientific Ontology", and chose to defend only the first part, which is offered here in an elaborate shape to those *interested in the categorial foundations of Physics*.

I thank Dr. Benjamin Kloss, Leitender Lektor für Philosophie at Peter Lang GmbH, Berlin, for his personal interest in my work and for his friendship; and all at Peter Lang for their generous support.

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Raphael Neelamkavil
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