



Jácome (Jay) Armas (ed.): Review of “Conversations on Quantum Gravity”

Cambridge University Press, 2021

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Published online: 29 January 2022
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When I was a beginning graduate student in physics—and I assume many beginning grad students have a similar experience—there was a point when I realized that the answers to my questions were no longer to be found in textbooks. At the same time, my questions were not well enough formulated to be asked of my supervisor or even of the more accessible postdocs. Papers in journals were written in an inaccessible, formal and elliptic style, so their value as a pedagogical resource was greatly limited. I found, ultimately, that the best way to understand the ins and outs of my newly adopted research field was to listen to people talk, to listen to their informal conversations over coffee or beer, to see how people used certain terms, how they talked about the big open questions, how they judged other people’s work. It was, in a way, a return to early childhood learning, without systematics and definitions, learning by full immersion, replete with ambiguities, redundancies, and misunderstandings. Only after absorbing the general outlines of the field in this manner did a return to more structured learning become possible, as research articles appeared in a new light and I had absorbed enough of the jargon and way of thinking to ask answerable questions of my own.

Conversations on Quantum Gravity provides an introduction to its topic that rests on precisely this principle: the reader gets to eavesdrop on physicists talking about the current status and central problems of the search for a physical theory that unites quantum mechanics and general relativity (as a theory of gravitation) in one overarching framework. Of course, the 37 conversations presented here are not random snippets, but rather ideal specimens: one of the interlocutors is always an eminent authority, the other (Jay Armas, the book’s editor) is junior enough to essentially act as an interviewer, but experienced enough to ask pointed questions, follow leads, and keep the conversation going.

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This makes for high-quality and far-ranging conversations with authoritative assessments by scientists who have themselves shaped the field. And the selection of interviewees covers the whole field of quantum gravity with its manifold rivaling approaches; the table of contents is a veritable Who's Who: Jan Ambjørn, Nima Arkani-Hamed, Abhay Ashtekar, Jan de Boer, Steven Carlip, Robbert Dijkgraaf, Bianca Dittrich, Fay Dowker, Laurent Freidel, Steven Giddings, Rajesh Gopakumar, David Gross, Gerard't Hooft, Petr Hofava, Renate Loll, Juan Maldacena, Shiraz Minwalla, Hermann Nicolai, Roger Penrose, Joseph Polchinski, Alexander Polyakov, Martin Reuter, Carlo Rovelli, Nathan Seiberg, Ashoke Sen, Eva Silverstein, Lee Smolin, Rafael Sorkin, Andrew Strominger, Leonard Susskind, Thomas Thiemann, Cumrun Vafa, Erik Verlinde, Steven Weinberg, Frank Wilczek and Edward Witten. There are no glaring omissions and the editor shows admirable restraint in not privileging his own specialty, string theory—even though he could well have privileged it, given that it is still by far the dominant approach, at least on the level of papers written and researchers involved.

The ideal reader of this book is thus the young physics (or philosophy of physics) grad student who is thinking of doing research in quantum gravity and wants to get an impression of the lay of the land; it is hard to think of a better way of doing that than by perusing this book. But the book, quite naturally, also has all the drawbacks of learning by listening to conversations. Contextualization is minimal; the interviewees are introduced solely with their name and their job title. One generally gets a good feeling for the interviewees through the conversations, but to get an idea of why a given person was selected to be interviewed in the first place (or even to find out if they were still alive when the book was published), one has to go and look them up on Wikipedia. Oddities are not commented upon, such as the one-page interview with Ed Witten, which (for purely alphabetical reasons) forms a somewhat strange coda and primarily consists of Witten asserting that string theory is still the only game in town. So while in general the conversations the reader gets to listen in on are selected and tuned for excellence, they are still just conversations and—apart from (helpful) bibliographies for each interview—nothing is offered to enhance their pedagogical utility. There are some introductory remarks to be sure. But while the preface contains some interesting information on how the book came to be, the introduction itself is well-meaning, but hurried and ultimately not very useful.

For this reason, the book is really only of use to those seriously engaging (or planning to engage) with the physics of quantum gravity, who are happy to temporarily absorb jargon they don't (yet) understand and who are willing to follow the manifold leads to the scientific literature. The book may of course be interesting to those who already consider themselves experts in quantum gravity, though for every insight it offers, it offers an equal amount of frustration at the persistent lack of consensus and convergence in this research field. But it is hard to see this book being of much interest to somebody with a mere amateur's interest in the subject, as the conversations get technical very quickly. I take it there are some people who find contemporary fundamental physics fascinating because of its multi-dimensional quirkiness and mind-boggling technical complexity; but most people will be more interested in the basic questions it purports to tackle, concerning the ultimate structure of matter and even reality. And there is little explicit and accessible reflection

on such fundamental matters in the conversations, a fact that distinguishes this book from “Conversations on Consciousness” (edited by Susan Blackmore, Oxford University Press, 2006), which Armas acknowledges as an inspiration. One need only compare the interviews with Roger Penrose, who features in both books. The conversation on quantum gravity turns to technical points already on the second page, where Penrose describes a conflict between the superposition principle and curved spacetime, which I found quite hard to grasp in this condensed form; indeed, I found the conversation with him on consciousness the far easier read, even though physics is my area of expertise. This difference is in part due to the subject matter, in part a deliberate decision by Armas. There is nothing objectionable about this, but the book’s title might invite readers expecting breezy, conversational reading; they would be disappointed.

What about people who want to engage deeply with research on quantum gravity, but on a meta-level, such as historians or sociologists? The book certainly contains many interesting elements when viewed from this angle, but as raw material for historical and social-science research the interviews are somewhat flawed. In the back-cover blurbs (all of which are written by physicists who could well have been interviewed themselves), Astrid Eichhorn calls the book a „long-exposure photograph“, which is a fitting metaphor: the interviewees got to edit their original responses over the course of many years and these edits are not marked in the book. This makes the interviews less useful as historical documents than they could have been otherwise, especially given the fact that the 2010s may well be remembered as a critical turning point in the history of quantum gravity; not because of any decisive breakthroughs, but rather for the gradual rise of a feeling of crisis, due, e.g., to the lack of new discoveries at LHC. It would have been useful to see how physicists changed their attitudes over the years, rather than have them simply edit out their earlier, presumably more optimistic, statements.

In this review, I have focused entirely on the book’s utility: excellent for quantum gravity researchers, especially young ones, too technical for general readers, a problematic but unique resource for historians. I have not judged the quality of the opinions and explanations given by the interviewed physicists. All of the interviewees seriously engaged with the questions being asked and took their time to provide relevant answers; some are a bit arrogant, others emphasize their humility. To give a verdict on the quality of their assessments would be to pass judgement on the entire research field of quantum gravity as it presents itself in the year 2021; this fact might make the book harder to review, but it certainly underlines the comprehensiveness of this unusual volume.

Funding Open Access funding enabled and organized by Projekt DEAL.

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