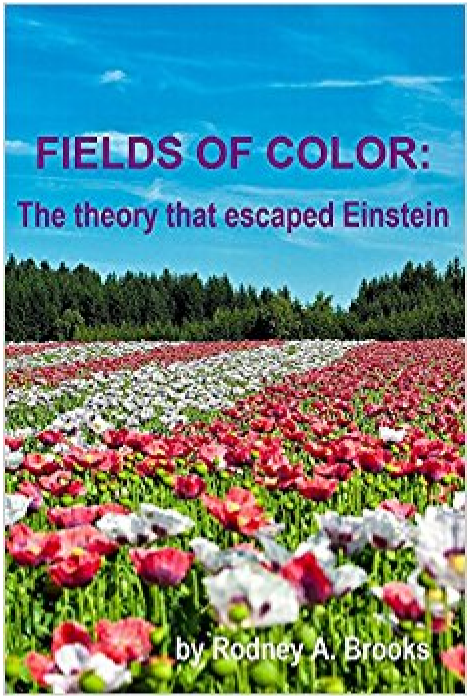
Fields Of Color: The Theory That Escaped Einstein



Synopsis

Fields of Color explains Quantum Field Theory to a lay audience without equations. It shows how this overlooked and misunderstood theory resolves the weirdness of Quantum Mechanics and the paradoxes of Relativity.

Book Information

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Customer Reviews

I now realize that from all the popular books on physics that I have read or skimmed, and there have been many, I have learned nothing! But your book I remember very well, and not only that but I feel that I finally understand relativity intuitively, as much as I possibly can for a layman (and, in a way, perhaps better than many physicists). You really have something to say, and what you say sticks to the ribs when the book is gone. --Arthur Schwartz, M.D.Although many books have been written about the interpretation of quantum physics, Rodney Brooks has written a book that finally gets it entirely right... Brooks presents the news about quantum field theory in a non-technical but accurate manner that will enlighten both the general public and the professional scientists. His explanatory technique of using different colors to represent different fields is a stroke of pedagogical genius. Anybody who wants to understand quantum physics should read this book. --Art Hobson, Ph.D., 2006 Milllikan Award winner and author of "Physics: Concepts and Connections"Applying Quantum Field Theory [to wave-particle duality] is shown to cause the 'paradox' to disappear. Further, Brooks' attack on Special Relativity based on the behavior of fields presents the reader with a more easily understandable picture... Despite the fact that Dr. Brooks has essentially rejected the use of mathematics throughout, there is plenty here for specialist and interested reader to ponder.
--Edward Finn, Ph.D., past Chairman of Physics at Georgetown University and co-author of the

textbook "Physics"

Rodney A. Brooks received a Ph.D. in physics from Harvard University where he learned Quantum Field Theory from its prime developer, Julian Schwinger. During a 25 year career at the National Institutes of Health he published 124 refereed articles. Among his accomplishments was the design and construction of the highest resolution PET scanner at the time. As an amateur clarinetist he founded and led a klezmer band called Shir Delite. After retiring in 1999 he moved to New Zealand where he founded "Kiwis for Balanced Reporting on the Middle East.&#34

First off, in common with every other book on QM, this book does not explain or resolve the paradoxes or mathematical inconsistencies of quantum theory. It does present a less common visual interpretation of the theory, following Schwinger's QFT, which is valid, and interesting. Also has a lot of interesting and entertaining footnotes.I would summarize the author's case as : "Field equations are the most intuitive and mathematically sound way of understanding physics." Most of the book is not about QFT, but about building this case. Mr. Brooks does this in an elementary and entertaining fashion. The author understands the subject, and does a good job of presenting his preferred way of viewing physics, which is: "fields are everything." The author was a student of the brilliant Julian Schwinger, who was the principle architect of QFT, and whom the author feels (perhaps rightly) has been overshadowed by more flamboyant (Feynman) or less mathematically rigorous (Feynman) physicists.As far as popular expositions of quantum fields, I would compare this book to Feynman's "QED: The Strange Theory of Light and Matter", which gives a nice intuitive description of the path integral approach to quantum fields, at about the same level.Both approaches are used by working physicists, as appropriate. Both approaches are mathematical tools for making predictions; neither is a key to understanding the nature of reality. Also note there are other formulations, or tools, in use.As far as 'paradoxes' and 'understanding quantum phenomena', in my opinion, the two above approaches are really about different mental models, and where to put the magic.Brooks/Schwinger - imagine a wave-function extending over space. Now the odds for an event occurring at a particular point can be calculated, but the event *happens* when the function magically and instantaneously collapses to that point, and disappears.Feynman - imagine a particle function which magically knows every possible path it could have traveled over a particular interval. The odds of the particle interacting or existing at a particular point are given by this function.Now, the mathematics in the two approaches is different, but equivalent, so what changes is the mental image that helps to facilitate the calculations. And it is always worthwhile to look at problems from different viewpoints.

As a physicist, I love this book. It is a great history book of Quantum Field Theory. I have been a 'particle' guy throughout my career, but with this gut instinct for a lack of substance, i.e. pure wave functions. QFT (my PhD was in the days of the dinosaurs) was not the push in those days, I was in the Feynman camp, and in my retirement I have been indulging myself in QFT. Most of the peer reviewed scientific literature is even by my standards complicated. Where this text will not get you doing QFT equations it has several pointers, especially on Brooks web site as a launching site for further research. I have written a few lay texts which I intend to incorporate QFT when I am comfortable I have a reasonable command of the subject beyond the basics I learned a quickly forgot in grad school. As Brooks himself points out, he states, 'I am not an expert in QFT.' Edward Witten (Theoretical Physicist, Princeton) describes QFT as "by far" the most difficult theory in modern physics ÃƒÂ¢Ã â ¬Ã â œ "so difficult that nobody fully believed it for 25 years." But this text has no equations, so breathe and read.

I have had a deep interest in QM for many years now and have studied quite a few books. My favourite is Ballentine - Quantum Mechanics - A Modern Development. But it is not for the lay reader, requiring considerable mathematical background. Normally I don't put much stock in books for the lay reader that usually confuse with populist, well to be blunt, rubbish such as observations require a conscious observer, particles going through both holes at once etc etc.This book however is different. QM is in fact an approximation to a deeper theory called Quantum Field Theory. Everything is simply much easier viewing it that way. No wave particle duality, particles going through two holes, yada, yada yada. As a field all these issues simply disappear. Only a couple of issues remain such as how the field becomes localised. This is the QFT version of the so called measurement problem, but without the usual metaphysical baggage.Read this book and forget the populist junk found in trash such as What The Bleep Do We Know Anway.

I have read about quantum physics off an on over the years hoping something eventually would sink in. Then I recently saw a YouTube clip of Sean Carroll coming clean on the wave/particle duality being resolved as waves acting as particles. This book provides a lucid description of how the wave/particle duality question is handled in quantum field theory, Along the way, the book highlights how theories persist in science after it is clear they don't add up. (Thomas Kuhn addressed this phenomenon in The Structure of Scientific Revolutions. Fittingly, he concluded that paradigm changes in scientific thinking advance in waves.) Along the way, Brooks also discusses the relationship between different types of particles that even bumble brains like me can follow.

Who would suspect that the title and image of flowers in a field hides a well written and fascinating glimpse of Quantum Field Theory for those who are missing years and years of intense study of the mathematics surrounding Hilbert Space and the hopeless complexities of partial differential equations? Back in the sixties I dabbled in quantum mechanics in graduate school and twisted my brains up in all the curiosities and bafflements of the Copenhagen Interpretation of particle/wave duality, superposition of states, and the collapse of the wave function. Dr. Brooks seems to have a way of looking at these weirdnesses (supported by the teachings of Julian Schwinger) to offer some hope that perhaps it's not all so impossible after all. If you Google "quantum fields" and read too far you will wish you had stopped at "Fields of Color" and let it go at that!

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