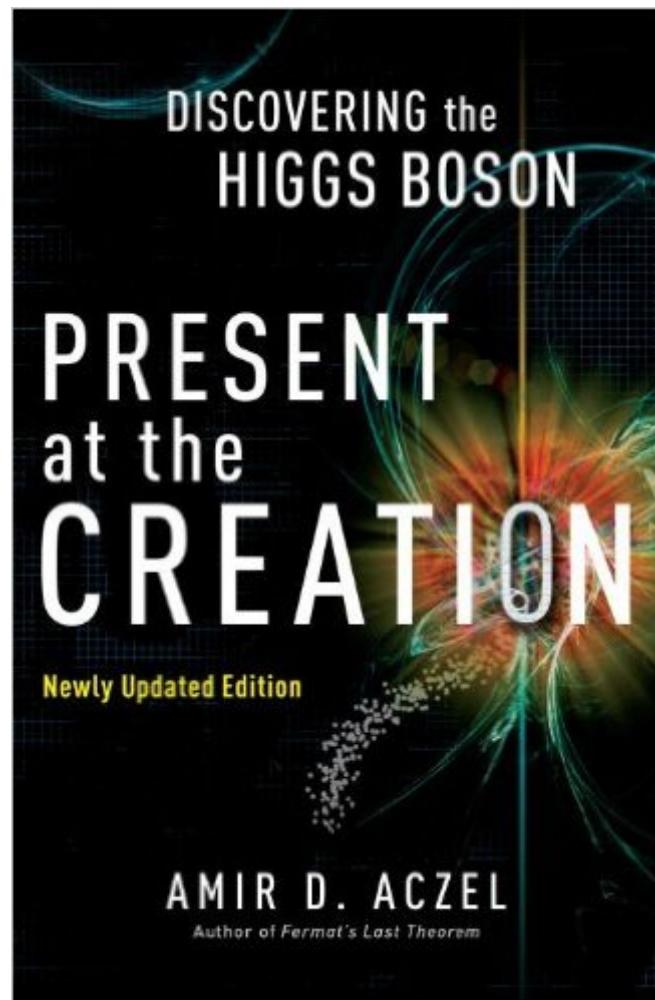


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# Present At The Creation: Discovering The Higgs Boson



## Synopsis

The Large Hadron Collider is the biggest, and by far the most powerful, machine ever built. A project of CERN, the European Organization for Nuclear Research, its audacious purpose is to re-create, in a 16.5-mile-long circular tunnel under the French-Swiss countryside, the immensely hot and dense conditions that existed some 13.7 billion years ago within the first trillionth of a second after the fiery birth of our universe. The collider is now crashing protons at record energy levels never created by scientists before, and it will reach even higher levels by 2013. Its superconducting magnets guide two beams of protons in opposite directions around the track. After accelerating the beams to 99.999991 percent of the speed of light, it collides the protons head-on, annihilating them in a flash of energy sufficient "in accordance with Einstein's elegant statement of mass-energy equivalence,  $E=mc^2$ " to coalesce into a shower of particles and phenomena that have not existed since the first moments of creation. Within the LHC's detectors, scientists hope to see empirical confirmation of key theories in physics and cosmology. In telling the story of what is perhaps the most anticipated experiment in the history of science, Amir D. Aczel takes us inside the control rooms at CERN at key moments when an international team of top researchers begins to discover whether this multibillion-euro investment will fulfill its spectacular promise. Through the eyes and words of the men and women who conceived and built CERN and the LHC "and with the same clarity and depth of knowledge he demonstrated in the bestselling Fermat's Last Theorem" Aczel enriches all of us with a firm grounding in the scientific concepts we will need to appreciate the discoveries that will almost certainly spring forth when the full power of this great machine is finally unleashed. Will the Higgs boson make its breathlessly awaited appearance, confirming at last the Standard Model of particles and their interactions that is among the great theoretical achievements of twentieth-century physics? Will the hidden dimensions posited by string theory be revealed? Will we at last identify the nature of the dark matter that makes up more than 90 percent of the cosmos? With *Present at the Creation*, written by one of today's finest popular interpreters of basic science, we can all follow the progress of an experiment that promises to greatly satisfy the curiosity of anyone who ever concurred with Einstein when he said, "I want to know God's thoughts" "the rest is details." •From the Hardcover edition.

## Book Information

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## **Customer Reviews**

The completion of repairs to CERN's new supercollider has resulted in a wealth of general science offerings devoted to the attempt to explain humanity's most expensive and complicated machine. It is quite clear that a number of publishers are hoping to ride an anticipated wave of publicity to great profit--if and when the Higgs boson is discovered. Having previously tackled several of the related books, I am pleased to say that this volume is one of Dr. Aczel's best efforts; it provides an excellent road map to the intricacies of the standard model--which I now understand a bit better than before--and provides both a more informative and more entertaining read than its competition. To be sure, this is no replacement for a text nor should anyone think of it in that light; rather, it is a story about discovery. To even begin to intelligently discuss the science that makes the supercollider relevant requires massive amounts of backstory. The reader must be introduced to fantastically complex theoretical musings and, I think some editor somewhere has dictated that no equations may be used, although a few of them crept into the appendix. Here is where Dr. Aczel's effort is superior. His recital of the basic underlying scientific principles has all the hallmarks of a capable lecturer--other authors in this area focus almost entirely on their unique and valuable contributions to the science in such a way that makes an understanding of the whole picture somewhat difficult, but this more general work is better able to convey the sense of wonder and shared discovery that motivates scientists to keep digging deeper into nature's inner workings.

A 3-star rating from means that I don't recommend a particular book, but I would not, in general, deter people from reading it. It also means that, in my opinion, if you don't get to this book on your reading list, then it is not a big deal; no loss. I want to formally begin by saying that, for those who do not like this book, this work is not really representative of the quality of Aczel's craft and ability. He really is a rare specimen of genius, in that his genius spills over from the world of mathematics and into the finer, more liberal arts, as attested to by his prose. In sum, Aczel could have done much better with this work. I think some issues in this book's construction were his fault, while many others were problems arising from the nature of the subject matter (i.e., the genre, popular physics), and the problem of being slightly out of his depth in subtler matters of the history of science (see the link to my blog post below). Some portions of this book are brilliantly composed, as one comes to expect from Aczel's works, like "Fermat's Last Theorem," for example. In other places, I could hardly figure out why Aczel was including a particular bit of information, such as talking about the world's largest tunnels in the world, of which the LHC's is not one of them. I see that he was trying to give the reader some amount of perspective, but I don't think the discussion was helpful (and that most would not find it helpful), and I seriously believe that it took away from the book; I felt like it was filler. In the first part of the book (the first 3 chapters, I think), Aczel bombards the reader with an endless series of numbers, some of which are helpful, but most just make the text a mess.

After reading *Massive* it was not a difficult task to pick up *Present at Creation* ("PAC") as there is some overlap in content, although *Massive* is primarily about the Higgs mechanism (Higgs field and Higgs boson). As the subtitle states, this book is primarily about the story of CERN and the LHC ("Large Hadron Collider"), which presently, and in the near future, is smashing accelerated proton streams at 99.9999964 % of the speed of light, and by using two separate beams containing approximately 7 trillion volts (7 TeV). This last achievement occurred on March 19, 2010. Despite these highlights and descriptions, this is probably the only issue one would have with the books contents--they are primarily descriptive without providing the prescriptive context in enable the reader to recall what they previously read. Another problem is that the book often repeats itself and is painfully descriptive for a popular level science book (e.g., chapters 8 through 10). There are many incredible facts one gleaned from the passages of the particle chapters--including color photographs and one of the best summaries on quarks I have read to date. Aside from these issues, PAC is fantastic at its storytelling goal. As the beams collide, there are four specific locations at CERN where pictures are taken at each of the four detectors named at the LHC: the ATLAS,

ALICE, CMS and the LHCb--each unit set up for a specific purpose in analyzing the collisions. The first chapter of PAC is to provide a lay of the land relating to CERN and the LHC. Moreover, besides a diagram showing the 8 points around the LHC that contain the different detectors, their placement and purpose, the remainder is to unpack the nature of LHC's quest, which is reiterated at the end chapter and appendix.

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