ANIL AGGRAWAL'S

Internet Journal of Book Reviews

A sister journal of AAIJFMT · Anil Aggrawal's Internet Journal of Forensic Medicine and Toxicology

VOL. 1, NO. 2 · JULY – DECEMBER 2002

Downloaded from www.anilaggrawal.com · ISSN 0972-9674 (Online) · https://www.anilaggrawal.com/br/vol_001_no_002/reviews/books/page002.html

Einstein's Brainchild: Relativity Made Relatively Easy!

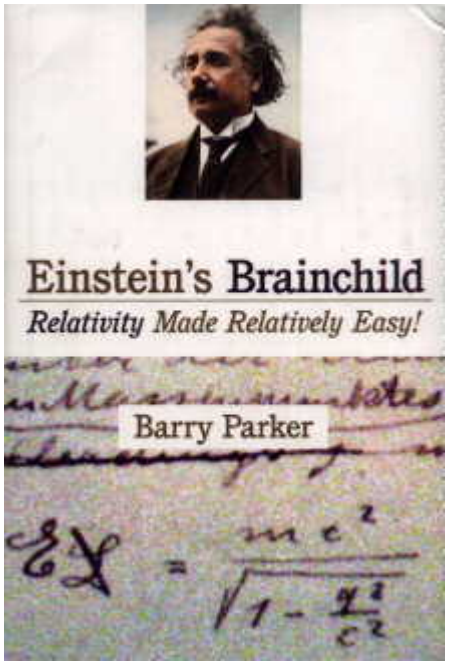
THE BOOK

Published 2000
Pages 300
ISBN-10 1-57392-857-7
Price $28.00

> *...NEWFANGLED PHYSICS ...This reviewer thoroughly enjoyed reading this book, and feels that it is destined to take the same place in history as One, Two, Three . . . Infinity by George Gamow and Relativity and the Layman by Sir James Jeans. Highly recommended to every person who wants to understand more sublime concepts of science in simple no-nonsense language...*

Einstein's Brainchild: Relativity Made Relatively Easy! *by* Barry Parker. Cloth Bound, 6" x 9". Prometheus Books, 59 John Glenn Drive, Amherst, New York 14228-2197, USA. or . Publication Date 2000. 300 pages, ISBN 1-57392-857-7. Price $28.00

Official site of this book: http://www.prometheusbooks.com/site/catalog/book_909.html



Barry Parker

Barry Parker, Ph.D. (Boise, ID), a professor of physics at Idaho State University from 1967 to 1997, is an award-winning science writer and the author of eleven highly acclaimed books in popular science, including *Search for a Supertheory* and *Alien Life: The Search for Extraterrestrials and Beyond*. For his interview done by this journal, please click here.

When Einstein propounded the special theory of relativity in 1905 - and ten years later his general theory in 1915 - only a handful of persons could understand it fully. Most persons found the theory somewhat surrealistic, what with rods foreshortening in the direction of travel, clocks going slower than usual, and the famous twin paradox predicting one of the twins ageing far slower than his other twin, if the former moved with a velocity nearing that of light and returned to meet the other after several years.

Theoretical physicists have traditionally found it difficult to convey these concepts to laymen in a convincing and clear manner, leaving the job to popular writers such as Isaac Asimov (1920-1992). However a handful of them have been able to do this exceedingly well, foremost among them being George Gamow (1904 - 1968), who has written the excellent multivolume "Mr. Tomkins" series (1939-67). This series started with *Mr. Tomkins in Wonderland* (1936). Mr. Tomkins lives in a wonderland, where the speeds of ordinary things such as buses and motor cars do not differ very much with that of light, creating a number of interesting paradoxes. I remember having read this book during my high school days, and it was this book, which drew me towards the new physics. Gamow followed this up with his other bestsellers such as *One, Two, Three . . . Infinity* (1947) and *The Creation of the Universe* (1952; rev. ed., 1961), in both of which he explains the Einstein's theory excellently. The English writer Sir James Jeans (1877 - 1946) has also written on relativity for the lay people.

The book under review is another excellent account of Einstein's relativity written by yet another theoretical physicist Barry Parker, who has worked as a professor of physics at the Idaho State University from 1967 to 1997. He has been able to explain most difficult concepts in a very simple and convincing manner. The three most important aspects of new physics, namely relativity, quantum mechanics and particle physics which defy and outrage common sense have been explained in this book. The book also explains how the new physics has been redefined as the study of relations between observers and events, rather than of the events themselves. The book explains that absolute space is a fiction; that what is observed, and therefore what happened, is not an absolute event, but merely a function of the observer's location and motion relative to other events. Well, what I am saying here might sound like repetition of what most writers have been saying over the years, and may even sound incomprehensible, but it is merely because I may not be as great a writer as Barry Parker. He explains these concepts very convincingly in this book.

The book is full of illustrative cartoons such as this. This one appearing on page 238 shows a physicist asking Albert Einstein which of the two institutes does he belong to (Institute of Reality or Institute of Non Reality). The chapter discusses such paradoxes as EPR Paradox (Einstein, Podolsky, Rosen Paradox), and Shrödinger's cat, which defy common sense. Einstein - who clearly believed he belonged to the Institute of Reality - believed that these paradoxes indicated that Quantum theory was still incomplete. It was only in 1983 that an experiment conducted at the University of Paris showed that Einstein was not correct!

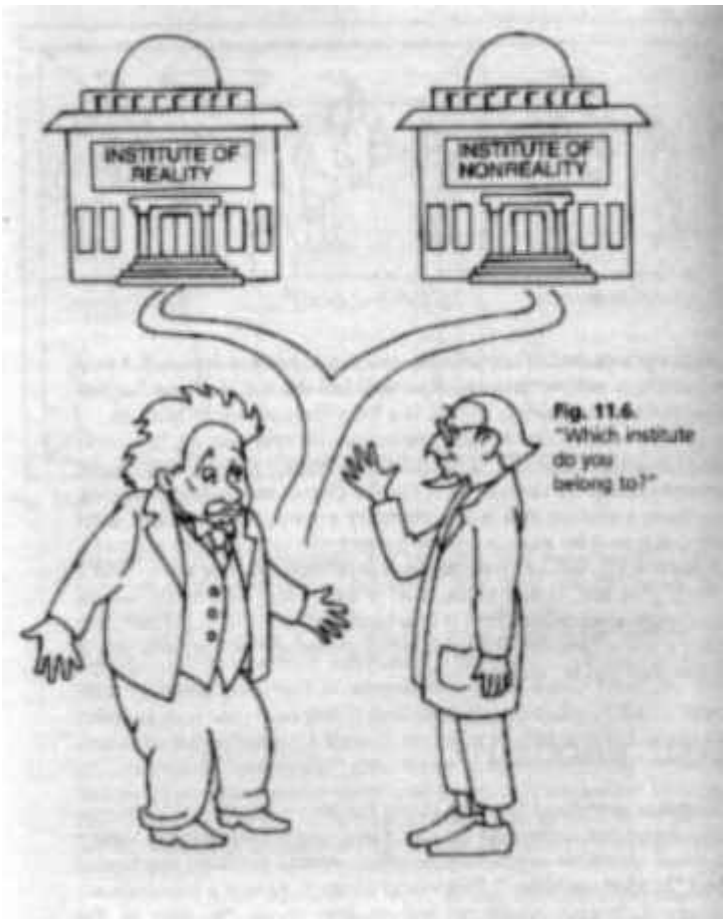


Fig. 11.6. "Which institute do you belong to?"

Parker backs up his highly impressive writing with a number of line diagrams, which appear on almost every page. There are a number of boxes which give interesting sidelights into the life and work of Einstein. The book ends with a very impressive glossary, which explains a number of terms in a dictionary like fashion. So if you don't know the meaning of terms like Cosmological constant, Great Attractor, Isotropic, Kerr Black Hole, Lagrangian Point and Photon sphere, all you have to do is to open the glossary section and you immediately get to see the meaning in clear language. For those who are wondering what these terms are, here are the meanings (taken verbatim from the glossary section of this book, page 257-267):

& Cosmological constant: Constant Einstein added to his equations of general relativity to stabilize the universe.

& Great Attractor: A huge accumulation of mass that has produced a measurable effect on the motion of the Local group of galaxies.

& Isotropic: The same in all directions.

& Kerr Black Hole: A spinning black hole.

& Lagrangian Point: Point between two bodies where their gravitational pull is equal.

& Photon Sphere: Surface around a black hole. Lies 1.5 times farther out than the event horizon.

Many of the terms appearing within the meanings may not be clear to the reader (e.g. the term "event horizon" appearing in the meaning of "photon sphere"). For these terms, the reader may want to refer further within the glossary section. This reviewer spent a number of hours reading the glossary section and found it exceedingly interesting.

Concepts within the chapters are explained very clearly. Parker starts with the childhood and youth of Einstein (chapter 1) and goes on to describe the famous Michelson-Morley experiment (chapter 2). This is the experiment where the two American physicists tried to detect the presence of ether by measuring the velocity of light in two directions - one in the direction of earth's motion through the universe, and the other against it. If ether existed - as the physics theories of the day predicted - then, there should have been interference bands, but nothing of the sort was detected. It was this experiment, which laid the foundations of Einstein's theory of Special relativity (chapter 3). Parker goes on to explain the Four-dimensional space time and time travel (chapter 4), General relativity (chapter 5) and Gravity and curved space-time (chapter 6). In chapter 7, he tells us how Einstein's theory was tested by the famous 1919 eclipse. The following extract from Chapter 7 would illustrate how easily Parker explains his concepts, mixing historical anecdotes with science. This is how Chapter 7 entitled "Testing the Theory" starts:

Excerpts:

Years before he finalized his general theory of relativity, Einstein was already thinking about how it could be tested. He soon realized that a beam of light passing near a massive body would be deflected by its gravity, or more properly, by its space curvature. The beam from a star would be ideal. There were always some stars near the limb of the sun; unfortunately the only time you could see them was during an eclipse. Einstein made the calculation: the stars would be displaced during an eclipse by .87 seconds of are (the angle between the original position of the star and its new position). He then talked to astronomers about the test, but no one seemed interested until he met a young Berlin astronomer by the name of Erwin Freundlich. Freundlich offered to organize an expedition to the next eclipse, which would be visible in Siberia in the summer of 1914.

Freundlich and several assistants left for Siberia about a month before the eclipse, and on August 1, 1914, while they were setting up their equipment, Germany declared war on Russia. Freundlich and his assistants were taken prisoner. Fortunately they were not detained for long. Germany had also taken prisoners and an exchange was soon arranged.

Einstein was disappointed, but ironically it was a lucky break for him. At this time, unknown to him, he was predicting the same displacement that Newton's theory gave. Years later, when he had completed his theory, he found that the displacement should be double .87, or 1.74. If Freundlich and his assistants had measured double his prediction, it likely would have gotten little attention.

EDDINGTON AND THE 1919 ECLIPSE

It would be another five years before anyone would try again to verify Einstein's prediction. Outside of Germany few knew anything about Einstein's theory. World War I was on and almost no scientific information was being exchanged between Germany and most of the rest of the world. One of the few

that had access to German journals was an astronomer in Holland by the name of Willem de Sitter. De Sitter became interested in Einstein's theory and passed details of it to scientists in England. Over the next few months he wrote several articles on it for the British journal of the Royal Astronomical Society, "Monthly Notices". Arthur Eddington, a professor of astronomy at Cambridge University and Director of the Cambridge Observatory, read the new theory with interest. He was, in fact, one of the few in England capable of understanding the mathematics of the theory. A child prodigy, he had distinguished himself at Cambridge by ranking first in mathematics. After studying the theory in detail he was so convinced of its validity he gave little thought to tests that might prove it. The theory was so elegant and beautiful it had to be right. But when the Astronomer Royal, Sir Frank Dyson, pointed out that the bending of starlight around the sun could be tested in an eclipse that would take place in May, 1919, Eddington was eager to help. The eclipse would, in fact, be an ideal one. It would take place near the Hyades cluster in the constellation of Hyades, which meant that a large number of stars would appear near the sun during the eclipse.

Dyson and Eddington made preparations for the eclipse expedition. Strangely, when they began, England was still at war with Germany. Few knew of the plans at this time. Testing a theory that a German had put forward would no doubt have been unpopular, but Eddington was a pacifist and Einstein was not actually a German (he was a Swiss citizen).

Two sites were chosen for the expedition: Principe Island in the Gulf of Guinea and Sobral in Brazil. Eddington was head of the expedition to Principe, A. C. D. Crommelin, the one to Sobral. Two months before the eclipse Eddington and his assistants set out for Principe, allowing plenty of time to set up and test their equipment. For several months Principe had been under a drought so there seemed to be little danger of clouds or rain. But when the day of the eclipse arrived, Eddington woke to rain pounding on his tent. He was devastated, but decided to make the best of it anyway. By midmorning the rain had stopped, but it was still cloudy. The eclipse would occur at midday. Even though all they could see was a bright disk through the dense clouds, preparations went ahead. To Eddington's delight as the eclipse began the clouds started to break up. He and his assistants began taking pictures. Their main interest was the stars around the disk of the sun, not the eclipse itself. The first ten plates showed no stars, but as they began the last six, there was a sudden break in the clouds and a few stars were visible. But it wasn't until the last plate that they got a good distribution of stars.

Eddington worried. Would it be enough? He was so anxious he began developing the plates the next evening and indeed in the last plates stars were visible. This region of the sky had been photographed back in England with the same telescope several months before they left and Eddington had brought the plates with him, so a comparison could be made. He realized that conditions were inadequate for a good measurement; nevertheless, he went ahead.

This reviewer thoroughly enjoyed reading this book, and feels that it is destined to take the same place in history as *One, Two, Three . . . Infinity* by George Gamow and *Relativity and the Layman* by Sir James Jeans. Highly recommended to every person who wants to understand more sublime concepts of science in simple no-nonsense language.

Order this Book by clicking here

Write an Email to Barry Parker by clicking here

Click here to visit Barry Parker's Home page.

-Editor-in-Chief