$E=mc^2$: A Biography of the World's Most Famous Equation

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E=mc². Just about everyone has at least heard of Albert Einstein's formulation of 1905, which came into the world as something of an afterthought. But far fewer can explain his insightful linkage of energy to mass. David Bodanis offers an easily grasped gloss on the equation. Mass, he writes, "is simply the ultimate type of condensed or concentrated energy," whereas energy "is what billows out as an alternate form of mass under the right circumstances."

Just what those circumstances are occupies much of Bodanis's book, which pays homage to Einstein and, just as important, to predecessors such as Maxwell, Faraday, and Lavoisier, who are not as well known as Einstein today. Balancing writerly energy and scholarly weight, Bodanis offers a primer in modern physics and cosmology, explaining that the universe today is an expression of mass that will, in some vastly distant future, one day slide back to the energy side of the equation, replacing the "dominion of matter" with "a great stillness"--a vision that is at once lovely and profoundly frightening.

Without sliding into easy psychobiography, Bodanis explores other circumstances as well; namely, Einstein's background and character, which combined with a sterling intelligence to afford him an idiosyncratic view of the way things work--a view that would change the world. --*Gregory McNamee*

E=mc²: A Biography of the World's Most Famous Equation Details

Date	:	Published October 1st 2000 by Berkley Trade (first published 2000)
ISBN	:	9780425181645
Author	:	David Bodanis
Format	:	Paperback 337 pages
Genre	:	Science, Nonfiction, History, Physics, Biography, Popular Science

From Reader Review E=mc²: A Biography of the World's Most Famous Equation for online ebook

Hari Kumar says

To be honest, this book was good, but not as I expected, that it would be awesome; as I was longing to lay my hands on this books for nearly an year until I found this in my usual bookstore.
And this is truly an amazing biography of the Equation, of which Dr.Einstein would have had only a moderate knowledge.
This book is a collection of stories of different thinkers, from the medieval period to the detonations of nuclear bombs, and how they happened to do it, from our history books. Many of which I had much more insight than what's in the book. This book contains a far little and juvenile scientific approach, which 'might' annoy certain people with a profound knowledge in Physics. But it also gave me many amazing details of certain discoveries.

Dan says

I like science books so was eager to read E=mc2. This brief book follows the evolution of the equation E=mc2 from the germ of an idea that began in Einstein’s mind to the construction of the Atomic Bomb. Later on in the book the equation is used to explain such things as the scientific creation of earth, where stardust comes from and then on to black holes.

One drawback to the scope here is that the book unintentionally reads like a series of articles. Covering this much scientific ground is hard to get right in a 200 page book. So some of the threads felt like teasers leaving me with wanting to know more.

One sizable portion of the book was especially interesting. Perhaps one of the best reads that I have found describing the Nazi efforts to build the A-bomb and the Allied attempts to disrupt it. The book detailed the efforts of Heisenberg and the story of the British and Norwegian’s successive attempts to blow up the Nazi’s heavy water supplies.

In another case I thought the vignette of Hoyle’s use of E=mc2 to derive the origins of star dust from supernovas was excellent.

Where this book suffers is that the author is not a great storyteller and there are very few quotes in the book.

There is also no math on the book beyond the profound equation itself which was disappointing. In fact I learned in my relativistic physics class more than 20 years ago that E=mc2 is not technically the correct equation. Rather it is a shortened equation. Of course the gist is valid but it would have been nice to see a little more consideration here given to the origins of the equation.

I give this book 3.5 stars, rounding up to 4 stars because the subject matter is interesting and the book is pretty short.

For better books that cover the history of the A-bomb, although lengthy, I would recommend two that each won Pulitzer prizes. The first being Kai Bird’s American Prometheus: The Tragedy and Triumph of J. Robert

Oppenheimer and Rhodes book on The Making of the Atomic Bomb.

Greg says

A customer at work:

"This title is so stupid, who knows that this would even mean, 'e equals mc two. How the hell am I supposed to know what this book is even about?"

Philip Mills says

This book is well written and the information is presented in an easily understandable manner. It felt like a kindly uncle was explaining physics to his not so bright nephew. I enjoyed it a great deal and felt I achieved a better understanding of the complex equation.

Gendou says

This book is not what's advertised. It's mostly (counting pages) about the building of the first nuclear bomb. If you're into war history, you may like this book. If you want to learn about the equation E=mc^2, try reading a real science book. Which this is not.

The author writes like an outsider looking in. I didn't feel like he had a firm grasp of the physics. He uses really poor analogies to try and describe the physics to the layperson instead of just explaining the physics like it is. Such half-wrong analogies are worse than useless because it later takes time to cure the lay reader of the resulting misconceptions. Why plant them in the first place?

The book even ends on an anti-intellectual tone, where it's claimed Einstein was a "profit" bringing down knowledge from "on high". This is the absolute opposite of the truth. Physics is accessible to anyone who is interested enough to spend the time and energy it takes to learn.

The author's apparent lack of expertise is also on display in the many subtle mistakes in the book. For example, he says that GPS satellites need a "relativistic fix" because the satellites are "traveling so fast". Sure, there's a 7 microsecond delay due to special relativity from their twice daily orbit around the Earth. But that's ignoring the larger, 45 microsecond delay due to general relativity from the Earth's gravity well! (source)

I would go so far as to say this book contains "scientism". I hate that word and it's almost exclusively used inaccurately by Creationists. But it happens to fit what this book has in it. It's claimed, over and over again, that the bombs dropped on Japan were somehow due to the equation. Which they weren't. The discoveries of radioactivity and the theory behind radioactive criticality had nothing to do with the equation. That equation explains where the energy comes from in terms of a conservation law (mass/energy). But it's ridiculous to say the equation "allowed", "enabled", or "caused" nuclear bombs to detonate over Hiroshima and Nagasaki. Since it's the thesis of the book, this poor philosophy is repeated throughout the book. Each time I read that the equation "made" something possible, or that something happened as "a result of" the equation, I wanted

to stab out my eyes with an ice pick.

Jimmy says

A very entertaining read. The book is about some of the people and discoveries that made it possible for Einstein to come up with his famous equation. Then it discusses some of the ramifications of his famous formula. I thoroughly enjoyed it.

Darin says

It may not seem strange that I include a history book in my top 20...until you consider that the history book is not about a person--or a civilization--or an era. It is about an equation. E=mc2.

There are lots of biographies of Einstein, and I think the best may have just been published(I am currently reading "Einstein: His Life and Universe" by Walter Isaacson.)

But rather than write about the professor, Bodanis discusses each of the five elements of the equation. He also talks about the people and mini-dramas of science that led to the famous discovery in 1905. It is easy on science and numbers--which is fine for me. The hard-core readers can find number-crunching equations on the book's website. It is bursting with stories that are seldom heard in the textbooks--making it easy and fun read.

While I don't agree with some of his conclusions in later chapters, he does make you think.

I recommend this to any of my friends with the slightest bit of interest in physics.

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rabbitprincess says

* * * 1/2

How does one write the "biography" of an equation? Sure, it's "born" whenever the person invents it, but equations can't exactly grow up, marry and die, at least not in the way living things can. David Bodanis's approach to biography is to first explain each part of the equation (E, =, m, c2) and the scientific developments that led to these elements being used in common scientific parlance, and then to trace the history of the whole equation, from when Einstein first developed it to how the universe will eventually end, in keeping with the principles of the equation.

This was a very satisfactory book. I learned a lot about some of the early French scientists, like Lavoisier, Emilie du Châtelet (who was great! people need to know about her) and Henri Poincaré, as well as some other unsung female scientists such as Cecilia Payne, whose sexist thesis advisor made me want to go back in time and smack him. There was even a WW2 commando raid! I love when those show up in unexpected places in my reading. In this case it was on a heavy water plant in Norway, which was part of the Germans'

effort to build an atom bomb.

From a scientific standpoint, the most memorable chapters were the one where Bodanis explains in subatomic detail exactly how the bomb dropped on Hiroshima wrought its horrific damage, and the one where he explains how the universe will end. The latter is probably not the best thing to read right before bed, because it's kind of depressing.

So the question is, how much scientific background do you need to appreciate this book? Well, there is a certain amount of detail when he explains the physics behind the equation, but overall I'd say if you were fine with the physics/Big Bang part of Bill Bryson's A Short History of Nearly Everything, this would be a good follow-up.

Anna says

Εξαιρετικ? βιβλ?ο με κ?θε κεφ?λαιο να αποτελε? ?να διαφορετικ? κεφ?λαιο της ιστορ?ας της φυσικ?ς, με κοιν? ?ξονα ?τι ?λα σχετ?ζονται με την περιβ?ητη εξ?σωση του τ?τλου!

Πολ? ?ξυπνη ιδ?α, και δεν περιλαμβ?νει καθ?λου μαθηματικ? και σ?νθετες περιγραφ?ς, εξ?λλου ο συγγραφ?ας ε?ναι δημοσιογρ?φος, που ?χει κ?νει επισταμ?νη ?ρευνα. Ο τρ?πος ?κφρασ?ς του ε?ναι σωστ?ς - για ?σους ε?στε επιστ?μονες και ψ?χνετε προβλ?ματα - και αποτελε? μια πολ? καλ? πρ?ταση για ?σους ενδιαφ?ρονται για τα επιστημονικ? ζητ?ματα.

Bonus: ?σοι ενδιαφ?ρεστε για το 2ο Παγκ?σμιο Π?λεμο, η ιστορ?α της πυρηνικ?ς β?μβας νομ?ζω ?τι ε?ναι ?να απ? τα πιο ενδιαφ?ροντα κομμ?τια του, με τη στρατηγικ? εκατ?ρωθεν να δ?νει και να πα?ρνει.

Care says

Quick Version:

This book is a well laid out explanation of each part of the equation, its history, and its role in our universe.

Long Version:

The genesis of David Bodanis' book was an interview he read in which actress Cameron Diaz expressed the desire-serious or in jest-to know what $E=mc^2$ really meant. Bodanis realized that the truth is that very few people have even a rudimentary knowledge of the usefulness of the world's most famous equation; this book is his attempt to rectify that.

The format chosen is an interesting one. Those who are true novices to physics-or lack interest in pursuing the equation beyond the basics-can read the front half of the book and walk away far more knowledgeable than they were when they picked it up. After a brief introduction to the time and place in which Einstein generated the paper which introduce the theory to the scientific world, Bodanis goes on to break down the equation and discuss each of its parts separately. What do they mean, and how do they interact with each

other? The reader is then led on a quick trip through history with regards to how the scientific community used the theory-the race to be the first to build “The Bomb” during World War II. Finally, the author discusses the theory in our universe. Those not interested in a brain drain of a read would still likely read the Epilogue, which discusses what else Einstein did, and the interesting appendix, which gives closure regarding the other key participants.

Of particular interest with regards to the structure of the book are the notes. If you would like to know more details (and are not afraid of either the odd equation or in depth descriptions), Bodanis suggests that you read the notes, where he has taken things a bit further. It is here that I have a bone to pick. The format that was chosen was that of endnotes, as opposed to footnotes. When endnotes are used, there is absolutely no indication within the text that there is a back of the book furtherance of the topic-two members of our book club did not even realize they were there and thus missed the opportunity to add to their reading experience. For those readers that do choose to read the endnotes concurrent with the front half of the book, you are left constantly flipping between the text and the notes to see if you have reached the next note (they are listed by page number). This is extremely disruptive to the flow of a book which requires some level of concentration to read and annoyed me to no end. Footnotes within the text would have been grand. As a side note, a member of our group tried to read the e-reader version. Footnotes would have enabled her to flip from text to notes with ease. As it was, she quickly gave up on trying to maneuver between the two.

The final section, a guide to further reading, is one of the finest source guides I have ever seen. Books are divided into categories and are each given a paragraph of explanation designed to help the reader ascertain if they are a good fit for their reading list.

Bodanis tops off his two leveled read with one final feat-he has a website to which he directs the serious student for further, more in depth, study. Whether you are interested in a basic explanation of a complicated theory, have a fascination with physics and would like to know more, or would like to go beyond your high school physics knowledge, this book is likely to fit your need.

Tonjo Wouters says

Heel leuk. Is ook in Nederlands. Makkelijk leesbaar, begrijpelijk. 384 blz in drie dagen uit!

Mark says

This is not a bad read, but it has some major flaws.

For one, this book is aimed at kindergartners.

Fay Weldon, in an ebullient blurb, claims that by reading this book she achieved an understanding of Einstein’s theory of relativity “by osmosis”. I’m afraid my brain does not work that way. For me, insight is based on facts, concepts and reasoning. And some concepts are not easy, and some sophisticated reasoning is sometimes necessary to "get" a difficult theory. In principle, even very hard concepts can be explained in simple terms, but it takes a very talented and patient author to do this well.

Mr Bodanis does not rise to the challenge. He aims his book squarely at readers who have no mathematics,

no physics and no chemistry whatsoever, and who are not expecting to pick up any here. For instance, he patiently explains the concept of squaring: four squared is not eight but, don't be surprised, sixteen. Any concept more difficult than this he is afraid to tackle, so most of what we get are broad generalizations, egregious simplifications, rough approximations, not-very-apt similes and repetitions.

On page 50, the author suddenly asserts "*That's why it's speed can be an upper limit*" [he's talking about the speed of light here] and a few pages further on "*That's what explains 'c' in the equation*" [light again]. Alas, nothing in the preceding paragraphs or pages warrants these bold statements: we know the speed of light IS an upper limit, but WHY that is so not even the most intelligent and dedicated reader will have fathomed, there simply not being enough explanatory power applied here.

Another thing I find grating in a science book is that Bodanis loves to talk about God whenever given half a chance.

He comes up with a highly original take on Michael Farraday's work on magnetism : it was inspired by his Sandemanian religious beliefs. Scientists are used to think in straight lines, Bodanis posits, but in church the circle is more important: "I will help you, and you will help the next person, and that person will help another, and so on until the circle is complete". So that's why Michael went looking for circular lines around his magnets, duh! Somehow I am not surprised no historian of science ever thought of this before.

And while Bodanis does not discuss Einstein's religious beliefs explicitly, he disingenuously suggests that the latter was a believer. Twice he mentions that The Wild Haired One referred to God as "The Old One", and he ends his book with a sentence strongly suggesting Einstein was a theist (*…the divine library that he was convinced awaited…*). In fact, though he disliked the label "atheist" and on occasion flirted with pantheism, Einstein called a belief in a personal god "childlike" and often defined himself as an agnostic.

If you made it this far down my review, you earned this confession: I only scored this book two stars to mark my displeasure with the overblown blurb on the cover, and the overly generous score on Goodreads. In fairness, this merits three stars.

There are some good stories here, competently told. The author gives pride of place to female scientists whose contributions were at one time underappreciated, which is laudable of course. And the voluminous notes at the end of the book partly offset my criticism about egregious simplification.

So if you find this in a yard sale, go ahead, spend a few cents, it is worth a read. But it has some major flaws. (Da capo)

Riku Sayuj says

A very well constructed story. Turned out to be of less scientific insight than I had hoped but was full of delightful historical factoids. Full review to follow.

VijayaRaghavan S N says

We all have heard of the phrase "match made in heaven". But we limit its use mainly to couples. That very

same phrase is applicable for this book too. Yes... Mr. Bodanis made a match out of 'History' and 'Science'.

History has always been a constant thorn in my life. There isn't any other subject that I have hated more than History (Civics is not too far away in the second spot). But I was relieved from the daily nightmares of History classes once I passed my secondary education. Phewww.... sigh of relief. Right? No... Then came another headache in the form of Physics in my junior college. I could say I have spent a considerable chunk of time on deciding which subject I hated most. Physics or History? I am still searching for an answer.

And then, years later (7 years to be precise), came a normal day in my PG course (a week or so back). My professor (who also happens to be my mentor) walked into the classroom and started talking about his struggles and how he hated thermodynamics and then the topic took a turn on to his PhD thesis. One thing lead to another which lead him to asking all of us if we have read the book E=mc2. Of the 13 students in my class, I can say I would be among the precious few who read books (mostly fiction, but a book is a book). No one raised their hands (not at all a surprise). Then he pointed at a few of us and made us sweat in shame by asking if we have ever gone through his library collection (which, btw, can be accessed by anyone of his students). I am not new to being shamed in class (for the right or the wrong reasons). But this hit me where it was supposed to hit not because he opened my eyes on how precious little I have read. But because there was a person of interest (for me) in the class and being mocked in front of that person was a dent in the mischievous plan that I am weaving. And that's how I took this book from his library at the very next week.

Going by the cover I was taken back to my nightmares during secondary education and junior college. History and Science? That too together? Double nightmare time. But I still wanted to see what was so special about this. I read one page...Hmm...Interesting. Read the second page...Hmm...looks good. Then I kept on reading and turning pages. Before long I read half of the book. I didn't want to finish the book in a day. So I kept it aside and did ration reading (a phrase coined by me which means reading only a particular number of pages per day). I finished it within three days and I was left wondering why the author had to bring the book to an end.

The word 'Biography' is truly made meaningful in this book. This books gives a detailed account on the birth, ancestry and adulthood of the equation. Are you wondering what BS am I talking? Why don't you find it out for yourself?

Another book which blended History with science was 'Cosmos'. But that dealt with astrophysics mainly. And that branch of physics is something that I wish that I majored in. So, even if the book would have been a drab (which is far from the truth) I would still have enjoyed it. That makes this one all the more spectacular. Bringing two different areas, which I hate from head till toe, together.

The only science book that I have read so far which didn't have any pictures and yet made sense to me what the author was saying. The way of writing followed in this book by linking scientists and different timelines together is something of a marvel.

P.S. I have to thank Cameroon Diaz from the bottom of my heart. Once you read the first paragraph from the book, you would understand why.

Jamie says

I'm not quite sure why I keep going back to these history of science books, but I enjoy them. E=mc2: A

Biography of the World's Most Famous Equation is pretty much what it says. But if you're looking for just another Albert Einstein biography, author David Bodanis is mostly going to disappoint you here. It's more like a biography of the eponymous equation, examining each term (heck, even the equal sign) in great detail and giving a thorough accounts of the history of each piece and the impact it has had on modern living.

The book strikes just the right balance between physics lessons (don't worry, there's no math) and explaining the scientific achievements leading up to and following in the wake of the equation's discovery. I'm hard pressed to think of a subject that would include French aristocrats getting beheaded over the construction of a wall, Madam Curie's radioactive cookbooks, high-brow academic bickering, and detailed discussions of how make uranium atoms asplode real good. My favorite part was something that actually sounds more like the final level in some World War II video game than a physics textbook: a small group of Norwegian commandos (actually mostly former plumbers and machinists) creeping into a heavy water factory in order to sabotage it and derail the Nazis' 1942 atomic weapon program.

It's all very thorough and very readable and I had no idea that there was so much that went into and came out of the fact that mass and energy are the same thing in two different forms. The end of the book even looks forward billions of years to show how the equation predicts the Earth will end (in flames as the Sun gives one final cosmic belch) and how the universe itself will eventually sputter to a stop. But don't worry, you'll be long dead.

Joseph says

I should state that I am not the sort of reader this author had in mind when he wrote this book. He cites actress Cameron Diaz saying that she would like to know what E=mc2 means. So not written for a PhD engineer. Still . . .

It should be possible to write a book that explains the science without simplifying to the point of misleading.

Without focusing on a small number of historical persons and giving them credit for advances that were not theirs

Without making some seem more like mystics than scientists or intellectuals.

Susan from MD says

The book is definitely for non-physicists and it takes a new approach to describing the equation, the Theory of Relativity (General and Special), and how the equation is applied. The first section takes each of the components of the equation and gives a brief history, often by way of a scientist who worked on that particular component. The next sections follow the "life" of the equation from its early days through current applications - from discussions of space-time to the atomic bomb to black holes to a mention of the unifying theory.

Having read several books on similar topics, I found this to be a fun and interesting approach. Given that it focuses on the people as well as the equation, and does not get to into the tech-y aspects of the physics and math behind the equation, it has more of a gossipy quality to it. Now, if you are looking for a "popular" book

on physics that really gets into describing complex things for the (somewhat informed) masses, this book may not be for you. But, it you would like something that takes a light-hearted approach to how the universe works, give it a try.

(view spoiler)

Rohan says

It looks like I cannot get enough of Historical Science books. This is yet another book that surprised me. In this book, the Author presents History and the impact of Einstein's famous equation. He initially tries to give a decent historical account of how the equation came about.

The book has its downsides. I really felt the equation could have been explained in much more exciting way than the Author did. But, I did like the fact that the Author focused in great detail about making of the Atomic Bomb (The Manhattan Project) and its destructive force that led to the surrender of Japan. Even though I was aware of most of the things described in this book from some of the other books I have read before, I still enjoyed going over them again thoroughly. Definitely a good read.

Iwan says

Het leukste populair wetenschappelijke boeken dat ik ken. Ik las de vertaling een jaar of tien geleden maar krijg weer zin om het te herlezen. Dat komt vooral door het intro:
'Een tijdje terug las ik in het tijdschrift Première een interview met de actrice Cameron Diaz, waarbij de interviewer aan het eind vroeg of er nog iets was dat zij graag zou willen weten. 'Ja', zei Diaz. 'Wat betekent eigenlijk E = mc2?'

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the gift says

unique take on the memorable equation. do not know why some of the various stories seemed familiar, but then i do read a bit, i am interested in science, in cosmology, even if it is not like my math is good enough. easy read by focusing on biographical elements of each part of the equation, including some names i had heard before- du chatelet, voltaire, maxwell, hoyle etc- and some new, women mostly, who had been written out of scientific history. long sections to the end, future reading, notes, further adventures of this and that person or idea…

i was really enjoying this, thinking i understood, when my father said he felt he same until he noticed something wrong- or wrongly put- and this confused me, engaged me to wonder what it was, because… he could not remember what it was. i have to take father’s word for it. he is retired university prof in theoretical chemistry. he said he would get back to me next week, and that yes it is a good book anyway. sigh…

dad said it is missing the equation of the Lorentz Transformation, oh well. feel much better. stupid, but better.

review continues: http://www.michaelkamakana.com/favour...