

Did Einstein Write *The Evolution of Physics*?

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Abstract

There are those who argue that Albert Einstein did not really write the book *The Evolution of Physics*, which is officially credited to both Einstein and Leopold Infeld. I argue that 1) Einstein was the principal author of the book, and 2) that the meat of the text came from Einstein's many essays and books which he had written prior to the publication of this book.

1 Introduction

The book *The Evolution of Physics* was written by Einstein and Infeld and published in 1938 by Cambridge University Press. It was a popular presentation of the historical development of physics over the previous few centuries, taking particular notice of relativity and quantum mechanics, and how those theories departed from the earlier conceptual prejudices of Newtonian mechanics.

Note: All following quotes are from *The Evolution of Physics*, unless stated otherwise.

The story for the origin of the book varies depending on whom one asks. This is my take on it: Einstein wanted to help Infeld financially; so, Infeld pitched the idea of a cooperative authorship of a popular book on physics, which they could co-write. Apparently, Einstein loved the idea. First, it would indeed help Infeld financially, but it would also help Einstein to consolidate the many popular essays he had himself written over the previous two decades into a single source book. Infeld would apparently use those essays as grist for the book, and Einstein would have final script approval on the text. (More about this detail later.)

Leopold Infeld was a physicist who coauthored a number of technical papers with Einstein, such as "On the motion of particles in general relativity theory" (A. Einstein and L. Infeld, *Can. J. Math.* Vol. 1 (1949) p. 209.) and a few others. He also work with both Einstein and B. Hoffmann on a unified field theory. He seemed to have a particularly strong affinity for approaching his own theoretical work along the same philosophical lines as Einstein's, hence was the original basis of their close association over the decades.

Infeld is a rare bird among physicist that I have known or read. He is one of the few physicists who actually seems to have understood the philosophy of Einstein and his research program to build a completely relativistic physics as a free creation! By building we come to understand by inventing understanding, not by discovering it!

On point 2) I will quote Infeld:

Einstein regards all physical concepts as free creations of the human mind. Science is a creation of the human mind, a free invention. This freedom is restricted only by our desire to fit the increasing wealth of our experiences better and better into a more and more logically satisfactory scheme. This dramatic struggle for understanding seems to go on forever. The history of science teaches us that, although through revolutionary progress we may solve old difficulties, in the long run we always create new ones. We may move from complexity to simplicity because of new and unexpected ideas. Then the evolutionary process begins again, leading to new difficulties and new contradictions. Thus we see in the history of science a chain of revolutions and evolutions. But there are no retreats! As though travelling on a spiral, we reach higher and higher levels of understanding, through the consecutive steps of revolutions and evolutions.

— Found in: *Albert Einstein*, by Infeld, p. 121.

I am quite fond of quoting from *Evolution* this particular passage (p. 31):

Physical concepts are free creations of the human mind, and are not, however it may seem, uniquely determined by the external world.

Infeld claims that this is pure Einstein, and indeed I can easily quote from many other pure Einstein essays that say essentially the same thing! To Einstein, the question is not whether Nature is intrinsically relativistic or not. The real question for him was whether or not Nature could be made to look relativistic as expressed through the equations of physics!

2 Laying out the evidence

It seems that as late as 1955, Einstein believed that the majority of physicists did not understand what he was really trying to do with relativity! Infeld quotes from a letter he received from Einstein dated 17 January 1955, just months before Einstein's death:

I am unfortunately (or should I say, fortunately) not well enough to attend such an official gathering. I believe it would be most desirable if you should explain in your lecture that the centre of the theory lies in the general relativity principle. For most of today's physicists have not yet comprehended this.

— Found in: *Why I left Canada*, by Infeld, p. 152.

To those who claim that *Evolution* does not accurately represent Einstein's views of relativity and the philosophy of physics circa 1938, I counter that it does. In fact, from the many essays I've read of Einstein about relativity and quantum mechanics and his philosophy of physics, I find no contradictions whatsoever on any point at all! Einstein himself often presented his relativity arguments in these essays in the historical view. He occasionally used the term "evolution" in his writings on science.

From the Introduction to the New Edition of *Evolution* we find from Infeld:

The first edition of this book appeared more than twenty years ago. Since then, death has come to Einstein, its chief author and perhaps the greatest scientist and the kindest man who ever lived.

To me, "chief author" means the person who directly wrote most the text of the book, or, at the very least, was primarily responsible for the accuracy of its content. To claim that Infeld was the true chief author of the book is to make Infeld a bald face liar.

Also, Infeld, for his part, was eager to write a popular treatment of relativity for its own sake, as opposed to this writing being merely a ploy to find work in the States. His quotes he alleges to Einstein on *Evolution*, which I take from Infeld's book *Why I left Canada* are as follows:

From the first page of the chapter on "Einstein," he tells us that *The Evolution of Physics* was a book which "I had written with Einstein" (p. 136.) He didn't say that *Evolution* was a book that Einstein merely lent his name to it. On the next page he states that, "we had worked together on ... *The Evolution of Physics*."

On page 141, he quotes from a letter he received on or about 21 April 1946:

I read with great pleasure your pamphlet on the atomic bomb though, unfortunately, I haven't yet had time to study your last paper. Today I sent you a copy of a letter about our baby [that is, *The Evolution of Physics*] which will undoubtedly be as pleasant for you as it was for me.

On page 142, we have another direct mention of the book being written over mutually agreed-upon criteria:

Yet, at the time, I believe that Einstein's distaste for quantum theory to be unfounded. (It is true that none of this distaste was reflected in *The Evolution of Physics* since we did not want to make it a polemical book.)

The three problems I have with the suggestion that Einstein did not completely accept the tenants of the book *The Evolution of Physics* are

- 1) that the contents are easily findable in many Einstein essays,
- 2) Einstein shows his own style in the book by its 19th century philosophical flavor in places,

3) Einstein's great ironic wit shows through, at least to me.

If Einstein were to let a book represent him by him placing his name on it only, and admitting he thought it contradicted his personal highly cherished beliefs that he had for decades fought for in the public arena in his own essays and articles, then he would be guilty not only of intellectual fraud, but also guilty of undermining his beliefs that he worked so hard to establish in public consciousness in the first place. I see no logic in him doing this. I see no need for him to submit to this, and I have found no evidence in the book itself that it contradicts any other Einstein work!

In a later printing of the book *The Evolution of Physics* in 2007 (by Touchstone), we find a Forward written by Walter Isaacson, who authored the book *Einstein: His Life and Universe*. In this forward, we find this comment that the origin of the book lay in the need for Infeld to secure his stay in the States by way of his coauthoring a book with Einstein on the history of physics:

So in order to finance his continued stay in the United States, Infeld came up with a plan to write a history of physics with Einstein, which was sure to be successful, and split the royalties. As Infeld later recalled, he knew that he would have to do most of the writing, but the important thing was that the ideas in the book had to be Einstein's:

I knew him well enough to understand that he would never lend his name to ghostwriting. . . I knew that if the book was to have any real historical value I must remain in the background and let Einstein express his views. It was important that the book should express Einstein's outlook on science. . . Next was the problem of the actual labor of writing, the tedious mechanism of popularization which would take a great deal of time. Here, I was sure I could do better than Einstein and would be able to relieve him of most of the work.

— Found in: *The Evolution of Physics*, 2007, Touchstone, pp. xv–xvi.

So, yes, on the one hand, Infeld admits to writing most of the text, but on the other hand, he did so with the express purpose of expressing Einstein's views.

Infeld eulogized Einstein:

On 18 April 1955 Einstein died. The great light went out. Probably the greatest physicist of all time had died, a man of unprecedented goodness—a goodness stemming rather from the intellect than from the heart. There died a man who was the conscience of

the world, who always raised his voice in defense of the oppressed, always against tyranny.

— Found in: *Why I Left Canada*, p. 152.

As for the Einstein wit I offer what I personally believe is pure Einstein, though I cannot prove it. Fully two-thirds through the book, after the author tell us about how brilliantly both Newtonian mechanics and SR work because of the simple basis they have on the inertial reference frame concept, they then tell us a shocking truth about all of it:

We have learned something about the laws of nature, their invariance with respect to the Lorentz transformation, and their validity for all inertial systems moving uniformly, relative to each other....

Good. All that effort we put into reading the book up to this point is then really worth the bother, right? They go on to say, though:

We have the laws but do not know the frame to which to refer them.

— Found in: *The Evolution of Physics*, p. 209.

Ouch!! I find this very ironically funny. And I take it as evidence of Einsteinian wit. This particular sentence is only appropriate from one having authority to make it, which would be only someone at the pinnacle of the field. That's one reason why I believe it is Einstein's line, not Infeld's, but it's just a guess on my part.

Another bit of evidence of real co-authorship between Einstein and Infeld is that at the end of each chapter in *Evolution* a summary is given, starting with the line: "We Summarize".

From Infeld's book *Albert Einstein* (p. 132), Infeld presents a bibliography of books on relativity which are "written at least partially by Einstein." Listed in this short list is the book *The Evolution of Physics*.

Einstein said:

To begin with I refer to the essays of Wolfgang Pauli and Max Born. They describe the content of my work concerning quanta and statistics in general in their inner consistency and in their participation in the evolution of physics during the last half century.

— Found in: "Remarks concerning the essays brought together in this cooperative volume," *Albert Einstein: Philosopher-Scientist*, Vol. 2, Open Court Classics, 1949, p. 665.

3 Comparison of *Evolution* to Einstein's Earlier Essays

Is the book an accurate representation of Einstein's views in 1938? I see no difference between it and Einstein's essays in the same general time period. Of

course, if Infeld was over a barrel, and Einstein was willing to help him, it was Einstein that held all the cards. Infeld would naturally have to defer to him, as it was Einstein's fame that could get the book published, not Infeld's. As far as I'm concerned, Einstein took full advantage to insist that every sentence reflect his own philosophy, not Infeld's, per se; and Infeld admitted to being absolutely fine with that. This is not only Einstein's privileged but his responsibility as the book's "chief" author to not subvert the views he had already published previously in his many essays and articles.

But I must also take issue with the myth that Einstein was not good at popularizing his own work. Many of Einstein's essays/lectures were intended for, or at least approachable by, lay audiences. They are clear enough for them to receive most of it. Just read them in *Ideas and Opinions*. In fact, the essay there called "Physics and Reality" (The Journal of the Franklin Institute, Vol 221, No 3, March, **1936**, *Ideas and Opinions*, pp. 290–323) is a perfect example, not only because it is readable by a layman, but also because it seems to be the germ paper for the book *The Evolution of Physics*. In fact, one could accurately characterize it this way: *The Evolution of Physics* is Einstein's further development of his theme originally found in "Physics and Reality." Einstein frequently took the historic approach to setup his own contributions to physics.

Let's just look at the development of "Physics and Reality."

- Section 1: General Consideration Concerning the Method of Science.
- Section 2: Mechanics and the Attempt to base all Physics Upon It.
- Section 3: The Field Concept.
- Section 4: The Theory of Relativity.
- Section 5: Quantum Theory and the Fundamentals of Physics
- Section 6: Relativity Theory and Corpuscles.

Other Einstein essays that follow the same general pattern of presentation, though not always as thoroughly, are "Maxwell's Influence on the Evolution of the Idea of Physical Reality" (1931), "On the method of theoretical physics" (1934), "The problem of space, ether, and the field in physics" (1934), "The fundaments of theoretical physics" (1940).

Now this evolution of chapters is very close to that presented in the book *Evolution*, and it further demonstrates Einstein's fixation on this one educational principle: The best way to get people to understand physics is to present it to them in its proper historical and philosophical context.

The main chapters in *Evolution* are:

- Section 1: The Rise of the Mechanical View
- Section 2: The Decline of the Mechanical View
- Section 3: Field, Relativity

- Section 4: Quanta

All Infeld had to do was to mash together all of Einstein’s previous essays on the history and nature of physics, as it evolved over the centuries, and conform the result to a popular audience. In the end, Infeld would employ his own writing skills to assemble Einstein’s ideas, based on Einstein’s published works on the subject, and based on his first-hand knowledge of his mentor’s beliefs, and create a historically accurate book that most people could follow, at least to some extent.

Creation is an act of sheer will.

— John Hammond (Character from Jurassic Park)

4 Cynicism

In the modern world of trash conspiracy theories, bigotry, racism, jealousies of those who have accomplished things in the public eye, and the abiding antisemitism that lingers on, we have a constant public airing of real and fake cynicism.

Of course, we should be skeptical of claims, ready and willing to test such claims willingly and honestly. But resist being cynical of other people’s motives. Give the same degree of respect to others that you would want others to give to you.

Real cynicism is a sincere, but misguided, assumption that other people are either not as smart as they are, or is the sincere belief that others are habitually lying to you, for hidden reasons.

I suppose that cynicism has its advantages, such as never having to take the time and make the mental effort to examine the evidence of any belief that you don’t want to adhere to. To trash something you can’t understand as evil.

Fake cynicism is hypocrisy, and the person affected by it knows it — at least at first. He or she knows that the arguments of their opponents have merit but refuse to admit it to themselves and then deceive themselves of the contrary.

No amount of logic or evidence seems to affect the cynic at all, except perhaps to give them a reason to double-down on their beliefs.

Jesus said, “I am the way the truth and the life.” Therefore, wherever truth is, Jesus is. And wherever a lie is, the Devil is. If you really want to be a pursuer of truth, you’d better resolve to become a lone wolf, for groupthink within even a small group of counterculture activists is still a path to certain self-deception, falsities — the doctrines of devils.

Nevertheless, it’s hard to be a lone wolf in search of truth. It’s fashionable to be a cynic, to distrust leaders or experts, or one’s elders in general. It’s fashionable to believe in conspiracy theories.

Know this one thing, however: cynicism and negativism have detrimental consequences to society, and the cynic will live within the world damaged by those negative consequences.

5 Conclusion

To me personally, the Einstein essays I mentioned above, together with the book *Evolution*, exist to answer just *one* important historical and philosophical question, which I will put this way:

Why is it that modern physics no longer uses the same methods and physical conceptualizations of doing physics that Newton used when he did physics?

So, you have a choice, dear reader: You can except the evidence at face value, or believe a conspiracy theory, instead.