Einsteinian blunders

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‘We are certainly not to relinquish the evidence of experiments for the sake of dreams and vain fictions of our own devising.’

Mathematical Principles of Natural Philosophy, Book III — I. Newton, 1687

Abstract

The World Year of Physics 2005 celebrates Einstein 1905. Too much celebration of a single character may be hazardous as an example for the younger generation. With such a motto in mind, I comment on some episodes in Einstein’s scientific career that are at some extent characterized by what could be dubbed blundering behavior. The final purpose is obviously to humanize the personage as opposed to the current trend of deification.
1 Introduction

“The World Year of Physics 2005 is an United Nations endorsed international celebration of physics. Events throughout the year will highlight the vitality of physics and its importance in the coming millennium, and will commemorate the pioneering contribution of Albert Einstein in 1905.”

This is the opening statement that appears in the electronic page http://www.physics2005.org, which is dedicated to the World Year of Physics. The idea seems to be, first, to celebrate physics, and, second, to commemorate Einstein. However, one sees without much effort that already, in the beginning of the year, there has been too much talking and writing on Einstein, with a noticeable bias to scientific idolatry, an unimaginable feature in science. We, scientists, are supposed to respect Nature as the sole source of inspiration for our activities both in the experimental and theoretical realms.

It is beyond of doubt that 1905 was Einstein’s annus mirabilis. In that year the world witnessed the publication of three masterpieces in the literature of contemporary physics. They were the work on Brownian motion, establishing the reality of atoms, the work on the photoelectric effect establishing the quanta of radiation, and the special theory of relativity. There was though an antecedent of such a high moment in science: the year 1666 is often remembered as Isaac Newton’s annus mirabilis. From 1665 to 1667 he also opened the doors to three new areas of scientific research, namely, he laid down the foundation of differential and integral calculus, he developed the theory of colors, and put forward his theory of gravitation. The publication in 1687 of his Mathematical Principles of Natural Philosophy marked the beginning of a new era in the scientific endeavor. There is a clear parallel with Einstein’s contribution to modern science.

In the following three sections I comment on aspects of Einstein’s scientific life that are often seen with respectful acceptance, in spite of being bad examples of scientific manners.

2 The cosmological constant

In an important paper published in the Annals of the Royal Prussian Academy of Sciences in 1917 entitled “Kosmologische Betrachtungen zur Allgemeinen Relativitätstheorie”, i.e., ”Cosmological Considerations on the Gen-
eral Theory of Relativity”, Einstein inaugurated the era of modern cosmology applying his ideas from General Relativity to the universe as a whole. Towards that aim, he abandoned his original field equations in favor of a new law in which there was an additional constant term that represented a repulsive gravitational potential (Rindler 2006, p. 304). The term gives a small repulsion near the origin but increased directly proportional to the distance until counterbalance the gravitational attraction between masses. His intention was obviously obtain a static model. Remember that at that time even galaxies were not known as independent cosmological entities. Only in the late 1920s, with the work of the astronomer Edwin P. Hubble the existence of galaxies came to be definitely proved. The solutions he had initially obtained with the application of the original field equations were unstable for gravitational collapse. The modification preserved the general covariance of the theory and solved the instability problem (North 1990, chapter 5). The constant became known as the cosmological constant, and is until today the matter of much debate.

I describe now some facts that led to the first Einsteinian blunder. It turns out to be a double-blunder, as I suggest below.

The introduction of the cosmological constant led to a great debate on many aspects of the new horizons opened up by General Relativity concerning the universe. A infinite model has obvious boundary condition problems, something that was recognized even in the context of a Newtonian cosmology (see Harrison 2000, chapter 16). With the cosmological constant, Einstein solved all problems by introducing a finite, spatially closed and static model, the latter feature being a result of Einstein’s — and of most scientists at the time — belief concerning the physical world.

Nevertheless, Einstein came later to reject his own modification of the field equations. North (1990, p. 86) quotes that already by 1919 Einstein considered that the introduction of the constant was “gravely detrimental to the formal beauty of the theory”; he considered it as an ad hoc addition to the field equations. Later on, he was further led to such a rejection by two new developments: on the observational side, Hubble’s work on the redshift-distance relation for galaxies was being interpreted as an indication of an expanding universe1 — no need of static solutions —, and on the theoretical

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1It is worthwhile to note at this point that the interpretation of Hubble’s redshift-distance relation as indicative of an expanding universe is only true when one takes for
side, the 1922 solution of the field equations by the Russian Aleksandr Friedmann and the 1927 solution by the Belgian Georges Lemaître which allowed for expanding models.

George Gamov (1970) tells the now legendary story that Einstein once has said to him that the cosmological constant was “my biggest blunder” 2.

But why a double-blunder? Einstein rejected the cosmological constant based on what he found to be physical and aesthetic inconsistencies that resulted from its adoption. Here he saw a blunder, his biggest one. On the other hand, from the strict theoretical and formal point of views, General Relativity is in fact enriched by the addition of the new term, while still keeping its features as a viable general covariant theory of gravitation. And that is where the double character comes from. The simple fact of abandoning it constitutes a blunder after a blunder. This is also suggested by Norh’s arguments (North 1990, p. 86), who writes that “he finally discarded the term in 1931, and in doing so deliberately restricted the generality of his theory.”

Recent claims, from the late 1990s and on, of a accelerating expanding universe have led to the resurrection of the cosmological constant, which would give the cosmic repulsion responsible for the acceleration. This idea and other variants became a strong feature of modern cosmology. The present status quo of modern cosmology is not though free of opposition. An example of that has recently materialized in An Open Letter to the Scientific Community (Lerner 2004).

3 The 1919 solar eclipse

In a short biography (Bernstein 1976), Einstein’s reactions to the scientific results obtained from the solar eclipse of 1919 are described. The main granted that the underlying theory under consideration, i.e., General Relativity in modern cosmology, is true. This is still a matter of debate since present cosmological models have led to a variety of hypotheses concerning the matter-energy content of the universe, such as baryonic dark matter, non-baryonic dark matter and the yet more mysterious dark energy. None of these have been so far proved to exist by any experimental or observational means.

2 This of course entirely justifies the title of the present article: if Einstein admits his “biggest” blunder, that implies the existence of the “smallest”, and a whole gradation of blunders in between.
issue was light bending by a gravitational source, and the occasion was most appropriate for the observational tests.

Two astronomical expeditions, one in Brazil and another in the African coast, were organized by Sir Arthur Eddington, a renowned scientist at the time, in order to measure the stellar positions around the solar disk during the total eclipse of May 29, 1919. Ilse Rosenthal-Schneider, Einstein’s student, tells that Einstein’s first reaction to the news that the measurements pointed to an agreement with General Relativity predictions for the light bending was: “— I knew it was correct”.

She asked him: “— What would it be if your prediction was not confirmed?”. He replied: “— Da könnt’ mir halt der liebe Gott leid tun, die Theorie stimmt doch.” Or, “— Then I would be sorry for the good Lord, but the Theory is correct.”

Is this an acceptable reaction of a theorist when confronted with experiments or observations that are relevant to his theory? Certainly not.

4 Einstein meets Hubble

The protagonist here is another Einstein — Elsa — Einstein’s second wife. She is sometimes featured as a woman of somewhat faint character (see Pais 1983). The story appears in many sources. The one I quote here is from the probably best biography of the great extragalactic astronomer Edwin Powell Hubble (Christianson 1995), the man that successfully proved the existence of external galaxies and would be awarded the Nobel prize in Physics in the early 1950s. It did not happen due to his premature death in 1953 (for a short account, see Soares 2001).

Einstein’s visit to the institutes of Caltech, in early 1931, was motivated by his curiosity on the work in mathematical physics done by Richard Tolman, who was working on relativity, and on the observational work by Hubble at the Mount Wilson Observatory.

He and wife made their first trip to the mountain, where the Observatory was located, in mid-February. They were accompanied by Hubble and others.

They visit all the installations in the Observatory, including the 100-inch dome, which houses the Hooker telescope — then the largest telescope of the world —, where most of Hubble’s work on extragalactic astronomy was being conducted.
Hubble’s biographer writes (p. 206): “When Elsa Einstein, who seemed always to be in the defensive, was told that the giant Hooker telescope was essential for determining the universe’s structure, she is said to have replied, ‘Well, well, my husband does that on the back of an old envelope.’ ” As in the previous section, one sees here the diminution of the relevance of experimental (strictly speaking, observational) science.

One could argue that this is not a legitimate Einsteinian blunder because it was Mrs. Elsa’s mouth that has spoken out the words. There are two counter-arguments against such a claim. The weak and the strong arguments. The weak one is just a play on words and goes like this: “Elsa is Einstein therefore it is an Einsteinian blunder”. The strong argument is that the episode appears very frequently in Einstein’s biographies and in writings of various nature about both Einstein and Hubble. It is an Einsteinian feature. As such, it might with justice be included in the gallery of authentic Einsteinian blunders.

5 Concluding remarks

It is understandable that amongst us, physicists and astronomers, there is frequently almost an adoration of Albert Einstein. He is without doubt the greatest scientist of the Twentieth century. Such an involuntary worship is everywhere: the most celebrated Einstein’s biography, namely, that by Abraham Pais (Pais 1983) is also contaminated. He adopts the usual trend of skipping uncomfortable details of Einstein’s personal and scientific life (Soares 2003).

The reader certainly noticed that none of the above-mentioned stories refers to Einstein’s annus mirabilis works but are at some extent related to General Theory of Relativity, which was developed ten years later. The explanation is simple. It is the result of a selection effect, given that the author of the present article is an extragalactic astronomer. That is to say, it does not means that there are not Einsteinian blunders related to that period. They can be mined, for example, in Abraham Pais’ book. Not without some effort, it should be added, as implied by the first paragraph,

And what about the atomic bomb? Certainly it cannot be classified as an Einsteinian blunder, in spite of Einstein’s deep involvement with the issue (especially on the political side, see Pais 1983 for details). The atomic bomb
is rather the world biggest blunder.

Scientific impartiality excludes, by definition, worshiping and the cult of personality. To err is human and so has Einstein erred in many occasions. This is the plain message to the younger generation of students and scientists.

Finally, young and old, let us all remember the famous Brazilian playwright Nelson Rodrigues that always used to say that “any unanimity is stupid.” Definitely right.

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