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Writing Samples

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The Reception of Einstein's Theory of Relativity at the Time

 Einstein's theory of relativity is perhaps one of the more famous scientific discoveries of the twentieth century. The purpose of the present sample essay provided by Ultius is to discuss the reception of the theory of relativity in Einstein's own day. The essay will begin with a short overview of the theory itself. Then, it will proceed to a consideration of the scientific reception of the theory during Einstein's time. After this, it will shift to a consideration of the philosophical and/or ideological reactions to the theory. Finally, the essay will reflect on modern echoes of these early reactions, and what they say about the future of the theory of relativity in particular and the role of science within modern culture in general.

**Overview of the Theory**

To start with, it is worth providing an overview of the theory of relativity itself, before going into the contemporary reception of the theory in Einstein's day. The main gist of Einstein's theory is that space and time are interwoven into a singular entity called spacetime, and that spacetime is affected by the presence of mass. To quote an image developed by Redd here: "Imagine setting a large body in the center of a trampoline. The body would press down into the fabric, causing it to dimple. A marble rolling around the edge would spiral inward toward the body, pulled in much the same way that the gravity of a planet pulls at rocks in space" (paragraph 4). In this image, the trampoline fabric itself would be spacetime, and the presence of the mass on the trampoline would thus cause an actual distortion in the fabric of spacetime. The reality of such distortions in spacetime being caused by mass is one of the main implications of Einstein's theory of relativity.

 Of course, this contradicts most commonsensical notions of the nature of space and time. One would ordinarily expect time and space to be absolute entities that exist in and of themselves, with matter existing within the context established by space and time. According to Einstein's theory, however, spacetime itself has interactions with matter, such that the presence of mass—and especially large masses—can alter the general fabric of spacetime itself. Spacetime does ceases to be fully "objective" or independent from the material world; rather, it spacetime itself becomes altered by its interactions with the material world. To pursue the example discussed above, this would mean that spacetime is somewhat malleable or susceptible to curvature, like the fabric of a trampoline; it is not like a solid floor of concrete upon which masses can move without affecting the structure of the concrete itself. In principle, this effect is omnipresent, with every existing mass exerting this kind of effect on spacetime; but in general, it only becomes empirically relevant when considering very large masses, such as stars and planets, or very acute and specific measurements.

**Scientific Reception**

Within the scientific community, Einstein's theory of general relativity, confirmed in the year 1919, received a great deal of criticism at the time. These criticisms came from two main angles: the first was misunderstanding, and the second was what could be called dogma. As Wazeck has written: "Because the arguments set out in hundreds of ensuing publications frequently rested on fundamental misunderstandings of Einstein's new theory, their accounts have largely been ignored by traditional history of science. Instead, attention has focused on the criticism of Einstein's work put forward by physicists who clung to classical physics" (paragraph 2). In other words, Einstein was surely a genius, and many fellow scientists reacted negatively to his theory of relativity due to the simple fact that they could not make adequate sense of the actual meaning or validity of the theory, despite the fact that it had been confirmed in accordance with rigorous scientific methodology. There were other scientists, however, who were of the opinion that Einstein's discovery simply could not have been valid, due to the fact that if it actually were valid, then this would undermine the very foundations of a great deal of the existing conceptual framework itself.

 This is related to the fact mentioned above that Einstein's theory of relativity implied a radical reformulation of the very nature of space and time themselves, including the supposition of a singular integrated entity called spacetime and the interaction of this entity with the material world in a mutually affecting way. As the American Museum of Natural History has indicated, these implications significantly undermined the framework of the world that was developed by Newton; and this is what Wazeck means by suggesting that many scientists rejected Einstein's theory of relativity in a prima facie way due to their adherence to Newton's classical theory of physics. Of course, this is a rather unscientific response to a scientific theory; the nature of science, after all, is that a theory stands or falls on the basis of its empirically verifiable merit and validity, and not on the basis of whether any given scientist wants it to be true. This suggests that at least to some extent, some of the scientists who rejected Einstein's theory of relativity did so on ideological grounds: they "believed" in Newton, which prevented them from likewise believing in Einstein.

 Of course, other scientists saw the merits of Einstein's theory and pursued the theory further, thereby helping to cement it within the general understanding that physics had of the universe. The ideological reaction of other scientists, however, is very interesting. And this is not least because there were several other ideological reactions to the theory of relativity as well, from disciplines beyond the bounds of physics proper. It is worth turning now to a consideration of these responses.

**Ideological Reception**

 One of the ideological responses to Einstein's theory of relativity emerged from the growing anti-Semitism and nationalism that was beginning to characterize Germany during that time. (Einstein was a Jew.) As Kaiser has noted: "right-wing political opportunists in war-ravaged Germany began to organize raucous anti-Einstein rallies. Only an effete Jew, they argued, could remove 'force' from modern physics; those of true Aryan spirit, they went on, shared an intuitive sense of 'force' from generations of working the land" (paragraph 8). As various articles in Hentschel's anthology of the relationship between physics and Nazism has shown, such sentiments only grew over time. From a scientific perspective, such a response to Einstein's theory of relativity would of course be ridiculous: if the traditional idea of force was not present the theory, then this would simply be because the concept was outmoded at the empirical level, and not because of the personal characteristics of Einstein himself. But it is the character of ideological reactions to science to ignore such points and proceed in this sort of analogical or metaphorical way.

 Moreover, there were also ideological reactions to the theory of relativity from the direction of philosophy. This had to do with basic philosophical conceptions regarding the nature of space and time. Clarifying the nature of such categories has always been one of the chief concerns of the discipline of philosophy; and with the theory of relativity, several philosophers reacted as if Einstein had inappropriately encroached upon the territory of philosophy. From the perspective of philosophy, science in general would have been unqualified to make such sweeping and revolutionary claims regarding the fundamental nature of space and time.

 This, however, was probably based on a conflation of the concepts of empirical time on the one hand with philosophical time on the other—a conflation to which, it must be admitted, Einstein himself contributed. For example, Chamberlain has provided an overview of a debate that occurred between Einstein and the esteemed philosopher Bergson, in which "Bergson did not challenge Einstein's scientific claims about relativity, including the then-startling claim of time dilation, in which time slows down for objects traveling at higher speeds . . . What he challenged instead was Einstein's interpretation of those claims, saying it went beyond science and was a 'metaphysics grafted upon science" (paragraph 5). Bergson's point was that philosophical time, which is based on time as it is actually experienced by human beings, had little to do with the empirical time addressed by Einstein's theory of relativity. Einstein, though, rebutted that philosophical time is not real time at all. This was admittedly an ideological and dogmatic position, and it contributed to the popular notion that Einstein's theory had significant implications beyond the specific field of physics itself.

**Reflection on Modern Echoes**

In modern times, one can still see echoes of the original ideological reactions to Einstein's theory of relativity. For example, Fisher has pointed out that some conservatives tend to view Einstein's theory as a form of liberal cultural encroachment: such commentators insist "that Albert Einstein's world-changing idea . . . is part of a pervasive and long-held conspiracy to make people have abortions and stop believing in Jesus" (paragraph 1). This logic, while absurd at face value, is based on a perceived relationship between the theory of relativity on the one hand and moral relativism on the other; the idea is that if the universe itself is "relative" in the way that Einstein's theory suggests, then this would lend support and credence to liberals who believe that human morality is also essentially relative and not absolute in nature.

 To an extent, this train of thought surely hinges on the unfortunate name of Einstein's theory itself, which does not really capture the essential science conveyed by the theory. More broadly, though, the problem would seem to consist of a basic misunderstanding of the nature of science itself, and the independence of science from other disciplines of culture and philosophy, especially ethics. In science, a theory cannot be an ideological hoax; rather, it must be supported at the empirical level by observable and verifiable experimental evidence. How one chooses to interpret the findings of a given scientific theory, however, can have significant implications beyond the domain of science itself. The theory of relativity has no intrinsic connection whatsoever with moral relativism, and such a connection could only be constructed on the basis of analogical—or essentially poetic—thinking. But it must be said that scientists themselves contribute to such misunderstandings and undermine the autonomy of science when they begin to extrapolate metaphysical or ethical implications from their own findings. At the level of science proper, a finding can have no such implications. Rather, all that can be said is that the findings is what it is. Leaving it at that would be the best way to respect the autonomy of both science and other aspects of culture, such as philosophy.

**Conclusion**

In summary, the present essay has consisted of a discussion of the reaction of Einstein's theory of relativity during his own time. This discussion has been framed by an introduction to the theory on the one end and a reflection of modern echoes on the other. A main conclusion that has emerged here is that responses to Einstein's theory have often been guided by ideological considerations, due to the apparently serious philosophical and cultural implications of the concept of relativity. Care should thus be taken in order to give to science what belongs to science, and to not let culture undermine the autonomy of science or vice versa.

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