

# Albert Einstein: Relativity, War, and Fame

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In 1922, Princeton University Press published Albert Einstein's *The Meaning of Relativity*, a popularization of his theory that has remained in print to this day, and that more than a half century ago Datus C. Smith, Jr., then the director of the Press, counted as one of its "crown jewels."<sup>1</sup> The book was the first in what has become a sizable number of volumes by and about Einstein that the Press has published, a number that continues to grow as successive editions of his writings appear.

Albert Einstein burst upon the world of physics in 1905, at age twenty-six, when he was working as an examiner in the Swiss patent office in Bern and published three extraordinary scientific papers. One, speaking to the developing though somewhat controversial atomic theory of matter, demonstrated the reality of atoms and molecules. The other two—one advancing a quantum theory of light, the other proposing the special theory of relativity—contributed decisively to the revolution in physics that marked the twentieth century.

Two years later, in 1907, Einstein began work on what became the general theory of relativity. The special theory discarded the assumption of Newtonian physics that there exists an absolute frame of reference in space against which all motion in the universe can be measured. Taking no frame as privileged, it related how phenomena occurring in one inertial frame—that is, one moving at constant velocity—would appear in a second moving in relation to the first. The two frames might be, for example, two trains traveling at different constant speeds on neighboring tracks. The question that started Einstein on what became the general theory of relativity concerned whether the relativity principle could be applied to gravitation. His efforts were greatly aided by an epiphany that inertial mass (that is, mass that resists a change in its motion) and gravitational mass (that is, mass that is attracted by other mass at a distance) are equivalent.<sup>2</sup> That insight led Einstein to examine gravitational phenomena in frames of reference that are not inertial, but that are accelerating with respect to each other.

In 1909 Einstein left the Swiss patent office for a position at the University of Zurich; he moved to professorships in Prague in 1911 and at the Polytechnic in Zurich in 1912. In 1914, he became a professor at the University of Berlin, the director of the Kaiser Wilhelm Institute for Physics, and a member of the Prussian Academy of Sciences. During much of this time, he struggled through writing a series of papers on gravitation, producing what he later described as a “chain of errors.” By November 1915, the struggle had brought him to “the final release from misery”—a general theory of relativity that he found excitingly complete. The theory deprived space of its independent three-dimensional existence, holding that it is a four-dimensional manifold defined by time as well as extension and is configured by the mass within it. The theory incorporated Newton’s laws as special cases in all frames of reference. It explained a peculiarity in the orbital motion of the planet Mercury that had long puzzled astronomers. And it predicted that the path of starlight would bend and the frequency of atomic spectra would change in the neighborhood of an enormous mass such as the sun. “The theory is of incomparable beauty,” he wrote to a friend.<sup>3</sup>

The atomic frequency shift had not been observed, data bearing on it was much disputed, and the failure to detect it offset the success of the general theory in accounting for the motion of Mercury. Great weight thus came to be attached to the theory’s prediction of the bending of light rays by the sun, which had been a consequence of Einstein’s formulation from its inception.<sup>4</sup> For several years, Einstein had been encouraging astronomers to look for the bending of starlight when it passed by the sun during a total eclipse. Attempts to measure such light deflection in Brazil during an eclipse in 1912 were thwarted by clouds and rain, and an attempt at observation in the Crimea during another eclipse in 1914 was prevented by both weather and the internment of the would-be observer, a German scientist, in Russia as a result of the outbreak of World War I.

The war quickly severed most contacts between German scientists and those in the nations of the Entente, but, worse, it shattered the amity of international science. In October 1914 ninety-three German professors, among them Wilhelm Roentgen, Max Planck, and thirteen other scientists of comparably high repute, issued an *Appeal to the Cultured World*, a manifesto denying that Germany was responsible for the war, protesting the “lies and defamations” leveled against its conduct in the conflict, and claiming that its soldiers had not committed atrocities in Belgium.<sup>5</sup> Lashing back,

angry fellows of the Royal Society of London demanded the removal of all Germans and Austrians from the list of foreign members, and the French Academy dropped the signers of the manifesto. In mid-1917, the eminent French mathematician Emile Picard, a former president of the French Academy of Sciences, told an influential member of the National Academy of Sciences in the United States that “personal” relations of any kind would be “impossible” with German scientists even after the war. They had to be ostracized from the structure and activities of international science indefinitely.<sup>6</sup>

Einstein declined to lend his prestige to the German war effort. He was a Swiss citizen, for one thing, but far more important, he was an enemy of nationalism, especially the Prussian variety, and counted himself an internationalist and a pacifist. He refused to sign the *Appeal to the Cultured World*, preferring instead to join a few other scientists and scholars in publishing an *Appeal to Europeans* that declared the attitudes in the manifesto inexcusable and urged that all educated men of all states should ensure “that the conditions of peace did not become the source of future wars.”<sup>7</sup>

In England, Arthur Eddington, an astrophysicist, secretary of the Royal Astronomical Society, a Quaker, and an outspoken pacifist, was eager to maintain relations with scientists in enemy countries. Learning about Einstein’s general theory from an astrophysicist in neutral Holland, Eddington recognized its high scientific significance. So did the astronomer royal, Frank Dyson, who obtained one thousand pounds to finance two expeditions to test Einstein’s prediction during the solar eclipse that would occur on May 29, 1919, and would achieve totality in the tropics. One of the expeditions, headed by Eddington, went to Principe, in the Gulf of Guinea off the west coast of Africa; the other, led by Charles Davidson and A.C.D. Crommelin, journeyed to Sobral, in northwestern Brazil. From Principe, where the totality of the eclipse lasted for 302 seconds, Eddington cabled London: “Through cloud, hopeful.”<sup>8</sup>

Einstein learned about and eagerly followed the progress of the English expedition. Although he reportedly declared later that he had had full confidence that the deflection would be found and would match the magnitude his theory predicted—1.74 seconds of arc—he nevertheless waited for news of the expedition’s results with keen, somewhat anxious attentiveness.<sup>9</sup> Then, in late September 1919, in a telegram from his Dutch friend and fellow physicist Hendrick A. Lorentz, he learned that the English expedition had detected a deflection of light by the sun of a magnitude

that fell within the range predicted by his theory. In late December two young German physicists verified the predicted shift in atomic spectra and also explained the reasons for the previous failures.<sup>10</sup>

Einstein's letters tell much about his scientific, political, and personal lives, and a growing body of them is conveniently accessible in *The Collected Papers of Albert Einstein*, the authoritative volumes of his writings and correspondence that Princeton University Press began publishing in 1987. Volume 9, the latest, bulges with the letters from January 1919 to April 1920 and reveals Einstein with tangible, compelling immediacy during the months in the aftermath of World War I, when the verification of his theory occurred and he suddenly became a world figure.

In the fall of 1919, as word about the eclipse expedition spread among scientists, accolades poured in from physicists on both sides of the recent wartime divide. Then, on November 6, 1919, a galaxy of British physicists and astronomers gathered in the rooms of the Royal Society of London at a joint assembly of that group and the Royal Astronomical Society to hear a formal report on the results of the eclipse expeditions. Many in the gathering were mindful that if the theory proved correct, the laws of Newton, whose portrait looked down on the crowd, would have to give way before those of Einstein. Eddington and Crommelin reported that light from a distant star had indeed been bent when passing by the sun, and that the magnitude of the deflection equaled within experimental error the quantitative prediction of Einstein's theory. The Nobel physicist Joseph John Thomson capped the historic occasion by calling the general theory of relativity "the greatest discovery in connection with gravitation since Newton."<sup>11</sup>

Within days newspapers made Einstein a figure of global prominence, but his sudden fame was energized as much by his location in the political space-time of the world war and its aftermath as by his identification as the twentieth-century Newton. The French physicist Jean Perrin had reported to him from Paris that it was "a great comfort for everyone here . . . to learn . . . that since the beginning of the great ordeal and throughout its entire duration you always knew where to look for justice." English scientists admired him for having not signed the manifesto of the ninety-three German professors, and a number, including Eddington, relished the fact that the theory of a physicist in Germany had been confirmed by English observations, which they counted as an augury for the restoration of international scientific relations.<sup>12</sup> Einstein, on his part, celebrated the fact that "En-

glish scientific men should have given their time and labor, and that English institutions should have provided the material means, to test a theory that had been completed and published in the country of their enemies in the midst of war.”<sup>13</sup>

Even before becoming world famous, Einstein had been in demand among physicists, finding the lecture hall overflowing with students and colleagues when he spoke. After the world discovered him, he was deluged with inquiries, invitations, and requests. “At night I dream I am burning in hell and the postman is the devil, hurling a fresh bundle of letters at my head because I still haven’t answered the old ones,” he complained. The German government valued Einstein as a prime cultural asset and agent of international reconciliation, providing hospitality and attention wherever he traveled.<sup>14</sup>

Berlin in 1919 was beset by shortages and inflation, and Einstein was by no means exempt from the rigors of life in the city. In early September the elevator service was cut off in his apartment building at 5 Haberland Strasse, prompting him to write to his mother that “each exit will involve a climbing expedition.” He added, “Much shivering lies ahead of us this winter.”<sup>15</sup> His mother, who was living in Switzerland, was mortally ill with cancer. Einstein brought her to Berlin, but although the local housing department had granted him an extra room in his building to accommodate her, the building’s owner refused to hand over the room. Einstein had to install his mother and her nurse in his study, where she lay suffering “terribly, physically and mentally,” he wrote.<sup>16</sup>

For several years Einstein had been estranged from his wife, Mileva, who was living in Switzerland with their two sons, and had been sending them more than half his salary. However, as the mark weakened in value against the Swiss franc, his support for them had eaten an increasing fraction of his salary—in 1917, all of it. The couple’s divorce decree, in February 1919, awarded Mileva the interest on the Nobel Prize money that everyone assumed Einstein would win. (He was nominated the next year by a group of Dutch physicists, Lorentz among them, who said of Einstein that “by making progress in the field of gravitation for the first time since Newton, he has placed himself among the first tier of physicists of all time.”) Early in June, Einstein married his cousin Elsa, a widow with two daughters. She brought to the marriage a dowry of more than 100,000 marks, but Einstein continued to feel financially strained. “Earning in Germany and spending in Switzerland is an impossible combination,” he wrote to a friend.<sup>17</sup>

Einstein was an engaged political observer. Late in the war, in a letter sent from Switzerland to the French writer Romain Rolland, Einstein averred that Germany had adopted a “religion of power,” and that he preferred the harshness of defeat to a negotiated peace: Defeat was the only way to check “this delusion of minds” and break the hold on the country of the military, the nobility, and the landed gentry.<sup>18</sup> Now, in the postwar months, he found redeeming features in Germany’s misery, confiding to a close friend that “people here appeal to me better in misfortune than in fortune and plenty, just as this landscape is unbearable in the blinding sun.” He likened Germany to “someone with a badly upset stomach who hasn’t vomited enough yet.” Einstein reckoned that it would do “no harm at all” to exclude German scholars from international society for a number of years. On the contrary, the exclusion might instruct Germany to “understand the attitudes of the ‘enemy’ so that there [would] be no room for the abhorrent idea of revenge, from which, later, new grief could grow.”<sup>19</sup>

Always a rationalist, Einstein hoped that inclinations to hatred and revenge might be leached away through a fair and truthful examination of the war’s events, especially the Allied allegations of German atrocities. To this end, he joined a small commission formed in Berlin to probe the accusations, its aim to enlighten people who believed they were “tendentious lies.” But he counted it “a pity . . . that the action taken regarding the punishment of war crimes is not international. That only fallible *Germans* should be held responsible, even though bad things happened to prisoners on the French side as well, does not allow for complete satisfaction with this act of justice.” He told Lorentz that he understood the “bitterness” arising from the “famous Manifesto of the 93,” adding, however, that foreign assessments of German scholars were “too harsh,” that the signers of the document had been ignorant of the injustices Germany had committed.<sup>20</sup> In any case, he thought the Allies had a lot to answer for, judging them now only a “slightly lesser evil” than Germany because of the harsh peace terms imposed at Versailles.<sup>21</sup>

Einstein remained transcendently internationalist, and his anti-nationalism put him at odds with Zionism as a move to establish a Jewish national state in Palestine, but he strongly sympathized with efforts to establish a Jewish homeland, thinking that the small size of the colony in Palestine would preserve the Jews there “from any power mania.”<sup>22</sup> Einstein’s self-identity as a Jew was surely bolstered by the anti-Semitism that he had encountered in

his earlier career. He had also long been disturbed by the denial of educational opportunity to talented young Jews in Polish and Russian universities.<sup>23</sup> Now, in postwar Berlin, nationalists and anti-Semites attacked both him and his theory of relativity. “Anti-Semitism is strong here and political reaction is violent, at least among the ‘intelligentsia,’” he noted in late 1919 to his close friend Paul Ehrenfest, in Leyden, who was also Jewish.<sup>24</sup>

Einstein dismissed anti-Semitism as inevitable, even if ugly, the product of a kind of biologically rooted exclusionism among gentiles. He found it heart-wrenching to see so many Jews, scientists and others, prostrate themselves to be accepted as Germans even though the majority of Germans did not consider them equal members of society. For Einstein, anti-Semitism was not so much to be contested as sidestepped. The answer to it was for Jews—members of a “community of destiny” rather than of a religion, he thought—to behave as tribally as their enemies, organizing and funding their own institutions of learning. Thus he pledged to do “all that is in my power” on behalf of the effort to establish a Hebrew University atop Mount Scopus, in Jerusalem, an institution that would serve not only Jews in Palestine but all his “tribal companions,” particularly Jews from Russia and Poland, whose talents would otherwise “go wretchedly to waste.” When in February 1921, Chaim Weizmann invited Einstein to join him on a trip to the United States to promote the new university, Einstein accepted, happy to have Weizmann exploit his name, “from whose publicity value a substantial effect is expected among the rich tribal companions in Dollaria.”<sup>25</sup>

When Einstein, Weizmann, and his small party of Zionists arrived in the United States in late March 1921, thousands of Jews greeted them at the Battery, and thousands more lined the streets cheering and waving handkerchiefs as they drove up the Lower East Side. Overflow crowds turned out to hear Einstein lecture, in German, on the theory of relativity, and politicians conferred on the modern Newton the keys to the city and the state. The day they arrived in Cleveland, Jewish merchants closed up shop at noon, and what an astonished reporter called “a swirl of fighting, crowding humanity” kept their two-hundred-car motorcade to a slow pace on the way to city hall.<sup>26</sup>

In Boston, where the Einstein-Weizmann party had been met with a brass band in the morning, then feted in the evening with a kosher banquet, Mayor Andrew J. Peters respectfully declared, “Not many of us can follow Prof[essor] Einstein in his discussion

of the mathematical properties of space; but all of us can understand his refusal to sign the manifesto of the ninety-three professors." Princeton University, awarding him an honorary degree in May, officially cited his loyalty to moral standards in having "refused to join with others in condoning the invasion of Belgium."<sup>27</sup>

When Einstein and Weizmann addressed a rally of thousands at the Sixty-ninth Regiment Armory in New York, the politico in the White House wired greetings—"their visit must remind people of the great services that the Jewish race have rendered humanity." President Harding had not wanted to meet Einstein, but he changed his mind once he was told that Einstein had not signed the manifesto of the ninety-three professors and that he was a Swiss citizen. In Washington a few days later, Mr. and Mrs. Harding had Professor and Frau Einstein over to the White House along with a delegation from the National Academy of Sciences.<sup>28</sup> Amid the picture taking the president amiably acknowledged that he did not understand the theory of relativity, but like public officials elsewhere, he clearly understood what Einstein meant to the nation's admirers of science, its Jewish voters, and its frame of thinking about the recent world conflict.

Einstein's trip netted the coffers of the Hebrew University far less than Weizmann had expected, but it did lead Einstein to publish one of the most influential books on the theory of relativity. For some time he had wanted to publish a good, accessible introduction to his theory, holding that one did not yet exist. He had published a brief book in German in 1917 under the title *On the Special and the General Theory of Relativity, Generally Comprehensible*. In 1919 it was being translated into English by Robert W. Lawson, a physicist at Sheffield University who had spent the war interned in Vienna, and who was eager to foster a restoration of international scientific relations, but Einstein thought the book might better have been subtitled "generally incomprehensible." (Planck noted that "Einstein believes his books will become more readily intelligible if every now and again he drops in the words, 'Dear Reader.'")<sup>29</sup>

At Lawson's urging, Einstein had prepared an article on relativity for *Nature* that turned out to be too long to publish there but formed the basis for the introduction to his theory that he had wanted to write. He apparently expanded that treatment into the Stafford Little Lectures that he gave at Princeton, delivering the first in the afternoon after the honorary degree ceremony to a jammed lecture hall. Princeton University Press contracted to

publish the lectures as *The Meaning of Relativity*. He was late in delivering the manuscript, and the manager of the Press, Paul Tomlinson, was concerned that the delay might diminish sales. He need not have worried.<sup>30</sup>

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### Notes

1. Datus C. Smith, Jr., to Albert Einstein, December 28, 1949, Albert Einstein Papers, California Institute of Technology, Pasadena, California, document 67–803. I am greatly indebted to Diana Kormos Buchwald for advice about Einstein and guidance through his papers.

2. Einstein to Ehrenfest, Berlin, December 4, 1919, in *The Collected Papers of Albert Einstein*, Diana Kormos Buchwald, general editor, vol. 9, *The Berlin Years: Correspondence, January 1919–April 1920* (Princeton: Princeton University Press, 2004), 163. Hereafter, *CPAE*.

3. Albrecht Fölsing, *Albert Einstein: A Biography*, trans. Ewald Osers (New York: Penguin, 1997), 374, 377.

4. Arnold Berliner to Einstein, April 9, 1919, *CPAE*, 9:15.

5. A full text of the manifesto and list of signers is in Georg F. Nicolai, *The Biology of the War* (New York: The Century Co., 1918), xi–xiii.

6. Picard to George Ellery Hale, July 22, 1917, George Ellery Hale Papers, Archives, California Institute of Technology, Pasadena, California, Box 47.

7. Fölsing, *Einstein*, 346, 368.

8. *Ibid.*, 434–436; Matthew Stanley, “‘An Expedition to Heal the Wounds of War’: The 1919 Eclipse and Eddington as Quaker Adventurer,” *Isis* 94 (March 2003): 57–89.

9. “Still no news about the solar eclipse,” he wrote to his mother in early September 1919. Einstein to Pauline Einstein, September 5, 1919, *CPAE*, 9:83.

10. Lorentz to Einstein [September 22, 1919]; Einstein to Robert W. Lawson, December 1919, *CPAE*, 9:201, 96.

11. Thomson is quoted in the *New York Times*, November 9, 1919, 6. The meeting is reported in the *London Times*, November 7, 1919.

12. Jean Perrin to Einstein, Paris, August 28, 1919; A. Frederick Lindemann to Einstein, November 23, 1919; with Arnold Berliner to Einstein, November 29, 1919, *CPAE*, 9:78, 147, 157.

13. Fölsing, *Einstein*, 450.
14. University president to Einstein, January 28, 1919; Georg Count von Arco to Einstein, April 12, 1919; Einstein to Ludwig Hopf, February 2, 1920, *CPAE*, 9:2, 17, 252; Fölsing, *Einstein*, 479.
15. Einstein to Max von Laue, March 27, 1920; Einstein to Pauline Einstein, September 5, 1919, *CPAE*, 9:307, 83.
16. Einstein to Konrad Haenisch, minister of education, the arts, and public education, December 6, 1919; Einstein to Heinrich Zangger, January 2, 1920, *CPAE*, 9:167, 208.
17. Divorce Decree, February 14, 1919; Einstein to Berlin-Schoeneberg Office of Taxation, February 10, 1920; Einstein to Heinrich Zangger, December 22, 1919; Lorentz et al. to Comité Nobel pour la physique, January 24, 1920, *CPAE*, 9:4, 189, 597–598.
18. Fölsing, *Einstein*, 414.
19. Einstein to Heinrich Zangger, Berlin, June 1, 1919; Einstein to Aurel Stodola, Berlin, March 31, 1919; Einstein to Lorentz, August 1, 1919, *CPAE*, 9:44, 15, 68.
20. Einstein to Lorentz, April 26, 1919, March 18, 1920, September 21, 1919, August 1, 1919, *CPAE*, 9:22–23, 303, 93, 68.
21. Fölsing, *Einstein*, 425; Einstein to Max and Hedwig Born, January 27, 1920; Einstein to Hedwig Born, August 3, 1919, *CPAE*, 9:241, 80.
22. Fölsing, *Einstein*, 498.
23. Einstein refused an invitation to lecture in Russia in 1914 on grounds that he didn't want to go "to a country where my tribal companions were so brutally persecuted." *Ibid.*, 489.
24. Einstein to Paul Ehrenfest, Berlin, December 4, 1919, *CPAE*, 9:164.
25. Einstein to Max Born, ca. November 9, 1919; Einstein to Paul Ehrenfest, November 8, 1919, *CPAE*, 9:137–138; Fölsing, *Einstein*, 491–493, 495, 497.
26. *Cleveland Plain Dealer*, May 26, 1921, 1, 2.
27. *Boston Evening Globe*, May 17, 1921, 11; Fölsing, *Einstein*, 502–503.
28. Quoted in the *New York Times*, April 13, 1921; Fölsing, *Einstein*, 502.
29. Fölsing, *Einstein*, 378–379. The English translation of Albert Einstein, *Über die spezielle und die allgemeine Relativitätstheorie. (Gemeinverständlich)* (Braunschweig: Vieweg, 1917), was published in the United States by Henry Holt in 1920 with an appendix recounting the observational verification of the general theory of relativity.
30. The publishing contract was dated May 9, 1921, and the manuscript was due the following month. Paul Tomlinson to Albert Einstein, September 30, 1921; Herbert S. Bailey, Jr., to Peter Wait, April 17, 1953. Albert Einstein Papers, California Institute of Technology, documents 67–885 and 67–953.