
THE ASSASSIN OF RELATIVITY

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SEEMINGLY PARALLEL

After all that has been said about Einstein, today a rather different story, perhaps one not usually heard in the canon of Einsteiniana. Friedrich Adler fought and followed his father, Victor Adler, head of the Austrian Workers Party. When his father pushed him to study something practical like engineering, he chose the abstractions of physics and epistemology. When his father argued for more professorial ambition, "Fritz" plunged into leftist politics (a dynamic that may not have surprised Victor Adler—he was, outside politics, a psychiatrist, rather well known). In fact, Sigmund Freud dreamed of Victor Adler, as he reported in his epochal *Interpretation of Dreams*, where the Dream Dr. Adler warned the dreaming Freud off excessive materialism in psychological explanation. During his theory years, Adler and Einstein had known each other in Zurich. They had the same thesis advisor, Alfred Kleiner, and both Adler and Einstein battled furiously with Kleiner over everything from physics to their careers. In 1908 both Einstein and Adler applied for a university job that had just come open, Adler as a *Privatdozent* at the University of Zurich, Einstein as a clerk from the Bern Patent Office. Friedrich Adler wrote his father on 19 June 1908 that his competition

is a man named Einstein, who studied at the same time as I did. We even heard a few lectures together. Our development is seemingly parallel: He married a student at about the same [time] as I, and has children. But no one supported him, and for a time he half starved. As a student he was treated contemptuously by the professors, the library was often closed to him, etc. He had no understanding of how to get on with the important people. . . . Finally, he found a

position in the patent office in Bern and throughout the period he has been continuing his theoretical work in spite of all distractions. Today he is in the school of Boltzmann, and one of the most distinguished and recognized. And this school, not that of Mach, is the mode today."¹

Ludwig Boltzmann's statistical mechanics, not Ernst Mach's sense-data positivism, may have been the mode, but it was definitely not the fashion Adler wore. His loyalties were to Mach in the realm of physics, as well as on epistemological and political grounds. But Einstein's epistemic-physics classification with Boltzmann did not sway Adler for a moment from backing Einstein for the position he himself was pursuing. To the educational authorities in 1908, Fritz wrote: "If it is possible to obtain a man like Einstein for our university, it would be absurd to appoint me. I must quite frankly say that my ability as a research physicist does not bear even the slightest comparison to Einstein's. Such an opportunity to obtain a man who can benefit us so much by raising the general level of the university should not be lost because of political sympathies."²

The Einsteins and the Adlers took up residence in same Zurich building, 12 Moussonstrasse. Both Adler and Einstein had married Slavs, both had young children. From that building, Adler wrote his father: "We are on very good terms with Einstein, who lives above us, and, as it happens, we're closer to them than any of the other academics. They run a . . . Bohemian household—like our own." Their young children played together, and the two physicists retreated to the attic for discussion. "The more I talk to Einstein," Friedrich Adler added, "the more I realize that my favorable opinion of him was justified. . . . We find ourselves in agreement on questions which the majority of other physicists would not even understand."³ Such questions no doubt included a shared (Machian) disdain for absolute space or absolute time.

Adler's high estimation of Einstein was reciprocated. By the end of 1910, most everyone knew that Einstein was to be offered a professorship at the German University of Prague: "One can now read in the professional journals about my appointment at Prague. But I have not yet received any communication. If it really comes, then I wish that [Friedrich] Adler would become my successor."⁴ Adler had written extensively on Mach's phenomenological approach to physics and had written some more technical papers (that Einstein respected) on thermodynamics, bashing Ostwald's attempts to reduce all physics to energy. But Adler's succession to Einstein was not to be. With some reluctance, weighted down by financial concerns, Friedrich Adler abandoned epistemology and physics for party work in Zurich and, after 1911, back in Vienna—Victor's unsuccessful struggles to persuade him to continue his work

in theory notwithstanding.⁵ Einstein and Adler remained in contact; in fact, in 1911, Friedrich brought Einstein to his parents' residence in Vienna where they spent a memorable evening in discussion.

In the summer of 1914, Leon Trotsky, then in exile in Vienna, visited the Socialist Workers Party to meet with the Adlers and recorded this:

In the secretariat I came across Friedrich Adler or "Doctor Fritz" as he was called in top party circles. . . . Thin, of quite a good height, slightly stooping, with a fine brow over which his curly shining hair fell down and with the imprint of a perpetual thoughtfulness on his face, Fritz always stood as one apart amongst the quite numerous Vienna party intellectuals so ready for wisecracks and cheap anecdotes. He had spent a year and a half in Zurich as assistant professor of physics and as editor of the local party newspaper *Volksrecht* [*People's Right*].⁶

Trotsky continued: the young Adler "with his inimitable revolutionary temperament" disdained this old system run by his father. But Fritz Adler's real criticism, according to Trotsky, "his distrust and his hate," were directed at the Habsburg regime. During their last meeting (on 3 August 1914), Friedrich Adler showed Trotsky the government's appeal to the population: hunt the suspicious foreigners. Trotsky said: "It was with concentrated abhorrence that he [young Adler] spoke of the rising orgy of chauvinism. But his outward restraint merely masked his profound moral shock."⁷ Then Victor Adler stepped into the secretariat, suggesting that Trotsky immediately accompany him to the chief of the political police (a striking measure of Adler's authority) to find out what the government intended to do with Russian exiles. In the car, Trotsky gestured to the festive reaction the city had to the beginning of war. Victor responded: "all the unbalanced and all the insane are coming out on the streets: this is their day. . . . War throws open the field to every Instinct and every type of lunacy. . . ." *Irrenarzt* Adler, according to Trotsky, viewed politics, especially (as he often put it) *Austrian* politics, as a form of psychopathology. Adler apparently had enough clout with the government to get an immediate audience with political police chief Heyer, who told the leftist duo that leaving town would be an excellent idea. Tomorrow? Trotsky asked. No, today, Heyer responded. Now. Three hours and ten minutes later, the Adlers had Trotsky and family on a train for Switzerland.⁸

SANE AND INSANE KILLING

Furious as he was at the slaughter of war, Einstein in late 1915 was immersed in the hardest work of his life, modifying and extending the equations of general relativity. In the third week of November 1915, he realized that the theory

correctly described the precession of the perihelion of Mercury. Overcome with emotion, he told a collaborator he had the feeling that something actually snapped within him. Friedrich Adler's passionate opposition to the war was directed elsewhere. At lunch, on 21 October 1916, Einstein's "parallel-life" friend took his Browning pistol, walked up to Count Stürgkh, Prime Minister of Austria (who was dining at the prestigious Meissl & Schadh Hotel), and put three bullets through the politician's head. Immediately arrested, Adler was matter-of-fact (*sachlich*) in his responses to the authorities' questions. In May 1917, the Viennese authorities hauled Adler before an Exceptional Court (*Ausnahmegericht*) in Vienna. A *cause célèbre*, the courtroom was packed, the windows opened, and hundreds hung on every word. In his defense, Adler adduced a wide range of offenses by Stürgkh, fastening on two.

Under the former leader's brutal bureaucratic rule, no one, Adler argued, knew who really ruled Austria. Go to a minister and you would be told that it wasn't his department, you had to see Stürgkh. Go to Stürgkh and you would be sent to the military. Stürgkh, Adler contended, "was not a man of the politics of *fortwursteln* [Austrian slang: get-along, go-along]. He was a man who with clear intent and conscience wanted to transform Austria into an absolutist state, and who with a clear course and a steady hand steered for that goal. . . . He was an opponent whom one had to notice, and with whom one had to battle relentlessly. . . ."9 Second, it was Stürgkh who had dissolved Parliament, Stürgkh who had wrecked the progressive road toward democracy that most civilized countries were already following, Stürgkh who stood as a "dead point" (*toter Punkt*) that had to be bypassed if Austria was to progress.

To save his son's life, Victor Adler pleaded for the court to find his son insane. He invoked Friedrich's past history in which his drive to work had surpassed all reason; he gestured to the mental illness found on so many branches of the family tree. And Victor hired a superb defense team to demonstrate the incompetence of his son, as the court deliberated whether he should hang. Aiding the defense was a testimonial from the Physical Society of Zurich, introduced at the trial and duly recorded in the transcript, along with another by Professor Heinrich Zangger. Adler's lawyer, Dr. Gustav Harpner, insisted on the "spontaneous" nature of these glowing reports, both of which spoke to Adler's scientific, philosophical, and personal qualities. Harpner: "I don't need to say that I did not ask for this testimonial. It was a fully spontaneous intervention [*Kundgebungen*]," and that he hadn't known until that very day either of the scientific society or of Professor Heinrich Zangger, who delivered testimony for the defense from Zurich's juridico-medical institute. "Spontaneous"? Not quite. Barely forty-eight hours after receiving Friedrich Adler's

communication, Albert Einstein had intervened. "Dear Zangger," Einstein had written,

The day before yesterday I got a scientific letter from my old friend Fritz Adler. You surely know what the man has perpetrated. I know you never thought particularly highly of him because of his scientific orientation. But as a person, he is an exceptional fellow and extraordinarily selfless, which has gotten him into this stew, as a matter of fact. My compassion for him has grown so strong that I really would like to do something for him.

Behind Zangger's "spontaneity" stood Einstein.¹⁰

In April 1917, Einstein also wrote Adler directly (in prison):

I hope you have received my package. I now have an unusual request: When your affair is deliberated in court, I would like to be summoned there as a witness; you should apply for this. Do not think this senseless; for not only the circumstances directly connected to the event are clarified through witness accounts, but statements are also brought forward that shed light on the character of the perpetrator.—How much I would like to discuss the relativity problem with you!¹¹

As we will see in a moment, that discussion was in train.

But politics weighed heavily on Einstein too.

The war, the physics of simultaneity, politics—all were fused even among Einstein's friends, including the scientist-philosopher-industrialist Walther Rathenau, former head of the war provisions board and author of *Zur Kritik der Zeit*. Modifying Einstein's *Gedanken-experimentalische* description of the coordination of clocks, Rathenau dropped a letter to Einstein just before Adler's trial: "Your illustration of the two flashes of lightning and the train really gripped me here (Incidentally, I turn it into two dynamite explosions and a czar train). What startles the czar twice is only *a single* matter for the assassin."¹²

Einstein so feared Adler's execution that he set aside some of the most productive work of his life, on a generally relativistic cosmology, to write the Emperor:

His Majesty!

Under the pressure of an unavoidable duty, I take the liberty of communicating a plea to your majesty.

The political murder, of which Fritz Adler is guilty, shook the well-being of every rightly sensitive person in the deepest way. With not a single word will I prettify this gruesome act. With regard to the psychological situation of the perpetrator, however, it seems to me to have to do with a tragic accident rather than a crime. Few can have known Herrn Adler so well as me.

I have known Herrn Adler since we were studying physics together 20 years ago in Zurich. He was for several years still my closest colleague as an assistant professor in [physics] at Zurich University; we also were, at that time, housemates. In those years I took Adler to be a man of the purest character, of an almost unparalleled selflessness. Few people have shown themselves to me, to be so unqualifiedly reliable and honest as he; few have, in such measure, overcome their own desires and devoted their strength to other than personal things.

Under these circumstances, I feel an unavoidable duty, if I herewith submit to your majesty, from the bottom of my heart, a plea for you to invoke the law of clemency, in the event that Adler is sentenced to death. A valuable life could be so preserved.¹³

On 18 and 19 May 1917, Stürgkh's assassin broke his public silence: hauled before the *Ausnahmegesicht*, as Einstein feared, Adler faced hanging. Debate raged. Victor Adler's hope for an insanity ruling had its best chance through the psychiatric report. But the commission found nothing *Wahnhaftes* in the motivation of Adler's act.¹⁴ Indeed, as they saw it, "Adler's act, from the standpoint of morality, must be considered as in some ways in contradiction to his character as it has been demonstrated up to the present. . . . One must say that his life has been, up to now, idealistic and all his efforts have been in that direction. He is however a fanatic . . . far from the normal Type." The fanatic and the mentally ill might be branches from the same trunk, the commission allowed; they conceded too that Adler was hereditarily a "psychopathological person" who suffered depressions and shallow manic states. But the experts ruled that "the act of which Adler is accused did not take place under [such psychopathology] instead [it] must be understood as the response of Adler's personality to given outer circumstances."¹⁵ These experts concluded: Adler may be psychopathological but he is responsible.

Against his own (survival) interest but in favor of his (political) ambition, Adler insisted he was fully responsible for his act as an expression of political conviction. "Already before the attack, I knew full well," he told the court, "that people would at first say that . . . committed this act as an incompetent [*Unzurechnungsfähiger*]. I was prepared—I *had* to be prepared that the press, above all, would be under the influence of the regime. . . ."¹⁶

Battling for Friedrich Adler's sanity—and fate—were two oddly paired sides. On the side of insanity sat Victor Adler, who, as father and psychiatrist, was desperately trying to make the case for his son's hereditarily induced loss of equilibrium, joined by the vicious right-wing press seeking to strip the assassination of political import. Meanwhile, in February of 1917, Trotsky

recalled in writing Victor Adler's biting words about the psychopathology of Austrian politics:

How far [Victor] was at that moment from the thought that his own son would carry out a political assassination. . . . I mention this here because after Fritz Adler's act of assassination the Austrian yellow press . . . attempted to present the self-sacrificing revolutionary as unbalanced and even insane, from the standpoint of their own base "sanity" that is. But the judicial medicine of the Habsburgs was forced to capitulate before the courageous tenacity of the terrorist. [With] what cold contempt [Fritz] would have treated the retorts of the eunuchs of social-patriotism . . . if their voices had reached him in prison.¹⁷

This prosanity alliance of the State, the medical-psychiatric panel, Trotsky, and Friedrich Adler himself left bad odds for the defense. But before continuing with the chronology, we need to step back because, from prison, awaiting trial, Adler attacked.

Einstein's final synoptic paper on the general theory of relativity was finished in March 1916, and Einstein himself was deeply affected by politics. During the war, Einstein had faced off against most of his professorial colleagues. Back in October 1914, dozens of luminaries—including the biologist Ernst Haeckel and the discoverer of X-rays, Wilhelm Roentgen—had signed a "Manifesto to the Civilized World," berating critics of the German military and defending German militarism in general and war actions in particular. Einstein with two colleagues responded in 1915 with a minority manifesto of their own, lobbying for a League of Europeans and an end to the catastrophic war.¹⁸ To the French author Romain Rolland, Einstein lamented the idiocy of militant nationalism that was tearing apart three centuries of cultural achievement. (Einstein once remarked that he felt roughly the same emotional bond to the nation as he did to his life insurance company.) Even scholars, he sadly remarked, had thrown their lot in with the insanity of nationalism.¹⁹ Einstein's wartime interventions were frequent, and both public and private. When he heard of the assassination, he acted.

Einstein wrote to Katja, Adler's wife, on 20 February 1917, four months after the shooting, three months before the trial: "Your misfortune and that of your husband, whom I have always admired, touched my heart deeply like little else that I have witnessed in this hard world. He is one of the most splendid and purest men I have ever known. I cannot judge his deed, since I cannot assess the motive behind it; I do not believe him capable of rash acts; he is much too conscientious for that. If there is something you think I can do for him or for you, think of me and write me."²⁰

A DECISIVE CRITIQUE

About the same time (mid-February), Adler wrote Katja and his parents from prison about Einstein: "I am suddenly a physicist again! I have made a discovery that one would not be overestimating if one described it as the greatest possible in the current state of physics. I awoke Saturday with the solution to a small problem which has bothered me for more than a year, namely the Foucault pendulum experiment. In the course of working through the consequences of my little insight I have arrived at generalization of the Newtonian principles—an elementary law which up until now has simply been overlooked." It would, Adler believed, give clarity to all questions of mechanics and thermodynamics. A few days later, he wrote to say his trial had been postponed until after Easter 1917—a good thing since he was very satisfactorily plunged deep into physics. "It has unexpectedly come to pass that I have found a decisive criterion in relativity theory that rules against Mach and Einstein and for Hendrik Lorentz. It puts everything in a new light. A big part of it is ready to print." Or as he put it in his letter to his parents: "What Mach searched for, I have found. . . . Like all great discoveries" it was simple and full of consequences.²¹

Friedrich Adler's discovery opened for him a new campaign. For Victor Adler, too, it launched a second front on which he could fight to have his son declared insane: the insanity of opposing Einstein. Adler the elder shot copies of his son's new manuscript to Einstein, Philipp Frank, and others, asking if the inner workings of the physics constituted evidence that could be used to show the derangement of his son. That put the physicists in a bit of a quandary, as Frank recalled a bit later: "The experts, especially the physicists, were placed in a very difficult situation. Adler's father and family desired that this work should be made the basis for the opinion that Adler was mentally deranged. But this would necessarily be highly insulting to the author, since he believed he had accomplished an excellent scientific achievement. Moreover, speaking objectively, there was nothing in any way abnormal about it except that his arguments were wrong."²² Meanwhile, Friedrich Adler had every intention of maintaining his sanity against his father, the courts, the right-wing screeds—anyone challenging his epistemo-physical work. He was willing to die for his sanity.

Back to physics. With the return address "Vienna VIII, 1 Alser St." (which was the prison), on 9 March 1917, Adler wrote to his relativistic twin, Einstein: "Now that I have plenty of free time at my disposal, I have taken up my studies on the foundations of physics again, which I had abandoned seven years ago. I intended to assemble in a book my previously published and unpublished papers on Mach. . . . The work had already progressed quite far

when I started the chapter on relativity. Then something quite unexpected happened to me."²³

Adler's philosophical work, *Ernst Mach's Conquest of Mechanical Materialism*, written in prison (and published in 1918), had two goals.²⁴ First, it was a rousing defense of many of Mach's doctrines. But it also reconstructed Mach, removing him from dogma. Like Mach, Adler wanted to free physics of absolutes in space, time, motion, and mass. It would be the counterpart, Adler argued, of Marx's historicization of the basic categories of an all-too-human society. Like Marx, Mach had grounded his views on experience (materialism) and made them irreducibly historical (equivalent, said Adler, to "dialectical").²⁵ In fact, for Adler, Mach's historical materialism of the inner core of science was precisely the needed complement to Marx. To Einstein, Adler wrote that he'd taken Mach's view since 1903 and that he'd advocated the importance of the relativity of motion in his 1907 courses back in Zurich. He recalled for Einstein the arguments they'd had in the attic rooms of Moussonstrasse 12: "I was very irritated, you see, that in taking the centrifugal effects into account, you rejected relativity for rotations. . . . So much the greater was my joy when your general theory of relativity came out." Adler believed Einstein had accepted Mach's position "entirely, including centrifugal phenomena." As Adler told Einstein in early February 1917, that joy was short-lived:

I was in ecstasy when suddenly, 4 weeks ago, a turning point came in my considerations which reveals the whole problem differently from how I had seen it previously. I found, first in a more recent discussion of Foucault's pendulum experiment, and then generally, a criterion that you and Mach do not take into consideration, or at least, not sufficiently, which sheds new light on it all. I believe I have found where the error in the assumptions not only by Mach but also by you lies.²⁶

Adler's new system, he continued, "does not involve a return to 'absolutes' but a criterion of a relativistic nature for preferred reference systems." Here, he hoped was the true spirit of Machism rescued from Mach's and Einstein's over-extended development of relativism.

There are three particularly interesting points about the technical criticism. First, Adler went after what he considered to be Einstein's (and Mach's) anthropocentrism. Second, on good Machist-positivist grounds, he told Einstein that his own way did not involve the ether. No ether as intuitive (Alfred Kleiner), as necessary physical hypothesis (Lorentz), or even as a pragmatically useful fiction (Henri Poincaré). Nor was Adler interested, on Machian anti-atomic grounds, in the detailed structure or dynamics of the electron. Lorentz, Max Abraham, Alfred Bucherer, and Poincaré were above all intrigued

by the possibility of spelling out the electron's structure. That said, Adler's work *does* involve a privileged frame—but not because he believed the earth (for example) is special. No, he argued that the privileged frame emerges from a rigorous application of the relativity principle itself. None of Adler's arguments moved Einstein, but Einstein did engage Adler in detail—with as much care as he lavished on any other critic. "Healthwise I am fine," Adler assured Einstein, "and, since I have the opportunity rarely offered in life being able to work in peace, I am completely happy, even though the time still available to me can be counted only by the week."²⁷

The trial proceeded—and ended—dramatically. At the final judgment, in May 1917, the court pronounced the defendant guilty and responsible. The punishment—according to section 136 of the sentencing protocols [*Strafprozeßordnung*—was death. Four days after the verdict, on 23 May 1917, an interview with Einstein appeared on page 2 of the morning edition of the *Vossische Zeitung*: "Friedrich Adler as Physicist: A Discussion with Albert Einstein." Undeterred either by the sentence or by the broader wartime repression that might have affected him, Einstein declared Friedrich Adler to be a clear thinker, someone who acted objectively—and selflessly—in his life as well as his studies. Einstein related how, years before, Adler had sacrificed his own excellent chance to land the University of Zurich professorship—even though it was an existential necessity for Adler that he get it. Adler had removed himself in favor of someone else because he considered the other candidate far superior from the point of view of pure science. Einstein did not mention that he, Einstein, had been that competitor.²⁸

Adler's work in physics, Einstein continued, consisted in the further development of the Machian point of view. According to Adler, it was Mach who had "brought it to consciousness" that mechanics had not been essentially altered since the time of Newton. There had been formal adumbrations to be sure, but it was in 1888 that Mach himself disentangled "classical mechanics" (handed down from the 17th century) from an "ideal mechanics" (that would be predicated only on the relation of objects to one another.) Heinrich Hertz had developed this point of view further—and then, through General Relativity (according to Adler), Albert Einstein had brought this "ideal program" to a "more beautiful and more unified" form that would overlap in everyday physics with the classical form. It was Adler's goal (so Einstein related) to describe the past of a body's behavior in terms of classical physics, and to use this "ideal physics" to tie a body to the rest of the world. The difference between classical mechanics and ideal mechanics consists in this: in ideal mechanics there is only the direct description of a body's behavior relative to other bodies: no speed, no acceleration, no inertia, and no force as classically conceived. Adler: "With Hertz and Einstein the real [*wirkliche*] path of the body is the

'straightest path'; in classical mechanics however, the real path is the superposition of two straightest paths" (that is, the straightest paths of velocity and of acceleration). Despite Einstein's respectful description, he was clear—Adler's project was not Einstein's. In particular, Adler was determined to locate a "preferred reference frame" grounded in the center of gravity—for example, the center of the earth or the center of the earth-moon system, when dealing with terrestrial phenomena. In common with relativity theory, Adler recognized multiple equivalent and equally justified frames of reference. But Adler's point of view was necessarily narrower than general relativity, grounded as it was in the center of gravity of ponderable bodies. Einstein reported that Adler considered this description as simpler and more natural.²⁹ Obviously Einstein did not agree.

Adler's execution was stayed, and he was transferred to the fortress at Stein-on-the-Danube, where he was to serve hard time in solitary confinement. On 6 July 1918, he once again wrote Einstein: "Dear Friend, It has been almost one year since I wrote you, but I have been thinking of you incessantly, for I was occupied the whole time with relativity theory. . . . I know that you are so convinced of the correctness of your foundations that you do not expect anything from further discussions of it. And yet I would like to burden you with the perusal of my book, for I imagine now having really caught Ariadne's thread, leading to a compelling derivation of the necessity for a preferred reference system from your transformation equations."³⁰ Simple diet, good air, quiet solitude—death row agreed with him: "In virtually all respects, I am doing better here than in Vienna. . . . In short, in this topsyturvy world we now live in, it is in actual fact considerably nicer *intra muros* than *extra*."³¹

Adler lambasted Einstein for his relativity of space and time. Einstein fired back a detailed response on 4 August 1918 that argued this way: At the root of all that Adler had done, according to Einstein, lay two crucial assumptions: (a) no Lorentz deformation of moving rigid bodies, and (b) no influence of motion on the running rate of clocks. Assumption (a) as Einstein noted, leads to Max Abraham's motion of an electron (and therefore was in trouble with electron deflection experiments). Assumption (a) also led inevitably to a direct contradiction with Michelson's experiment if it is valid that for a preferred reference frame K in which light travels same speed always in a vacuum. Such considerations led Einstein to lay out for Adler precisely the constraints that Einstein understood to hem in any putative theory of the electrodynamics of moving bodies. So the ether was neither in motion nor at rest. Einstein insisted that "It was these facts which compelled the formulation of the special theory of relativity." As far as Einstein could see, Adler had not even tried to address these constraints.

The struggle continued. One of Adler's strong claims in *Ortszeit* was that "The error of Einstein's considerations is hidden in the circumstance that Einstein silently has smuggled in the assumption that clocks in all systems have been coordinated [*gerichtet*]." ³² Einstein bridled: "It is self-evident that I treat all times of the system as equivalent since I set out from the postulate of relativity. I cannot be reproached for not making any use of your 'zonal time'." Einstein insisted that Adler's "symmetry system K" was, under another name, nothing other than Lorentz's ether—and so Adler had inherited, willy-nilly, all of Lorentz's problems. "Your sentence 'The error of Einstein's . . . ' is completely incomprehensible to me. If a system's clocks are not set rel[ative] to one another (in some way or other), their data are then incoherent and cannot serve for a time definition, not even in a 'symmetry system'." "My [Einstein's] view" is that one can have a "system time" but not a "universal time." This latter can be had only through instantaneous signaling or motion-independent clocks. "The existence of either of these things must be questioned in principle, though, *a priori*." ³³

Adler went after the Einsteinian clock-coordination in other ways. Identifying his own work with the strict examination of measurement that Mach had pursued elsewhere, Adler argued that inequalities in the running rate of clocks could be due either to their mechanism or to the partition of their dials. ³⁴ Einstein's sharp tongue, otherwise held in check in correspondence with Adler, let loose: "the dial is a bit odd, why not the handle and the polish as well? We imagine my standard clocks as having been produced identically somewhere and sometime by a clockmaker who enjoys a world monopoly and then having been brought to the different locations and into the states of motion of the various locations." ³⁵

Adler tried again a few weeks later (20 September 1918), claiming that the Lorentz theory was preferable in certain respects; that was nonsense, Einstein replied: "A decision between Lorentz and Einstein is impossible . . . since *factually* Lorentz's theory agrees entirely with the special th[eory] of rel[ativity]; it is just a more specialized (exclusively electromagnetic) theory." ³⁶

The up-the-river theorist then turned to clocks and the "twin paradox," as it came to be called: "you can see that I did not overlook your 'standard clock,' rather that it is the actual point of departure of my reflections. I have been making a serious effort for a year now to understand it, but an *insurmountable logical contradiction* in your assertion remains for me": one twin rotates with the earth, comes back, the other remains still; each looks the same to the other, yet the clocks are supposed to be different. Einstein stands his ground: "Only if systems K and K' were both *justified* systems in the sense of the special principle of relativity would there be a contradiction with the (special)

principle of relativity; they are not both justified, however, because K' is not a Galilean (acceleration-free) reference system. Only when general relativity is taken as a basis are both frames of reference equivalent. In this case, the difference in the rates of the clocks is explained by the combined effects of the influence of the velocity and the gravitational potential. Nowhere is a contradiction evident."³⁷ Then Adler's piece de resistance:

At the heart of Adler's argument in his book manuscript lay the view that, when Einstein had taken special relativity to encompass all inertial reference systems as "equivalent," he had generalized too far. Instead, Adler allowed two reference systems, S and S' , to be equivalent if they had equal and opposite velocities with respect to a "symmetry system" (*Symmetralsystem*) K . The infinite set of pairs of systems—(S_m, S_m'), (S_n, S_n'), . . . —were equivalent, by Adler's lights, but, emphatically, when the systems had different velocities, S_m was not equivalent to S_n' . He then introduced three key definitions. *Ortszeit* (local time) was the time that S or S' should use; it was equal to the quantity Lorentz had introduced some years before, $t' = t - vx/c^2$. This quantity had been taken up by Poincaré and given a physical definition, but for Lorentz it was purely a mathematical device that would simplify the equations. Later, in 1904, Lorentz modified the result, so it read $t' = k(t - vx/c^2)$, where $k = 1/\sqrt{1 - v^2/c^2}$. This allowed Lorentz to make the equations of electrodynamics look exactly the same in arbitrary inertial reference systems as they did in the system that was at rest with respect to the ether. Adler wanted to use only the older form of Lorentz's local time, and it is this that he designated "*Ortszeit*."

Next, Adler defined "Zonal Time" (*Zonenzeit*) following, quite explicitly, the everyday notion of a similar name that had proven of such use in scheduling trains and other practical matters. Indeed, Adler's text referred frequently to the details of real clock coordination techniques—he discussed master clocks (*Normaluhren*); cable links between sites; and the distinction in particular cities, such as Geneva, between "train time" (*Bahnzeit*) and "city time" (*Stadtzeit*). Just as Middle European Time specified a common time for the region of the earth's surface from 0° longitude (through Greenwich, England) to 15° east, so Adler (his comparison) used "Zonal Time" to indicate a conventionally synchronized set of clocks based on a single local time in a particular domain.³⁸ Finally, "System Time" (*Systemzeit*), according to Adler, was what you had if the Zonal Time extended throughout the entirety of the domain in question—for example, if you conventionally made the whole world use the time of one particular place, that would be a "System Time." It was Adler's view that Einstein had wrongly applied his light-exchange method of clock coordination to the entirety of the domain of all inertial reference systems,

that is, (Adler said), Einstein had promoted clock synchronization by light exchange to a "higher" *system* concept valid everywhere.³⁹

This over-extension was Einstein's great mistake, according to Adler. The famous physicist had "silently" smuggled in the assumption that his light-coordination method could rightly be applied to *all* inertial frames of reference. On the contrary, the prisoner wrote, there is one system, the privileged "symmetric" system K, where this Einsteinian time coordinating "correction" need not take place.⁴⁰ We will return to Adler's best argument for K in a moment.

In many respects, Adler understood the special theory of relativity in ways that Einstein found lucid. The good prison air left Adler not the slightest bit vague, for example, about several points on which he found Einstein's relativity theory to have substantively advanced physics. These were not trivial points, either—each had become a point of contention by numerous critics: Adler wrote lucidly in *Ortszeit, Systemzeit, Zonenzeit* about Einstein's new kinematics, how Einstein had studied the properties of rulers and clocks *before* undertaking questions about the forces that moved particles around—and many, even among the world's best physicists, had not truly understood this about Einstein's work. Adler grasped too that Einstein had *derived* the Lorentz transformation, not *assumed* it as had both Lorentz and Poincaré. And Adler noted very clearly that Einstein knew how to add one velocity to another relativistically—Adler, and practically no one else, saw immediately the importance of Einstein's velocity addition formula. Then Adler wheeled around and attacked: Einstein's equations, he insisted, hid a covert preferred reference frame.

Figure 13.1 illustrates Adler's anti-Einstein machine. His Figure 2 shows the machine before anything is set in motion. Two identical meter sticks are used, one (below the horizontal line) with conducting leads attached from each end of the stick to a galvanometer labeled G. The stick above the horizontal line also has two conducting wires attached to its ends, but these go to a battery, E. If the upper (battery-bearing) stick moves right to left while the lower stick is stationary then, says Adler, according to Einstein, the upper stick will contract (Adler's Fig. 4): no contact is made between electrical leads, so the galvanometer does not deflect. Conversely, if one takes the point of view of the battery-bearing stick, then the galvanometer stick contracts (Adler's Fig. 3). Again, no deflection of the galvanometer. But, says Adler triumphantly, if we put ourselves in the "symmetry frame" in which the two sticks are moving with equal and opposite velocity, then the conductors touch: the galvanometer deflects. Since the galvanometer cannot both deflect and not deflect, he concludes that the nonsymmetric frames do not reflect reality—which is contained only in the symmetry frame (Adler's Fig. 5).

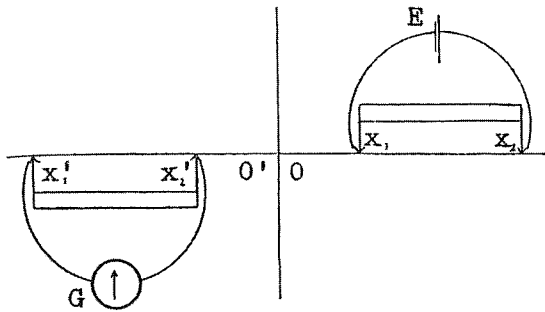


Fig. 2. Die Systeme vor Bewegungsbeginn.

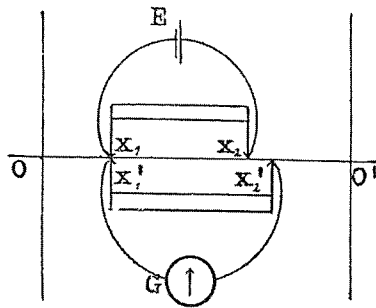


Fig. 4. Die Koinzidenz von x_1 und x_1' gesehen im System S_n zur Systemzeit t_1 .

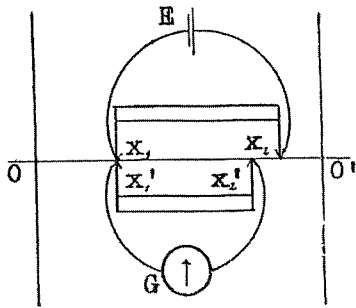


Fig. 3. Die Koinzidenz von x_1 und x_1' gesehen im System S_n zur Systemzeit t_1 .

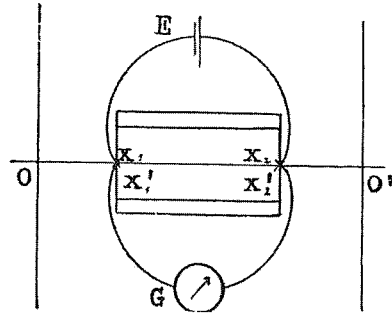


Fig. 5. Die Koinzidenz von x_1 und x_1' gesehen zur Zeit τ_1 des Symmetralsystems.

FIGURE 13.1 Adler's anti-Einstein machine. Friedrich Adler, *Ortszeit, Systemzeit, Zonenzeit und das ausgezeichnete Bezugssystem der Elektrodynamik. Eine Untersuchung über die Lorentzsche und die Einsteinsche Kinematik* (Vienna: Wiener Volksbuchhandlung, 1920), 128f.

Adler: relativity is smashed. "The galvanometer will say that the two relativity theorists [both Einstein and Lorentz] are wrong, that neither of the two slabs has contracted." Bang: Einstein's relativity theory is dead.⁴¹

This time Adler's target did not drop. "[Y]our bias for absolute time or for the instantaneous signal is exposing itself," Einstein replied. "Under no circumstance will a current flow if the contacts made are so brief that their duration is small against the propagation time of light or of an electrical wave between the two contact points."⁴² Neglecting the necessity of keeping contact long enough for light to make the crossing is, in principle, at the heart of the problem. But making the contacts longer so this condition was fulfilled in the "symmetry frame" (Adler's Fig. 5) turns out to ensure that the galvanometer deflects in all the moving frames. Einstein liked the example so much that he wrote a new and related one for Adler, illustrating again how the relativity

of simultaneity resolved the new paradox, and considered including Adler's galvanometer example in the dialogue between an anti-relativity critic (*Kritikus*) and a relativist that he was writing for *Die Naturwissenschaften*.⁴³ Bullet deflected, its lead recycled as movable type pro causa:

Kritikus: I see, you have defused my objection, but I must tell you, your argument leaves me more convicted than really convinced. . . .

If anyone was more convicted than convinced, it was Friedrich Adler in late October 1918. By then, the Imperial armies were on the run. Einstein wrote to Adler on 20 October wondering "who between us will be the first to manage to come and see the other. Who can know?" Within days, the Social Democrats were hovering about the levers of power; the Emperor was urgently pleading for assistance; and desperately, the old Council of Ministers offered amnesty for all political prisoners. Friedrich Adler emerged from the Stein fortress on 1 November 1918 and was immediately greeted as a hero of the working class, not only in Austria. That said, it took extraordinarily little time after his release for Adler to clash with his father's moderate positions. It was their last conflict: Victor died on 10 November 1918.

Turbulent times. Both Friedrich Adler and Einstein pushed for a socialist, internationalist position, but one that would eschew the antidemocratic drive of the Bolsheviks. Einstein went to one of the soldier-worker councils to plead for democracy, and on 13 November 1918, pressed for a National Assembly:

[A]ll true democrats must stand guard lest the old class tyranny of the right be replaced by a new class tyranny of the left. Do not be lured by feelings of vengeance to the fateful view that violence must be fought with violence, that a dictatorship of the proletariat is temporarily needed in order to hammer the concept of freedom into the heads of our fellow countrymen. Force breeds only bitterness, hatred and reaction.⁴⁴

Adler too was similarly vocal in his challenge to the dictatorial left. Despite such increasing doctrinal tensions within the left, in January 1919, Lenin and Trotsky offered Adler the position of Honorary Secretary to the Third International, honorary commander-in-chief of the Red Army, and honorary chairman of the Central Soviet.⁴⁵ He refused. To Lenin's and Trotsky's dismay, Adler—at this point far more famous than Einstein—did worse: he joined the center-left Second International as it met in Bern (February 1919), only to dispute and split with *them* because they purged the Bolsheviks. In short order he had created the political version of his "privileged frame of reference" in which he could follow no laws but his own.⁴⁶ Vladimir Lenin returned the compliment—he denounced Adler in December 1918:

The bourgeoisie are compelled to be hypocritical and to describe as "popular government," democracy in general. . . . The Scheidemanns and Kautskys, the Austerlitzes and Renners (and now, to our regret, with the help of Friedrich Adler) fall in line with this falsehood and hypocrisy. But Marxists, Communists, expose this hypocrisy, [as they aim] to replace this dictatorship with *the dictatorship of the proletariat*.⁴⁷

Trotsky concurred, adding in April 1922 a postscript to his earlier, laudatory *Novy Mir* profile of the Adlers; now he lamented that Fritz Adler's personal courage was not matched by his "strength of thought." A fallen hero, Trotsky lamented, for "now Adler acts as a leader of the 2nd International serving the cause against which he had attempted to stand up if only by staking his life. . . ." ⁴⁸ Political satirists, but also Trotsky, dubbed Adler's position the "Second and a Half International." When the Moscow Trial of 1–9 March 1931, aimed its sights at "saboteurs" supposedly encouraged by a scheming Labour and Socialist International (expanded from the Second International), Adler and his allies blasted Stalin's falsehoods, showing, with the cover photograph of their book, *The Witchcraft Trial in Moscow*, that one of the accused, Abromovich, could not possibly have been in Moscow in August 1928 because he was in Brussels at the LSI meeting.

Then Adler turned personal. "What I have so far set out could have been written by any other socialist . . .," Adler wrote, though he never counted himself among the many. "I am compelled to speak *personally* for my attitude to the problems raised by the Moscow Trial is not so simple as that of those who reject individual terror 'on principle.'" He recalled his words to the Special Tribunal in which he asserted that in fact every act of violence was justified against the rulers of Austria—trials like his were a travesty of justice, awakening in him "a feeling of offended honour, a feeling of shame at being an Austrian." Adler added: "Every act of violence was justified against the rulers" of Austria, but now the terrorist should stay his hand against the Soviet Union.⁴⁹

To justify this distinction he continued, "I always held firmly to the belief that questions of individual terror must be decided under a dual aspect: whether they correspond to a *natural consciousness of justice on the part of the people* and whether under the given circumstances they are a *suitable method* in the proletarian struggle for emancipation." Now—November 1936—it was not a time for such acts. The "Stalin experiment" had succeeded in certain economic achievements, but that did not mean for Adler that we should "allow ourselves to be forced to play the part of dumb curs or mendacious whitewashers. In this we differ from the puppets of the Communist Parties." Adler opposed individual or revolutionary acts of terror against the Soviet government. But he absolutely would not "give up the rights of criticism,

a criticism which [is] indispensable, not to the detriment but in favour of a peaceful and evolutionary development in the Soviet Union towards . . . the rights and liberties of the people." The Soviets, Adler declaimed, would be the fortress against Hitler's Germany and Mussolini's Italy.⁵⁰

Unlike Trotsky or Lenin—or the increasingly restive Second International, for that matter—Einstein already, by 1930, sketched the Adlers in an elegiac light. By then, of course, he had left behind the fame of ordinary physics. From the moment the pacifist physicist Arthur Eddington had announced the bending of starlight in November 1919, Einstein was the subject of poems and polemics, architecture and arch enemies. In 1930, Emma Adler (Fritz's mother) wrote to Einstein, "I write to you not as the world famous Einstein . . . but to the Einstein who years ago spent an unforgettable evening with us in the Blü-mengasse," asking if he would contribute to a memory book of Victor. Ein-stein did, recalling their day together in 1911.⁵¹ In the older Adler, Einstein saw a man whom every political camp trusted, a philanthropic spirit that grasped human frailties, a vestige of an older, tolerant Vienna no longer imag-inable in postwar desperation, a priest-like figure of a forgotten patriarchal past. Were such a man alive, Einstein ruminated, perhaps the powers at Ver-sailles would not have made their tragic errors.⁵²

No saint-like priest he, Friedrich Adler never quit making trouble. He in-furiated the communists by lambasting the Stalinist purges, he protested against the Popular Front, he re-joined the Second International, then blasted them for refusing to oppose Hitler during the opening salvos of World War II. During one of Adler's speeches, Léon Blum leaned over to his neighbor and whispered, "he shoots better than he speaks."⁵³ After he fled from Europe to New York in 1940, the Nazi capitulation found him in apartment 14C on West 106th Street, just off Central Park West. "Dear Friend," he wrote to Einstein on Mercer Street in June 1945, "I was very happy to see you personally again." Not missing a beat, Adler plunged into a discussion of an American so-cialist and Max Born's latest on special relativity. The world changed utterly and not at all. Adler moved back to Zurich, where he worked on a biography of his father and lived until January 1960.⁵⁴

THE ASSASSIN OF RELATIVITY

Friedrich Adler is a troubling figure, an ever-recurring tertium quid in histor-ical set-pieces we are used to staging as two-part Manichean struggles. He ap-pears, infuriatingly, to stand for the right to the left and, enragingly, for the left to the right. He stood with clear-sighted sanity and obsessive insanity; the best, most efficient party official and dutiful son, but also the schismatic, pat-ricidal opponent of the ameliorist Austrian Socialist establishment that his

father had devoted his life to building. Fritz was a hero to the revolutionaries Lenin and Trotsky, nominated to a prestigious place in the Third International, then rescuer to the Second International, then marching alone with the "Second and a Half" into the political night. From his cell came *Ernst Mach's Conquest of Mechanical Materialism*, which began with an homage to Mach, grappled with Mach's sworn enemy Max Planck, and then pulled back from both—neither anthropocentric-relativist nor trans-humanly absolutist. Finally, prison-author of a book litigating between his old friend Einstein's work and that of Lorentz and yet one that ends up throwing both accounts into the trash, Adler saw himself as the discoverer of the fatal flaw in the relativisms of both Einstein and Mach: Adler, the truest relativist with the anti-relativist, privileged frame K.

Here was the pacifist killer, the socialist individualist, the sideways gear in the motor of modernity. How to make sense of this wrongness in the proportion? Some have tried to find a psychodynamic explanation—a task in a certain sense launched by Friedrich Adler's psychiatrist-father long before Fritz gunned down Count Stürgkh. Melancholia, mania, fears of a nervous collapse—all these figure in the letters between son and father. One recent psychohistorical account makes Fritz Adler's gunshots into an attempt to impress his father. That seems, on the face of it, rather unlikely, given the lifetime Victor Adler had devoted to working within the Austro-Hungarian establishment. A step up might be to track the event as a symbolic (as well as real) killing. Even better: an account that took the fundamental cycle of ambivalence through his many relations of attachment and rebellion. Retainer and regicide: Fritz's deep friendship and fury with Einstein, with his filial devotion to and up-ending of Mach, and his ferocious devotion to the Party then his denunciation of it—all double actions of attraction and repulsion, need and hate.

But even corrected, refined, made more multivalent, the reductively psychological account won't do. It won't do for Adler and it won't do for Einstein—not because there is nothing to psychological explanations, but because here, in this case, they are too broad, too crude, too unmatched to the phenomena we want to understand. In Adler's case the post-hoc psychopathologizers are actually joining, after the fact, one side in the 1917 trial: that of the yellow press, struggling to depoliticize Adler's act. For both Einstein and Adler, reductive psychohistories too crudely make a bilayer system of the real (psychological) and the symbolic (physics, philosophy, politics).

Another possibility: We could take politics as our base—either the explicit politics that Friedrich Adler held or the politics of which he was a part but which were beyond his control. Then we could see his commitment to Machism as an expression of his "fundamental" Austro-Marxism, a stance he had taken (according to his biographers) since late childhood, growing up as

he did in the heart of the movement. His killing of Stürgkh, his philosophy, his commitment to a relativity of physics—all could be seen as part of his “underlying” politics. Even his psychological state could be taken to emerge from a view that Adler claimed to have held since childhood, that justice meant freedom from raw domination—a view not that far from Einstein’s.

Or flip the account a third way: perhaps Adler’s philosophical beliefs lie deepest, to the necessary inclusion of sensory data at the beginning of our all-too-human knowledge and beliefs. Because he was trained by Mach, we could make Adler’s politics and physics an epiphenomenal description of underlying views about how we secure knowledge.

None of these “true ground” accounts rings true to me. Much as we might like to “solve” Friedrich Adler by classing him in familiar dichotomous categories, maybe we should not. Maybe this strange, disquieting cipher helps us not so much by his typicality, but as a kind of anti-case study, a disturbing and forgotten (though once more famous) *Doppelgänger* to Einstein, an exemplar of nontypicality in a profoundly untypical moment. Maybe Adler could remind us of the limits of our categories, and in so doing help us understand a bit better who Einstein was by setting him in relief and showing us the explosive confluence of philosophy, politics, and physics from 1905 to 1919. After all, Einstein too drew heavily on Mach—and his nemeses Boltzmann and Planck. Einstein too could both sympathize with the assassin and take pleasure in the company of royalty and his cordial exchanges with Franklin Roosevelt. Einstein too wanted a physics of relative lengths of times but also of absolute speed of light and one set of physical laws—Machian relativism and Planckian absolutes. In these tensions, perhaps, lies a breakdown of comforting structures we too easily adopt from the early 20th century.

Of course, Einstein won his relativity battles and left to us a legacy unmatched in the history of science. True too, Friedrich Adler lost his wars—for a way to skew the dictatorships left and right in pre-World War II Austria; for an alternative to relativism and absolutism in philosophy; for a relativistic path to a privileged frame of reference. But both Adler and Einstein endlessly challenged simplistic splits. If the hybrid of philosophy, physics, and politics presses us to rethink the tumultuous years of the 20th century outside the realm of simple dichotomies, that might be a good last shot from the assassin of relativity.

Peter Winch, trans. (Chicago: University of Chicago Press, 1980), p. 41. Wittgenstein's famous quote derives from his *Philosophical Investigations* (New York: Macmillan, 1953).

³⁴Robert Musil criticized Mach's positivism in a 1908 doctoral thesis (*Beitrag zur Beurteilung der Lehren Machs*) for the University of Berlin. See the English translation, *On Mach's Theories*, Kevin Mulligan, trans. (Washington, DC: Catholic University of America Press, 1982).

³⁵See Ernst Mach, *The Analysis of the Sensations and the Relation of the Physical to the Psychological* (Chicago: Open Court Publishing Company, 1914).

³⁶For examples of Mach's prose style, see Rudolf Haller and Friedrich Stadler, eds., *Werk und Wirkung* (Wien: Hölder-Pichler-Tempsky, 1988), and *Popularwissenschaftliche Vorlesungen*, 4th, rev. ed. (Leipzig: Johann Ambrosius Barth, 1910). On clarity in modern scientific language, see Gerald Holton, *Einstein, History, and Other Passions: The Rebellion Against Science at the End of the Twentieth Century* (Cambridge, MA: Harvard University Press, 1996), p. 163; and Holton, *Thematic Origins of Scientific Thought: Kepler to Einstein* (Cambridge, MA: Harvard University Press, 1973), p. 224.

³⁷Einstein's theory of relativity is misconstrued in, for example, composer George Rochberg's *The Aesthetics of Survival: A Composer's View of Twentieth-Century Music*, rev. ed. (Ann Arbor: University of Michigan Press, 2004), p. 154.

³⁸See Hermann von Helmholtz, *On the Sensations of Tone as a Physiological Basis for the Theory of Music*, 2nd ed. (New York: Dover Publications, 1954).

³⁹Dane Rudyar's essay was published in *The Musical Quarterly* 8 (1922), pp. 108–18. On Rudyar, see Carol J. Oja, *Making Music Modern: New York in the 1920s* (New York: Oxford University Press, 2000), pp. 97–110.

⁴⁰Lazare Saminsky, *Physics and Metaphysics of Music and Essays on the Philosophy of Mathematics* (The Hague: Martinus Nijhoff, 1957).

⁴¹Saminsky, *Physics and Metaphysics of Music*, p. 21. He argued further that "The triton [fourth + major seventh] and its resolution mark a definite position in the tonal universe even as gravitational and electro-magnetic tension in the physical world signify a change in the curvature of the space-time continuum," p. 21.

⁴²See Saminsky, *Physics and Metaphysics of Music*, pp. 33–40.

⁴³Saminsky, *Physics and Metaphysics of Music*, p. 36.

⁴⁴Quoted in Rosenkranz, *Albert Through the Looking Glass*, p. 24. Einstein's statement appeared in the German journal *Menschen* on January 27, 1921.

⁴⁵On Richard Strauss and realism, see Morten Kristiansen, *Richard Strauss's Feuersnot in its Aesthetic and Cultural Context: A Modernist Critique of Musical Idealism* (Ph.D. diss., Yale University, 2000), pp. 32–172.

⁴⁶Ferruccio Busoni, *Sketch of a New Aesthetic of Music*, Theodore Baker, trans. (New York: G. Schirmer, 1911).

⁴⁷Hans Pfitzner, *Futuristengefahr: Bei Gelegenheit von Busoni's Ästhetik* (Leipzig: Süddeutsche Monatshefte, 1918).

⁴⁸See Botstein, "Pfitzner and Musical Politics," p. 65, pp. 72f.

⁴⁹Heinrich Schenker, *Harmony*, Oswald Jonas, ed., Elisabeth Mann-Borghese, trans. (Chicago: University of Chicago Press, 1954). Schenker's *Harmonielehre* was the first volume of his *Neue musikalische Theorien und Phantasien*. On Schenker, see also Leon Botstein, "Gedanken zu Heinrich Schenker's jüdischer Identität," in Evelyn Fink, ed., *Rebell und Visionär. Heinrich Schenker in Wien* (Vienna: Lafite, 2003), pp. 11–17.

⁵⁰Arnold Schönberg, *Theory of Harmony*, Roy E. Carter, trans. (Berkeley: University of California Press, 1978).

⁵¹Clark, *Einstein*, p. 414.

NOTES TO CHAPTER 13

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- ²Friedrich Adler to the Board of Education the canton of Zurich, 1908, cited in Florence, *Fritz*, pp. 44–45.
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- ⁴Einstein to Alfred Stern (Zurich), 6 December 1910, cited in John Stachel et al. (eds.), *Einstein Collected Papers*, Vol. 5, doc. 236 (hereafter CPAE; Princeton, NJ: Princeton University Press, 1987ff.). Princeton University Press's English translation of CPAE: Vol. 5 (1995) is by Anna Beck, vol. 6 (1997) by Alfred Engel, vol. 7 (2002) by Alfred Engel, vol. 8 (1998) by Ann M. Hentschel. Hereafter these English translations designated E; this reference, p. E168.
- ⁵Florence, *Fritz*, p. 45.
- ⁶Leon Trotsky, "Political Profiles, Victor and Friedrich Adler," in *Novy Mir* No. 903, 5 February 1917, <http://www.marxists.org/archive/trotsky/works/1940/profiles/victor-friedalder.htm> (accessed 8 December 2004).
- ⁷Trotsky, "Political Profiles."
- ⁸Trotsky, "Political Profiles."
- ⁹J. W. Brügel, ed., *Friedrich Adler vor dem Ausnahmegericht* (Vienna, Frankfurt, Zurich: Europa Verlag, 1967), p. 147; also Florence, *Fritz*, p. 235.
- ¹⁰AE to Heinrich Zangger, after 10 March 1917, CPAE, vol. 8, doc. 310, pp. E299f., on p. 299.
- ¹¹AE to FA, 13 April 1917, CPAE, vol. 8, doc. 324, p. E315.
- ¹²Walther Rathenau to Einstein, 10–11 May 1917, CPAE, vol. 8, doc. 337, pp. E327–29, on p. E. 328.
- ¹³"Draft for a petition by Albert Einstein to the Austrian Emperor, requesting a pardon for Friedrich Adler," probably spring 1917. Manuscript in the collection of the Max Planck Institute for History of Science, Berlin, Germany. Also in CPAE, vol. 10.
- ¹⁴J. W. Brügel, ed., *Ausnahmegericht*, p. 241.
- ¹⁵J. W. Brügel, ed., *Ausnahmegericht*, pp. 241, 243f.
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- ¹⁸Otto Nathan and Heinz Norden, *Einstein on Peace*, preface by Bertrand Russell (New York: Simon and Schuster, 1960).
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- ²⁰AE to Katja Adler, 20 February 1917, cited in CPAE, vol. 8, doc. 301, p. E288.
- ²¹Quotation "I am suddenly . . ." from Friedrich Adler to Katja Adler, mid-February 1917, in Rudolf Neck, *Arbeiterschaft und Staat im ersten Weltkrieg 1914–19*, 2 vols. (Vienna: Europa-Verlag, 1968), vol. 1, p. 235, doc. no. 140. Quotation including "everything in a new light" from Neck, *Arbeiterschaft*, vol. 1, p. 244, doc. no. 147. Fritz Adler to Katja, 22 February 1917, parts of letter from Friedrich Adler to Katja, Victor, and Emma Adler cited in Florence, *Fritz*, p. 199.
- ²²Philipp Frank, *Einstein: His Life and Times* (New York: Knopf, 1953), pp. 174f.
- ²³FA to AE, 9 March 1917, CPAE, vol. 8, doc. 307, p. E294f., on p. 294.
- ²⁴Friedrich Adler, *Ernst Machs Überwindung des mechanischen Materialismus* (Wien: Verlag der Wiener Volksbuchhandlung Ignaz Brand & Co., 1918).
- ²⁵Friedrich Adler, *Ernst Machs*, pp. 133–40.
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- ²⁸"Friedrich Adler als Physiker. Eine Unterredung mit A. Einstein," in *Vossische Zeitung*, 23 May 1917, morning edition, p. 2, cited in Fölsing, *Einstein*, p. 786 (note 38).
- ²⁹All from Kurt Joel, "Friedrich Adler als Physiker," in *Vossische Zeitung*, 23 May 1917, p. 2.
- ³⁰FA to AE, Stein-on-the-Danube, 6 July 1918, CPAE, vol. 8, doc. 582, pp. E607f.
- ³¹FA to AE, Stein-on-the-Danube, 6 July 1918, CPAE, vol. 8, doc. 582, pp. E607f.
- ³²Friedrich Adler, *Ortszeit, Systemzeit, Zonenzeit und das ausgezeichnete Bezugssystem der Elektrodynamik. Eine Untersuchung über die Lorentzsche und die Einsteinsche Kinematik* (Vienna: Wiener Volksbuchhandlung, 1920), p. 70.
- ³³AE to FA, 4 August 1918, CPAE, vol. 8, doc. 594, pp. E616–20, on p. 617.
- ³⁴Adler, *Ortszeit*, pp. 75, 79.
- ³⁵AE to FA, 4 August 1918, CPAE, vol. 8, doc. 594, pp. E616–20, on p. 618.

³⁶AE to FA (Berlin), 29 September 1918, CPAE, vol. 8, doc. 628, p. E658–60, first emphasis added, second in original.

³⁷AE to FA, 29 September 1918, CPAE vol. 8, doc. 628, p. E658–60, on p. E660.

³⁸Adler, *Ortszeit*, pp. 60f. On train time, city time, master clocks, telegraphic exchange of time signals, and the different zones chosen for train and ship travel, see *ibid.*, chapter 2. For a much more extended discussion of the more-than-metaphors of trains and longitude determination in the development of relativistic clock coordination procedures, see Peter L. Galison, *Einstein's Clocks, Poincaré's Maps* (New York: Norton, 2003).

³⁹Adler, *Ortszeit*, p. 70.

⁴⁰Adler, *Ortszeit*, p. 70.

⁴¹Adler, *Ortszeit*, p. 130, figures on pp. 81, 128f.

⁴²AE to FA, 29 September 1918, CPAE, vol. 8, doc. 628, pp. E658–60, on p. 660.

⁴³See AE to FA, 30 September 1918, CPAE, vol. 8, doc. 629, on pp. E660f–61f. See also FA to AE, 12 October 1918, CPAE, vol. 8, doc. 632, on pp. E664–66, where Adler also switches to an electron traveling with a velocity. Einstein replied that this was an improvement, but now Adler would have no paradox: "You will certainly discover, though, that the condition relating to the moment of passing is independent of the choice of coordinates." From AE to FA, 20 October 1918, CPAE, vol. 8, doc. 636, pp. E670f. The article in *Die Naturwissenschaften* was called "Dialog über Einwände gegen die Relativitätstheorie," published on 29 November 1918 in vol. 6, pp. E697–702.

⁴⁴Einstein, "On the Need for a National Assembly," 13 November 1918, CPAE, vol. 7, doc. 14, pp. E76–77, on p. E76.

⁴⁵Suzanne Sturmthal Russin, *Democracy Under Fire: Memoirs of a European Socialist—Adolf Sturmthal* (Duke University Press, 1989), p. 15.

⁴⁶AE to FA, 20 October 1918, CPAE, vol. 8, doc. 636, p. E670f., on p. E671. On the release of Adler, see Florence, *Fritz* (1971), pp. 301–307. On the Adler and the Second and Third International, see *ibid.*, p. 313.

⁴⁷Lenin, "Democracy and Dictatorship," written 23 December 1918, published 3 January 1919, *Pravda* 2, in Vladimir Ilyich Lenin, *Collected Works*, vol. 28, pp. 368–72, <http://www.cddc.vt.edu/marxists/archive/lenin/works/1918/dec/23.html>.

⁴⁸Trotsky, "Political Parties," in *Novy Mir* 903.

⁴⁹Adler, *The Witchcraft Trial in Moscow: Commission of Enquiry into the Conditions of Political Prisoners, November 1936* (New York: Published for the Socialist Party of the United States by Pioneer Publishers, 1937), pp. 34–36.

⁵⁰Adler, *The Witchcraft Trial*, pp. 34f.; impending war, fortress, p. 36.

⁵¹Emma Adler to Einstein, 9 July 1930, Albert Einstein Archives, Adler File, doc. 34-408.1. I would like to thank and acknowledge the gracious help of the Einstein Papers Project for helping me to locate this and the other documents mentioned below.

⁵²Einstein Archives, Adler File, doc. 6-040.

⁵³Florence, *Fritz*, p. 315.

⁵⁴FA to AE, 28 June 1945, Einstein Archives, Adler File, doc. 6-019.

NOTES TO CHAPTER 14

¹H. Reichenbach, *Philosophie der Raum-Zeit-Lehre* (Berlin: de Gruyter, 1928), pp. 47f.; translated as *The Philosophy of Space and Time* (New York: Dover, 1958), pp. 35f.

²A. Einstein, *Geometrie und Erfahrung. Erweiterte Fassung des Festvortrages gehalten an der Preußischen Akademie der Wissenschaft zu Berlin am 27. Januar 1921* (Berlin: Springer, 1921), pp. 3f.; translated in G. Jeffrey and W. Perrett, eds., *Sidelights on Relativity* (London: Methuen, 1923), pp. 28f.

³See Einstein, *Geometrie und Erfahrung*, pp. 4f. [Jeffrey and Perrett, pp. 30f.]: "Geometry treats of objects that are designated with the words line, point, etc. No kind of acquaintance or intuition of these objects is presupposed, but only the validity of those axioms which are likewise to be conceived as purely formal, i.e., as separated from every content of intuition and experience. . . . These axioms are free creations of the human spirit. All other geometrical propositions are logical consequences of the (only nominalistically conceived) axioms. The axioms first define the objects of which geometry treats.