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book Fa2003 composite.qxd 09/10/03 10:28 AM Page 26

Gerald Holton

Einstein's Third Paradise

Historians of modern science have good reason to be grateful to Paul Arthur Schilpp, professor of philosophy and Methodist clergyman but better known as the editor of a series of volumes on "Living Philosophers," which included several volumes on scientist-philosophers. His motto was: "The asking of questions about a philosopher's meaning while he is alive." And to his everlasting credit, he persuaded Albert Einstein to do what he had resisted all his years: to sit down to write, in 1946 at age sixty-seven, an extensive autobiography – forty-five pages long in print.

To be sure, Einstein excluded there most of what he called "the merely personal." But on the very first page he shared a memory that will guide us to the main conclusion of this essay. He wrote that when still very young, he had searched for an escape from the seemingly hopeless and demoralizing chase after one's desires and strivings. That escape offered itself first in religion. Although brought up as the son of "entirely irreligious (Jewish) parents," through the teaching in his Catholic primary school, mixed with his private instruction in elements of the Jewish religion, Einstein found within himself a "deep religiosity" – indeed, "the religious paradise of youth."

The accuracy of this memorable experience is documented in other sources, including the biographical account of Einstein's sister, Maja. There she makes a plausible extrapolation: that Einstein's "religious feeling" found expression in later years in his deep interest and actions to ameliorate the difficulties to which fellow Jews were being subjected, actions ranging from his fights against anti-Semitism to his embrace of Zionism (in the hope, as he put it in one of his

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book Fa2003 composite.qxd 09/10/03 10:28 AM Page 27

speeches [April 20, 1935], that it would include a "peaceable and friendly cooperation with the Arab people"). As we shall see, Maja's extrapolation of the reach of her brother's early religious feelings might well have gone much further.

The primacy of young Albert's First Paradise came to an abrupt end. As he put it early in his "Autobiographical Notes," through reading popular science books he came to doubt the stories of the Bible. Thus he passed first through what he colorfully described as a "positively fanatic indulgence in free thinking."[1] But then he found new enchantments. First, at age twelve, he read a little book on Euclidean plane geometry – he called it "holy," a veritable "Wunder." Then, still as a boy, he became entranced by the contemplation of that huge external, extra-personal world of science, which presented itself to him "like a great, eternal riddle." To that study one could devote oneself, finding thereby "inner freedom and security." He believed that choosing the "road to this Paradise," although quite antithetical to the first one and less alluring, did prove itself trustworthy. Indeed, by age sixteen, he had his father declare him to the authorities as "without confession," and for the rest of his life he tried to dissociate himself from organized religious activities and associations, inventing his own form of religiousness, just as he was creating his own physics.

These two realms appeared to him eventually not as separate as numerous biographers would suggest. On the contrary, my task here is to demonstrate that at the heart of Einstein's mature identity there developed a fusion of his First and his Second Paradise – into a Third Paradise, where the meaning of a life of brilliant scientific activity drew on the remnants of his fervent first feelings of youthful religiosity.

Einstein's Third Paradise

For this purpose, we shall have to make what may seem like an excursus, but one that will in the end throw light on his overwhelming passion, throughout his scientific and personal life, to bring about the joining of these and other seemingly incommensurate aspects, whether in nature or society. In 1918 he gave a glimpse of it in a speech ("*Prinzipien der Forschung*") honoring the sixtieth birthday of his friend and colleague Max Planck, to whose rather metaphysical conception about the purpose of science Einstein had drifted while moving away from the quite opposite, positivistic one of an early intellectual mentor, Ernst Mach. As Einstein put it in that speech, the search for one "simplified and lucid image of the world" not only was the supreme task for a scientist, but also corresponded to a psychological need: to flee from personal, everyday life, with all its dreary disappointments, and escape into the world of objective perception and thought. Into the formation of such a world picture the scientist could place the "center of gravity of his emotional life [*Gefühlsleben*]." And in a sentence with special significance, he added that persevering on the most difficult scientific problems requires "a state of feeling [*Gefühlszustand*] similar to that of a religious person or a lover."

Throughout Einstein's writings, one can watch him searching for that world picture, for a comprehensive *Weltanschauung*, one yielding a total conception that, as he put it, would include every empirical fact (*Gesamtheit der Erfahrungstatsachen*) – not only of physical science, but also of life.

1 All translations from the original German are this author's, where necessary.

book Fa2003 composite.qxd 09/10/03 10:28 AM Page 28

Einstein was of course not alone in this pursuit. The German literature of the late nineteenth and early twentieth centuries contained a seemingly obsessive flood of books and essays on the oneness of the world picture. They included writings by both Ernst Mach and Max Planck, and, for good measure, a 1912 general manifesto appealing to scholars in all fields of knowledge to combine their efforts in order to "bring forth a comprehensive *Weltanschauung*." The thirty-four signatories included Ernst Mach, Sigmund Freud, Ferdinand Tönnies, David Hilbert, Jacques Loeb – and the then still little-known Albert Einstein.

But while for most others this culturally profound longing for unity – already embedded in the philosophical and literary works they all had studied – was mostly the subject of an occasional opportunity for exhortation (nothing came of the manifesto), for Einstein it was different, a constant preoccupation responding to a persistent, deeply felt intellectual and psychological need.

This fact can be most simply illustrated in Einstein's scientific writings. As a first example, I turn to one of my favorite manuscripts in his archive. It is a lengthy manuscript in his handwriting, of around 1920, titled, in translation, "Fundamental Ideas and Methods of Relativity." It contains the passage in which Einstein revealed what in his words was "the happiest thought of my life" [*der gluecklichste Gedanke meines Lebens*] – a thought experiment that came to him in 1907: nothing less than the definition of the equivalence principle, later developed in his general relativity theory. It occurred to Einstein – thinking first of all in visual terms, as was usual for him – that if a man were falling from the roof of his house and tried to let anything drop, it would only move alongside him, thus indicating the equivalence of acceleration and gravity. In Einstein's words, "the acceleration of free fall with respect to the material is therefore a mighty argument that the postulate of relativity is to be extended to coordinate systems that move non-uniformly relative to one another . . . ."

For the present purpose I want to draw attention to another passage in that manuscript. His essay actually begins in a largely impersonal, pedagogic tone, similar to that of his first popular book on relativity, published in 1917. But in a surprising way, in the section titled "General Relativity Theory," Einstein suddenly switches to a personal account. He reports that in the construction of the special theory, the "thought concerning the Faraday [experiment] on electromagnetic induction played for me a leading role." He then describes that old experiment, in words similar to the first paragraph of his 1905 relativity paper, concentrating on the well-known fact, discovered by Faraday in 1831, that the induced current is the same whether it is the coil or the magnet that is in motion relative to the other, whereas the "theoretical interpretation of the phenomenon in these two cases is quite different." While other physicists, for many decades, had been quite satisfied with that difference, here Einstein reveals a central preoccupation at the depth of his soul: "The thought that one is dealing here with two fundamentally different cases was for me unbearable [*war mir unertraeglich*]. The difference between these two cases could not be a real difference . . . . The phenomenon of the electromagnetic induction forced me to postulate the (special) relativity principle."

Let us step back for a moment to contemplate that word "unbearable." It is reinforced by a passage in Einstein's

book Fa2003 composite.qxd 09/10/03 10:28 AM Page 29

"Autobiographical Notes": "By and by I despaired [*verzweifelte ich*] of discovering the true laws by means of constructive efforts based on known facts. The longer and the more despairingly I tried, the more I came to the conviction that only the discovery of a universal formal principle could lead us to assured results." He might have added that the same postulational method had already been pioneered in their main works by two of his heroes, Euclid and Newton.

Other physicists, for example Bohr and Heisenberg, also reported that at times they were brought to despair in their research. Still other scientists were evidently even brought to suicide by such disappointment. For researchers fiercely engaged at the very frontier, the psychological stakes can be enormous. Einstein was able to resolve his discomfort by turning, as he did in his 1905 relativity paper, to the *postulation* of two formal principles (the principle of relativity throughout physics, and the constancy of the velocity of light in vacuo), and adopting such postulations as one of his tools of thought.

Einstein also had a second method to bridge the unbearable differences in a theory: *generalizing it*, so that the apparently differently grounded phenomena are revealed to be coming from the same base. We know from a letter to Max von Laue of January 17, 1952, found in the archive, that Einstein's early concern with the physics of fluctuation phenomena was the common root of his three great papers of 1905, on such different topics as the quantum property of light, Brownian movement, and relativity. But even earlier, in a letter of April 14, 1901, to his school friend Marcel Grossmann, Einstein had revealed his generalizing approach to physics while working on his very first published paper, on capillarity. There he tried to bring together in one theory the opposing behaviors of bodies: moving upward when a liquid is in a capillary tube, but downward when the liquid is released freely. In that letter, he spelled out his interpenetrating emotional and scientific needs in one sentence: "It is a wonderful feeling [*ein herrliches Gefühl*] to recognize the unity of a complex of appearances which, to direct sense experiences, appear to be quite separate things."

The postulation of universal formal principles, and the discovery among phenomena of a unity, of *Einheitlichkeit*, through the *generalization* of the basic theory – those were two of Einstein's favorite weapons,[2] as his letters and manuscripts show. Writing to Willem de Sitter on November 4, 1916, he confessed: "I am driven by my need to generalize [*mein Verallgemeinerungsbeduerfnis*]." That need, that compulsion, was also deeply entrenched in German culture and resonated with, and supported, Einstein's approach. Let me just note in passing that while still a student at the Polytechnic Institute in Zurich, in order to get his certificate to be a high school science teacher, Einstein took optional courses on Immanuel Kant and Goethe, whose central works he had studied since his teenage years.

That *Verallgemeinerungsbeduerfnis* was clearly a driving force behind Einstein's career trajectory. Thus he generalized from old experimental results, like Faraday's, to arrive at special relativity, in which he unified space and time, electric and magnetic forces, energy and mass, and so resolved the whole long dispute

2 A third was his use of freely adopted (non-Kantian) categories, or thematic presuppositions. The prominent ones include unity or unification; logical parsimony and necessity; symmetry; simplicity; causality; completeness of explanation; continuum; and, of course, constancy and invariance.

book Fa2003 composite.qxd 09/10/03 10:28 AM Page 30

among scientists between adherence to a mechanistic versus an electromagnetic world picture. Then he generalized the special theory to produce what he first significantly called, in an article of 1913, not the *general* but the *generalized relativity theory*. Paul Ehrenfest wrote him in puzzlement: "How far will this *Verallgemeinerung* go on?" And, finally, Einstein threw himself into the attempt of a grand unification of quantum physics and of gravity: a unified field theory. It is an example of an intense and perhaps unique, life-long, tenacious dedication, despite Einstein's failure at the very end – which nevertheless, as a program, set the stage for the ambition of some of today's best scientists, who have taken over that search for the Holy Grail of physics – a theory of everything.

So much for trying to get a glimpse of the mind of Einstein as scientist. But at this point, for anyone who has studied this man's work and life in detail, a new thought urges itself forward. As in his science, Einstein also *lived* under the compulsion to unify – in his politics, in his social ideals, even in his everyday behavior. He abhorred all nationalisms, and called himself, even while in Berlin during World War I, a European. Later he supported the One World movement, dreamed of a unified supernational form of government, helped to initiate the international Pugwash movement of scientists during the Cold War, and was as ready to befriend visiting high school students as the Queen of the Belgians. His instinctive penchant for democracy and dislike of hierarchy and class differences must have cost him greatly in the early days, as when he addressed his chief professor at the Swiss Polytechnic Institute, on whose recommendation his entrance to any academic career would depend, not by any title, but simply as "Herr Weber." And at the other end of the spectrum, in his essay on ethics, Einstein cited Moses, Jesus, and Buddha as equally valid prophets.

No boundaries, no barriers; none in life, as there are none in nature. Einstein's life and his work were so mutually resonant that we recognize both to have been carried on together in the service of one grand project – the fusion into one coherency.

There were also no boundaries or barriers between Einstein's scientific and religious feelings. After having passed from the youthful first, religious paradise into his second, immensely productive scientific one, he found in his middle years a fusion of those two motivations – his Third Paradise.

We had a hint of this development in his remark in 1918, where he observed the parallel states of feeling of the scientist and of the "religious person." Other hints come from the countless, well-known quotations in which Einstein referred to God – doing it so often that Niels Bohr had to chide him. Karl Popper remarked that in conversations with Einstein, "I learned nothing . . . . he tended to express things in theological terms, and this was often the only way to argue with him. I found it finally quite uninteresting."

But two other reports may point to the more profound layer of Einstein's deepest convictions. One is his remark to one of his assistants, Ernst Straus: "What really interests me is whether God had any choice in the creation of the world." The second is Einstein's reply to a curious telegram.

In 1929, Boston's Cardinal O'Connell branded Einstein's theory of relativity as "befogged speculation producing universal doubt about God and His Creation," and as implying "the ghastly

book Fa2003 composite.qxd 09/10/03 10:28 AM Page 31

apparition of atheism." In alarm, New York's Rabbi Herbert S. Goldstein asked Einstein by telegram: "Do you believe in God? Stop. Answer paid 50 words." In his response, for which Einstein needed but twenty-five (German) words, he stated his beliefs succinctly: "I believe in Spinoza's God, Who reveals Himself in the lawful harmony of the world, not in a God Who concerns Himself with the fate and the doings of mankind." The rabbi cited this as evidence that Einstein was not an atheist, and further declared that "Einstein's theory, if carried to its logical conclusion, would bring to mankind a scientific formula for monotheism." Einstein wisely remained silent on that point.

The good rabbi might have had in mind the writings of the Religion of Science movement, which had flourished in Germany under the distinguished auspices of Ernst Haeckel, Wilhelm Ostwald, and their circle (the *Monistenbund*), and also in America, chiefly in Paul Carus's books and journals, such as *The Open Court*, which carried the words "Devoted to the Religion of Science" on its masthead.

If Einstein had read Carus's book, *The Religion of Science* (1893), he may have agreed with one sentence in it: "Scientific truth is not profane, it is sacred." Indeed, the charismatic view of science in the lives of some scientists has been the subject of much scholarly study, for example in Joseph Ben-David's *Scientific Growth* (1991), and earlier in Robert K. Merton's magisterial book of 1938, *Science, Technology and Society in Seventeenth-Century England*. In the section entitled "The Integration of Religion and Science," Merton notes that among the scientists he studied, "the religious ethic, considered as a social force, so consecrated science as to make it a highly respected and laudable focus of attention." The social scientist Bernard H. Gustin elaborated on this perception, writing that science at the highest level is charismatic because scientists devoted to such tasks are "thought to come into contact with what is essential in the universe." I believe this is precisely why so many who knew little about Einstein's scientific writing flocked to catch a glimpse of him and to this day feel somehow uplifted by contemplating his iconic image.

Starting in the late 1920s, Einstein became more and more serious about clarifying the relationship between his transcendental and his scientific impulses. He wrote several essays on religiosity; five of them, composed between 1930 and the early 1950s, are reproduced in his book *Ideas and Opinions*. In those chapters we can watch the result of a struggle that had its origins in his school years, as he developed, or rather invented, a religion that offered a union with science.

In the evolution of religion, he remarked, there were three developmental stages. At the first, "with primitive man it is above all fear that evokes religious notions. This 'religion of fear' . . . is in an important degree stabilized by the formation of a special priestly caste" that colludes with secular authority to take advantage of it for its own interest. The next step – "admirably illustrated in the Jewish scriptures" – was a moral religion embodying the ethical imperative, "a development [that] continued in the New Testament." Yet it had a fatal flaw: "the anthropomorphic character of the concept of God," easy to grasp by "underdeveloped minds" of the masses while freeing them of responsibility.

This flaw disappears at Einstein's third, mature stage of religion, to which he believed mankind is now reaching

book Fa2003 composite.qxd 09/10/03 10:28 AM Page 32

and which the great spirits (he names Democritus, St. Francis of Assisi, and Spinoza) had already attained – namely, the "cosmic religious feeling" that sheds all anthropomorphic elements. In describing the driving motivation toward that final, highest stage, Einstein uses the same ideas, even some of the same phrases, with which he had celebrated first his religious and then his scientific paradise: "The individual feels the futility of human desires, and aims at the sublimity and marvelous order which reveal themselves both in nature and in the world of thought." "Individual existence impresses him as a sort of prison, and he wants to experience the universe as a single, significant whole." Of course! Here as always, there has to be the intoxicating experience of unification. And so Einstein goes on, "I maintain that the cosmic religious feeling is the strongest and noblest motive for scientific research .... A contemporary has said not unjustly that in this materialistic age of ours the serious scientific workers are the only profoundly religious people."

In another of his essays on religion, Einstein points to a plausible source for his specific formulations: "Those individuals to whom we owe the great creative achievements of science were all of them imbued with a truly religious conviction that this universe of ours is something perfect, and susceptible through the rational striving for knowledge. If this conviction had not been a strongly emotional one, and if those searching for knowledge had not been inspired by Spinoza's *amor dei intellectualis*, they would hardly have been capable of that untiring devotion which alone enables man to attain his greatest achievements."

I believe we can guess at the first time Einstein read Baruch Spinoza's *Ethics* (*Ethica Ordinae Geometrico Demonstrata*), a system constructed on the Euclidean model of deductions from propositions. Soon after getting his first real job at the patent office, Einstein joined with two friends to form a discussion circle, meeting once or twice a week in what they called, with gallows humor, the *Akademie Olympia*. We know the list of books they read and discussed. High among them, reportedly at Einstein's suggestion, was Spinoza's *Ethics*, which he read afterwards several times more. Even when his sister Maja joined him in Princeton in later life and was confined to bed by an illness, he thought that reading a good book to her would help, and chose Spinoza's *Ethics* for that purpose.

By that time Spinoza's work and life had long been important to Einstein. He had written an introduction to a biography of Spinoza (by his son-in-law, Rudolf Kayser, 1946); he had contributed to the *Spinoza Dictionary* (1951); he had referred to Spinoza in many of his letters; and he even had composed a poem in Spinoza's honor. He admired Spinoza for his independence of mind, his deterministic philosophical outlook, his skepticism about organized religion and orthodoxy – which had resulted in his excommunication from his synagogue in 1656 – and even for his ascetic preference, which compelled him to remain in poverty and solitude to live in a sort of spiritual ecstasy, instead of accepting a professorship at the University of Heidelberg. Originally neglected, Spinoza's *Ethics*, published only posthumously, profoundly influenced other thinkers, such as Friedrich Schlegel, Friedrich Schleiermacher, Goethe (who called him "our common saint"), Albert Schweitzer, and Romain Rolland (who, on reading *Ethics*, confessed, "I deciphered not what he said, but what he meant to say").

book Fa2003 composite.qxd 09/10/03 10:28 AM Page 33

For Spinoza, God and nature were one (*deus sive natura*). True religion was based not on dogma but on a feeling for the rationality and the unity underlying all finite and temporal things, on a feeling of wonder and awe that *generates* the idea of God, but a God which lacks any anthropomorphic conception. As Spinoza wrote in Proposition 15 in *Ethics,* he opposed assigning to God "body and soul and being subject to passions." Hence, "God is incorporeal" – as had been said by others, from Maimonides on, to whom God was knowable indirectly through His creation, through nature. In other pages of *Ethics,* Einstein could read Spinoza's opposition to the idea of cosmic purpose, and that he favored the primacy of the law of cause and effect – an all-pervasive determinism that governs nature and life – rather than "playing at dice," in Einstein's famous remark. And as if he were merely paraphrasing Spinoza, Einstein wrote in 1929 that the perception in the universe of "profound reason and beauty constitute true religiosity; in this sense, and in this sense alone, I am a deeply religious man."

Much has been written about the response of Einstein's contemporaries to his Spinozistic cosmic religion. For example, the physicist Arnold Sommerfeld recorded in Schilpp's volume that he often felt "that Einstein stands in a particularly intimate relation to the God of Spinoza." But what finally most interests us here is to what degree Einstein, having reached his Third Paradise, in which his yearnings for science and religion are joined, may even have found in his own research in physics fruitful ideas emerging from that union. In fact there are at least some tantalizing parallels between passages in Spinoza's *Ethics* and Einstein's publications in cosmology – parallels that the physicist and philosopher Max Jammer, in his book *Einstein and Religion* (1999), considers as amounting to intimate connections. For example, in Part I of *Ethics* ("Concerning God"), Proposition 29 begins: "In nature there is nothing contingent, but all things are determined from the necessity of the divine nature to exist and act in a certain manner." Here is at least a discernible overlap with Einstein's tenacious devotion to determinism and strict causality at the fundamental level, despite all the proofs from quantum mechanics of the reign of probabilism, at least in the subatomic realm.

There are other such parallels throughout. But what is considered by some as the most telling relationship between Spinoza's Propositions and Einstein's physics comes from passages such as Corollary 2 of Proposition 20: "It follows that God is immutable or, which is the same thing, all His attributes are immutable." In a letter of September 3, 1915, to Else (his cousin and later his wife), Einstein, having read Spinoza's *Ethics* again, wrote, "I think the *Ethics* will have a permanent effect on me."

Two years later, when he expanded his general relativity to include "cosmological considerations," Einstein found to his dismay that his system of equations did "not allow the hypothesis of a spatially closed-ness of the world [*raeumliche Geschlossenheit*]." How did Einstein cure this flaw? By something he had done very rarely: making an ad hoc addition, purely for convenience: "We can add, on the left side of the field equation a – for the time being – unknown universal constant, - λ." In fact, it seems that not much harm is done thereby. It does not change the covariance; it still corresponds with the observation of motions in the solar system ("as long as λ is small"), and so forth. Moreover, the proposed new universal constant λ also

book Fa2003 composite.qxd 09/10/03 10:28 AM Page 34

determines the average density of the universe with which it can remain in equilibrium, and provides the radius and volume of a presumed spherical universe.

Altogether a beautiful, immutable universe – one an immutable God could be identified with. But in 1922, Alexander Friedmann showed that the equations of general relativity did allow expansion or contraction. And in 1929 Edwin Hubble found by astronomical observations the fact that the universe does expand. Thus Einstein – at least according to the physicist George Gamow – remarked that "inserting λ was the biggest blunder of my life."

Max Jammer and the physicist John Wheeler, both of whom knew Einstein, traced his unusual ad hoc insertion of λ, nailing down that "spatially closed-ness of the world," to a relationship between Einstein's thoughts and Spinoza's Propositions. They also pointed to another possible reason for it: In Spinoza's writings, one finds the concept that God would not have made an empty world. But in an expanding universe, in the infinity of time, the density of matter would be diluted to zero in the limit. Space itself would disappear, since, as Einstein put it in 1952, "On the basis of the general theory of relativity…space as opposed to 'what fills space'…had no separate existence."

Even if all of these suggestive indications of an intellectual, emotional, and perhaps even spiritual resonance between Einstein's and Spinoza's writings were left entirely aside, there still remains Einstein's attachment to his "cosmic religion." That was the end point of his own troublesome pilgrimage in religiosity – from his early vision of his First Paradise, through his disillusionments, to his dedication to find fundamental unity within natural science, and at last to his recognition of science as the devotion, in his words, of "a deeply religious unbeliever" – his final embrace of seeming incommensurables in his Third Paradise.