lifelong friends, and he would later reminisce with them about "our cheerful 'Academy,' which was less childish than those respectable ones which I later got to know at close quarters." In response to a joint postcard sent from Paris by his two colleagues on his seventy-fourth birthday, he paid tribute to it: "Your members created you to make fun of your long-established sister Academies. How well their mockery hit the mark I have learned to appreciate fully through long years of careful observation."[79]

The Academy's reading list included some classics with themes that Einstein could appreciate, such as Sophocles' searing play about the defiance of authority, *Antigone,* and Cervantes' epic about stubbornly tilting at windmills, *Don Quixote.* But mostly the three academicians read books that explored the intersection of science and philosophy: David Hume's *A Treatise of Human Nature,* Ernst Mach's *Analysis of the Sensations* and *Mechanics and Its Development,* Baruch Spinoza's *Ethics,* and Henri Poincaré's *Science and Hypothesis.*[80] It was from reading these authors that the young patent examiner began to develop his own philosophy of science.

The most influential of these, Einstein later said, was the Scottish empiricist David Hume (1711–1776). In the tradition of Locke and Berkeley, Hume was skeptical about any knowledge other than what could be directly perceived by the senses. Even the apparent laws of causality were suspect to him, mere habits of the mind; a ball hitting another may behave the way that Newton's laws predict time after time after time, yet that was not, strictly speaking, a reason to believe that it would happen that way the next time. "Hume saw clearly that certain concepts, for example that of causality, cannot be deduced from our perceptions of experience by logical methods," Einstein noted.

A version of this philosophy, sometimes called positivism, denied the validity of any concepts that went beyond descriptions of phenomena that we directly experience. It appealed to Einstein, at least initially. "The theory of relativity suggests itself in positivism," he said. "This line of thought had a great influence on my efforts, most specifically Mach and even more so Hume, whose *Treatise of Human Nature* I studied avidly and with admiration shortly before discovering the theory of relativity."[81]

Hume applied his skeptical rigor to the concept of time. It made no sense, he said, to speak of time as having an absolute existence that was independent of observable objects whose movements permitted us to define time. "From the succession of ideas and impressions we form the idea of time," Hume wrote. "It is not possible for time alone ever to make its appearance." This idea that there is no such thing as absolute time would later echo in Einstein's theory of relativity. Hume's specific thoughts about time, however, had less influence on Einstein than his more general insight that it is dangerous to talk about concepts that are not definable by perceptions and observations.[82]

Einstein's views on Hume were tempered by his appreciation for Immanuel Kant (1724–1804), the German metaphysician he had been introduced to, back when he was a schoolboy, by Max Talmud. "Kant took the stage with an idea that signified a step towards the solution of Hume's dilemma," Einstein said. Some truths fit into a category of "definitely assured knowledge" that

was "grounded in reason itself."

In other words, Kant distinguished between two types of truths: (1) analytic propositions, which derive from logic and "reason itself" rather than from observing the world; for example, all bachelors are unmarried, two plus two equals four, and the angles of a triangle always add up to 180 degrees; and (2) synthetic propositions, which are based on experience and observations; for example, Munich is bigger than Bern, all swans are white. Synthetic propositions could be revised by new empirical evidence, but not analytic ones. We may discover a black swan but not a married bachelor or (at least so Kant thought) a triangle with 181 degrees. As Einstein said of Kant's first category of truths: "This is held to be the case, for example, in the propositions of geometry and in the principle of causality. These and certain other types of knowledge . . . do not previously have to be gained from sense data, in other words they are a priori knowledge."

Einstein initially found it wondrous that certain truths could be discovered by reason alone. But he soon began to question Kant's rigid distinction between analytic and synthetic truths. "The objects with which geometry deals seemed to be of no different type than the objects of sensory perception," he recalled. And later he would reject outright this Kantian distinction. "I am convinced that this differentiation is erroneous," he wrote. A proposition that seems purely analytic — such as the angles of a triangle adding up to 180 degrees — could turn out to be false in a non-Euclidean geometry or in a curved space (such as would be the case in the general theory of relativity). As he later said of the concepts of geometry and causality, "Today everyone knows, of course, that the mentioned concepts contain nothing of the certainty, of the inherent necessity, which Kant had attributed to them."[83]

Hume's empiricism was carried a step further by Ernst Mach (1838–1916), the Austrian physicist and philosopher whose writings Einstein read at the urging of Michele Besso. He became one of the favorite authors of the Olympia Academy, and he helped to instill in Einstein the skepticism about received wisdom and accepted conventions that would become a hallmark of his creativity. Einstein would later proclaim, in words that could be used to describe himself as well, that Mach's genius was partly due to his "incorruptible skepticism and independence."[84]

The essence of Mach's philosophy was this, in Einstein's words: "Concepts have meaning only if we can point to objects to which they refer and to the rules by which they are assigned to these objects."[85] In other words, for a concept to make sense you need an operational definition of it, one that describes how you would observe the concept in operation. This would bear fruit for Einstein when, a few years later, he and Besso would talk about what observation would give meaning to the apparently simple concept that two events happened "simultaneously."

The most influential thing that Mach did for Einstein was to apply this approach to Newton's concepts of "absolute time" and "absolute space." It was impossible to define these concepts, Mach asserted, in terms of observations you could make. Therefore they were meaningless. Mach ridiculed Newton's "conceptual monstrosity of absolute space"; he called it "purely a thought-thing which cannot be pointed to in experience."[86]

The final intellectual hero of the Olympia Academy was Baruch Spinoza (1632–1677), the Jewish philosopher from Amsterdam. His influence was primarily religious: Einstein embraced his concept of an amorphous God reflected in the awe-inspiring beauty, rationality, and unity of nature's laws. But like Spinoza, Einstein did not believe in a personal God who rewarded and punished and intervened in our daily lives.

In addition, Einstein drew from Spinoza a faith in determinism: a sense that the laws of nature, once we could fathom them, decreed immutable causes and effects, and that God did not play dice by allowing any events to be random or undetermined. "All things are determined by the necessity of divine nature," Spinoza declared, and even when quantum mechanics seemed to show that was wrong, Einstein steadfastly believed it was right.[87]

Marrying Mileva

Hermann Einstein was not destined to see his son become anything more successful than a third-class patent examiner. In October 1902, when Hermann's health began to decline, Einstein traveled to Milan to be with him at the end. Their relationship had long been a mix of alienation and affection, and it concluded on that note as well. "When the end came," Einstein's assistant Helen Dukas later said, "Hermann asked all of them to leave the room, so he could die on his own."

Einstein felt, for the rest of his life, a sense of guilt about that moment, which encapsulated his inability to forge a true bond with his father. For the first time, he was thrown into a daze, "overwhelmed by a feeling of desolation." He later called his father's death the deepest shock he had ever experienced. The event did, however, solve one important issue. On his deathbed, Hermann Einstein gave his permission, finally, for his son to marry Mileva Marić.[88]

Einstein's Olympia Academy colleagues, Maurice Solovine and Conrad Habicht, convened in special session on January 6, 1903, to serve as witnesses at the tiny civil ceremony in the Bern registrar's office where Albert Einstein married Mileva Marić. No family members — not Einstein's mother or sister, nor Marić's parents — came to Bern. The tight group of intellectual comrades celebrated together at a restaurant that evening, and then Einstein and Marić went back to his apartment together. Not surprisingly, he had forgotten his key and had to wake his landlady.[89]

"Well, now I am a married man and I am living a very pleasant cozy life with my wife," he reported to Michele Besso two weeks later. "She takes excellent care of everything, cooks well, and is always cheerful." For her part, Marić* reported to her own best friend, "I am even closer to my sweetheart, if it is at all possible, than I was in our Zurich days." Occasionally she would attend sessions of the Olympia Academy, but mainly as an observer. "Mileva, intelligent and reserved, listened intently but never intervened in our discussions," Solovine recalled.

Nevertheless, clouds began to form. "My new duties are taking their toll," Marić said of her housekeeping chores and role as a mere onlooker

* Once married, she usually used the name Mileva Einstein-Marić. After they were divorced, she eventually resumed using Mileva Marić. To avoid confusion, I refer to her as Marić throughout.