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Einstein on Religion and Science

Abstract

The main issue of this paper is the question what Einstein actually meant from the philosophical and/or theological point of view in his famous phrase God does not play dice. What is the 'underlying' concept of necessity in this phrase, and first of all: which God here does not play dice – theistic, deistic, pantheistic? Some other passages from Einstein's informal writings and public speeches suggest that he was very close to pantheism, following Spinoza, whom he admired and appreciated mostly among philosophers. However, Spinoza's pantheism implies determinism which was presumably not the main point of Einstein's protest against 'dicing God' in quantum physics... So, is Einstein's God nevertheless closer to Newton's Pantocrator as to Spinoza's Deus sive natura? Maybe yes, but only in case if the 'Universal Ruler' does not punish, neither reward his creatures, ourselves, tiny human beings in the mighty and incredibly 'well-tuned' cosmos. The enigma of the famous phrase remains.

Key Words

God, playing dice, panteism, determinism, religion, science, Albert Einstein

For motto of my contribution in this conference at 100th anniversary of Einstein's Special Theory of Relativity, I have chosen a quotation from his famous essay *The World As I See It* (1930), which reveals very well Einstein's greatness, his modesty, compassion and human faith:

"How strange is the lot of us mortals! Each of us is here for a brief sojourn; for what purpose he knows not, though he sometimes thinks he senses it. But without deeper reflection one knows from daily life that one exists for other people – first of all for those upon whose smiles and well-being our own happiness is wholly dependent, and then for the many, unknown to us, to whose destinies we are bound by the ties of sympathy. A hundred times every day I remind myself that my inner and outer life are based on the labors of other men, living and dead, and I must exert myself in order to give in the same measure as I have received and am still receiving. [...] The ideals that have lighted my way, and time after time have given me new courage to face life cheerfully, have been Kindness, Beauty, and Truth."¹

In my reflections of Einstein-philosopher, who often pondered on the relation between science and religion, considering his own scientific work as a kind of religious devotion, as unveiling God's "Design", as scientific questing of the ultimate Logos in Cosmos – in these reflections I am referring mainly to some well known articles on religion, which Einstein wrote after 1930, motivated also by several misunderstandings from the side many theologians and other

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Albert Einstein, *Ideas and Opinions*, Three Rivers Press, New York 21982, pp. 8–9.

people, who estimated him an atheist. Einstein's articles on religion were included into two well-known collections, in *The World As I See It* (1949) and *Out of My Later Days* (1950), but here are quoted from a later edition, titled *Ideas and Opinions* (1954); next to these articles I quote some passages from Einstein's letters, particularly to Max Born. As secondary literature, I refer mainly to both Abraham Pais' monographs about Einstein's life and work (*Subtle is the Lord*, 1982, and *Einstein Lived Here*, 1994), to Max Jammer's book *Einstein and Religion* (1999), and to some recent articles of Gerald Holton and Alan H. Batten.

Einstein outlines in *Religion and Science* (1930) three stages of religious development in the history of mankind:

1. religion of fear;
2. social and moral religion ("God as Providence");
3. "cosmic religious feeling" (*die kosmische Religiosität*).

Einstein says that "with primitive man it is above all fear that evokes religious notions – fear of hunger, wild beasts, sickness, death", and that is why "the human mind creates illusory beings more or less analogous to itself [... and] tries to secure the favor of these beings by carrying out actions and by offering sacrifices..."² According to Einstein, we can explain with human fear also "the formation of a special priestly caste which sets itself up as a mediator between the people and the beings they fear, and erects a hegemony on this basis".³

On the second stage:

"The desire for guidance, love and support prompts men to form the social or moral conception of God. This is the God of Providence, who protects, disposes, rewards, and punishes, [...] the comforter in sorrow and unsatisfied longing; he who preserves the souls of the dead"⁴,

i. e., God as saviour (*sotér*), in Christianity incarnated in Jesus, Son of Man. In other cultures, says Einstein, there are other gods of providence, yet their common feature is the *anthropomorphic* conception.

The third and the highest stage of religious experience – which belongs partly, but not in the pure form, already to the first and second stages – is the "cosmic religious feeling", without any "anthropomorphic conception of God". The main features of this feeling are outlined in the following passage from *Religion and Science*:

"The individual feels the futility of human desires and aims and 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. [...] The religious geniuses of all ages have been distinguished by this kind of religious feeling, which knows no dogma and no God conceived in man's image; so that there can be no church whose central teachings are based on it. Hence it is precisely among the heretics of every age that we find men who were filled with this highest kind of religious feeling and were in many cases regarded by their contemporaries as atheists, sometimes also as saints. Looked at in this light, men like Democritus, Francis of Assisi, and Spinoza are closely akin to one another."⁵

For Einstein, in his religious quest, the key reference is Spinoza. We are not far from truth if we consider Einstein as a modern, scientific and cosmological Spinozist, i. e., a pantheist whose religious attitude and feeling is *die kosmische Religiosität*. Spinoza was Einstein's favorite philosopher, quoted and mentioned by him many times in his writings, letters and conversations.

He even composed a poem, an ode *To Spinoza's Ethics* (1920), which begins with the verses:

*How much do I love that noble man
More than I could tell with words
I fear though he'll remain alone
With a holy halo of his own.*⁶

Einstein declared his belief in Spinoza's God (*Deus sive natura*) also in the famous telegram which he sent in 1929 to New York's rabbi Herbert S. Goldstein, who was worried by the Boston's cardinal's charge that Einstein's theory of relativity implies "the ghastly apparition of atheism". Goldstein asked Einstein: "Do you believe in God? Stop. Answer paid 50 words." Einstein answered Goldstein in 25 German words, here in English:

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.

We may note here that Spinoza, strictly speaking, would not say that God "reveals" Himself (or Itself) in..., but that God actually *is* the same as "the lawful harmony of the world". This is namely the strict pantheist position, so we may assume from Einstein's telegram that he was not quite a strict pantheist. Max Jammer quotes an Einstein's answer, when he was asked to define God:

"I'm not an atheist, and I don't think I can call myself a pantheist."⁷

Then he speaks about his belief in the laws of the marvelously ordered universe, which give evidence of the divine Creator. However, Einstein was surely a pantheist in some broader sense; at another occasion, speaking of the superior Mind that reveals itself in the world, he maintained that "in common parlance this may be described as 'pantheistic' (belief) in Spinoza's (sense)".⁸ Jammer understands Einstein's 'pantheistic' attitude in the following way:

"Einstein agreed with Spinoza that he who knows Nature knows God, but not because Nature is God but because the pursuit of science in studying Nature leads to religion."⁹

Well, this could be said of some theist as well, so let us suspend a definite conclusion at the moment.

As Gerard Holton correctly points out, the main Einstein's motive and the principal methodological maxime in his quest of the "third paradise", i. e., of the union of his first and second "paradises", religion and science respectively,

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A. Einstein, *Ideas and Opinions*, pp. 36–37.

3
Ibid., p. 37.

4
Ibid.

5
Ibid., p. 38.

6
See: Max Jammer, *Einstein and Religion*, Princeton University Press, Princeton 1999, p. 43; in the Appendix of this book we find the whole poem in the original German; here we quote just the first strophe:

*Wie lieb ich diesen edlen Mann
Mehr als ich mit Worten sagen kann.
Doch fuercht' ich, dass er bleibt allein
Mit seinem strahlenden Heiligenschein.*

7
M. Jammer, *Einstein and Religion*, p. 48.

8
Ibid., p. 75.

9
Ibid., p. 148.

was *die Einheitlichkeit*, the supreme Unity of all phenomena.¹⁰ This was, of course, also the basic idea behind Einstein's "Principle of Relativity" and the later "Principle of General Covariance". We know from his biographies that Einstein was not content with associations which his expression "Principle of Relativity" (or "Theory of Relativity") had provoked, so he would prefer that his theory was named *die Invariantentheorie* (Theory of Invariance), following Felix Klein's term, but it was already too late to rename it.

Soon after the publication of his famous "field equations" of the General Theory of Relativity (GTR), Einstein wrote to Willem de Sitter (1916):

"I am driven by my need to generalize (*mein Verallgemeinerung-bedürfnis*; the word is written in the original German without hyphens!)."¹¹

This need to generalize is principal for all Einstein's scientific search and for his philosophical world-view. The quest for *die Einheitlichkeit* is the basic motive also for his later endeavors to formulate the "Unified Field Theory" (UFT), which would unite gravity and electromagnetism. Einstein was not successful in his final search, however, he was indeed a visionary, since the quest for a unified theory has become the "Holy Grail" of modern physics. Nowadays, the search of unification of all four basic forces in nature (gravity, electromagnetic force, weak and strong nuclear force) is going on other lines, following mainly quantum theories. The best candidate for the "Final Theory",¹² which would unite *microcosmos* (quantum forces) and *macrocosmos* (gravity), is supposed to be some "string theory" (there is a set of different string theories): very tiny "strings", which vibrate in many dimensions, are introduced to replace particles, in order to resolve the incompatibility between quantum mechanics (QM) and (GTR). Ways are different, but the main motive for this unification is still the same as Einstein's: the quest of *die Einheitlichkeit* of physics, and consequently of the whole natural science. We may say that Einstein's epistemological *ideal* was such a theory of nature, which would not only connect (GTR) and (QM), but also resolve all contingencies (presumably also constants in presently known physical equations) into lawful *necessities*. This would be indeed the final Theory (**T**), the "Universal Equation".

Spinoza's *Ethica, ordine geometrico demonstrata* was for Einstein the highest ideal of unity of philosophy and religion, of reason and faith, based on necessity, culminating in Spinoza's *amor dei intellectualis*. From this philosophical and scientific belief we can also understand Einstein's famous dictum (1941), a paraphrase of Kant:

"Science without religion is lame, religion without science is blind."¹³

or a similar thought in Einstein's earlier paper (1930):

"I maintain that the cosmic religious feeling is the strongest and noblest motive for scientific research. [...] What a deep conviction of the rationality of the universe and what a yearning to understand, were it but a feeble reflection of the mind revealed in this world, Kepler and Newton must have had to enable them to spend years of solitary labor in disentangling the principles of celestial mechanics!"¹⁴

But here we have to add something essential: yes, Kepler had indeed very deep conviction in the rationality of the universe, since without this conviction he could not formulate the laws of planetary motions – however, his Platonic metaphysical beliefs were almost too deep for a break-through in science, when he tried in his early work *Mysterium cosmographicum* (1597) to explain the orbits of planets with five Platonic "ideal geometrical bodies"; so

his later scientific success was the result of having abandoned the “ideal circles” in favor of empirically founded ellipses. (Of course this does *not* mean that Platonism is a wrong philosophical basis for scientific investigations – on the contrary: I am inclined to think that Platonism in some “refined” sense is the ultimate ground of scientific laws and the best foundation of the scientific quest of truth.)

Comparing Kepler with Newton, we may say that the latter’s belief in the rationality of the universe is more independent of his religious feelings and reflections as former’s. True, Newton’s *Pantocrator*, Universal Ruler, “God of a working day” (if we use Alexandre Koyré’s term), is always and everywhere present “behind” or even “in” nature, since space is His *sensorium*, yet Newton’s God is practically absent in the physical calculus of the “celestial mechanics”: from the scientific point of view, circles and ellipses are equally right, the only thing which matters in modern science is the consistency of the mathematical system and its adequacy for the description of physical facts; the world “outside” is supposed to be ontologically *real*, objective, however, its reality is not a matter of science, but of philosophy and/or theology.

Anyway, Einstein was probably right, when he said that *some* “religious feeling” (whether pantheistic or theistic or deistic) is needed for great achievements in science, especially in cosmology, but on the other hand we must not overlook that such “religious” attitude in science is, from the methodological point of view, actually a deviation from the conception of modern science, let us say from the “Galilean science”, which is based only on empirical facts and mathematical tools. So we may say that Niels Bohr with his “Copenhagen interpretation” of (QM) was in some deeper philosophical sense a closer follower of Galilean “antirealism”, compared with Einstein’s “realism” concerning the equations of (GTR) – namely, Bohr argued that science has to limit itself to phenomena, and he defined the word *phenomenon* as referring “exclusively to observations under specified circumstances, including an account of the whole experiment”;¹⁵ of course, considering the second part of the quoted phrase, which is a variant of the “Complementarity Principle” (Bohr, 1928), the method of (QM) differs very much from the Galilean science. For Einstein, this new “phenomenological” attitude in science was unacceptable, since it ignores the “objective reality”. And the reality is for him in some fundamental way connected with his religious feeling of God who does not “play dice”.

Now, there are two main problems (among others) of pantheism – problems, which are radically solved in the “pure” pantheism of Spinoza, but which remain problems in Einstein’s pantheistic “cosmic religion”:

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Gerald Holton, “Einstein’s Third Paradise”, *Daedalus*, Fall 2003, from Internet.

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G. Holton, “Einstein’s Third Paradise”.

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The term “Final Theory” is known from Steven Weinberg’s popular book *Dreams of a Final Theory: The Scientist’s Search for the Ultimate Laws of Nature*, Random House Inc., London 1994. Weinberg hopes that such a Theory is possible, at least in principle. Stephen Hawking uses the term “Theory of Everything” (TOE) for the Theory which is supposed to explain “the origin and fate of the

universe” and link together all known physical phenomena; however, (TOE) is usually meant in a more specific sense, namely as a theory that would unify four fundamental physical forces (or interactions).

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A. Einstein, *Ideas and Opinions*, p. 46.

14

Ibid., p. 39.

15

Niels Bohr, quoted from: Abraham Pais, *Subtle is the Lord*, Oxford University Press, Oxford 1982, p. 455.

- I. Does Einstein's "cosmic religion" necessarily imply the negation of God as Person?
- II. What has Einstein really meant with determinism?

In the following, I discuss these two questions, which are mutually connected.

Ad I.: Einstein's open critique of the "personal God" of Christianity and Judaism is present in the second part of his essay *Science and Religion*, which he presented in the "Conference on Science, Philosophy, and Religion", held at the Jewish Theological Seminary of America, in New York, 1940, and which was published the same year in the famous journal *Nature* (№ 146), and it is, incidentally, the only Einstein's paper on religion, published in a scientific journal; a year later this text was included into the proceedings of this symposium (1941).¹⁶ Let us see some passages:

"It seems to me that what is important is the force of the superpersonal content and the depth of the conviction concerning its overpowering meaningfulness, regardless of whether any attempt is made to unite this content with a divine Being, for otherwise it would not be possible to count Buddha and Spinoza as religious personalities."¹⁷

The phrase "superpersonal content" refers both to human superpersonal (or superindividual) attitude towards God and also to God's own superpersonal nature. Then Einstein goes on with his reflection on religion and science:

"... a conflict [between religion and science] arises when a religious community insists on the absolute truthfulness of all statements recorded in the Bible. This means an intervention on the part of religion into the sphere of science; this is where the struggle of the Church against the doctrines of Galileo and Darwin belongs. On the other hand, representatives of science have often made an attempt to arrive at fundamental judgments with respect to values and ends on the basis of scientific method, and in this way have set themselves in opposition to religion. These conflicts have all sprung from fatal errors."¹⁸

This strategy of distinction between religious ("moral") and scientific level of discourse has been known from Middle Ages on, from Abelard and Ockham, to Copernicus and Bruno, Galileo and Spinoza, up to Hume and Kant. Einstein's specific point in this ancient dispute between science and philosophy on the one side and religion or theology on the other is his insisting – which is not present in such sharpness neither in Spinoza – that the main source of trouble is the theistic concept of a "personal God", with whom man can have personal relations (in prayer, rituals etc.). It is interesting that Einstein insists that the "anthropomorphic character" of the "personal God" is even *nowadays* (i. e., in 20th century) the heaviest obstacle for collaboration between the established religion(s) and science(s):

"The idea of God in the religions taught at present is a sublimation of that old concept of the gods. Its anthropomorphic character is shown, for instance, by the fact that men appeal to the Divine Being in prayers and plead for the fulfillment of their wishes. [...] The main source of the present-day conflicts between the spheres of religion and of science lies in this concept of a personal God."¹⁹

We may ask: why? What is wrong with the "personal God" in relation to science? Einstein is convinced that every personal God must have a free will, namely such that He can interfere in the processes of nature with miracles, revelations, prophecies etc. – and *that* is, following Einstein, in direct opposition with science, with natural laws, for which "absolutely general validity is required". Spinoza's opinions about miracles were very similar, and we may agree with both on this point, nevertheless we can doubt in Einstein's presup-

position that every idea of a “personal God” implies His intervening into the presumably fixed “order of nature”. For example, one of the most famous philosophical theists, Leibniz, does not think of God in this way; and neither Newton’s *Pantocrator* performs miracles, He just “guarantees” the proper functioning of the “world mechanism”. Even Spinoza, in spite of his negative attitude to miracles in *Tractatus Theologico-Politicus*, does not explicitly negate the biblical “personal God”; his main point is that the Bible has to be understood as symbolic, “moral” discourse, not as a scientific treatise. Although Einstein agrees with such a moderate attitude towards the Holy Script, yet he goes on in his critique of a “personal God”, and in the above mentioned conference delivers a rather unrealistic proposal for “teachers of religion”:

“In their struggle for the ethical good, teachers of religion must have the stature to give up the doctrine of a personal God, that is, give up that source of fear and hope which in the past placed such vast power in the hands of priests. In their labors they will have to avail themselves of those forces which are capable of cultivating the Good, the True, and the Beautiful in humanity itself.”²⁰

Einstein, with his unexpected address to “teachers of religion” that they have to give up “the doctrine of a personal God”, provoked many Jewish and Christian clerics, as well as other too pious people of America, and raised some quite intolerant and anti-Semitic feelings. However, there were also some very interesting philosophical and/or theological reactions, among them the most known and important is the critique of the famous Protestant theologian, Paul Tillich, himself exiled in 1933 from Germany by the Hitler regime as the first non-Jewish professor, because of his close affiliation with the Social-Democratic party and his opposition to Nazism. Two great men, Einstein and Tillich, have known each other from their Berlin days in the early twenties, and they both felt not only respect to each other, but also had much in common, especially their quest for *Einheitlichkeit*, Unity or Sythesis of all knowledge. However, after Einstein’s “provocation”, Tillich in his commentary *Science and Theology: a discussion with Einstein* (1941) wrote sharply that “no criticism of this distorted idea of God can be sharp enough”, but on the other hand he also tried to be sympathetic, offering “a solution in which [Einstein’s argument] is accepted and overcome at the same time”.²¹ This alleged solution was based on Tillich’s symbolic reading of the Holy Script – Einstein had presumably not taken into account that the term “personal God” was a *symbol* for expressing “the experience of the numinous” (in the sense of Rudolf Otto), so that “the predicate ‘personal’ can be said to the Divine only symbolically or by analogy, or if affirmed and negated at the same time”.²² Tillich believes and argues that “the symbol of the personal God is indispensable for living religion”.²³ And Jammer further explains Tillich’s point: “One should not use a primitive pattern of the concept of the personal God in order to challenge

16
Abraham Pais, *Einstein Lived Here*, Oxford University Press, Oxford 1994, p. 121.

17
A. Einstein, *Ideas and Opinions*, p. 45.

18
Ibid.

19
Ibid., pp. 46–47.

20
Ibid., p. 48.

21
M. Jammer, *Einstein and Religion*, p. 107.

22
Paul Tillich, quoted from: M. Jammer, *ibid.*, p. 111.

23
Ibid., p. 112.

the idea itself,” since the mature idea “need not, and in fact cannot, interfere with science and philosophy.”²⁴ He adds that

“Tillich’s statements converge toward Einstein’s ‘cosmic religion’ as much as is possible for a theistic theologian.”²⁵

A similar critique was addressed to Einstein by the famous Catholic (and also “heretical”) theologian Hans Küng:

“If Einstein speaks of cosmic reason, this must be understood as an expression of reverence before the mystery of the Absolute, as opposed to all-too-human ‘theistic’ ideas of God. [...] God is not a person as man is a person.”²⁶

I quite agree with Küng’s remark. I am more sceptical of Tillich’s critique, but here I cannot enter into the discussion about complicated relations between affirmative, negative and symbolic (or mystical) theology. I would just say that the hermeneutical as well as theological problem of symbolic reading of the Bible is far from being definitively solved; to see it we have to consider just a simple question: are the miracles, performed by Jesus, meant (only) symbolically? And His very Resurrection – is it just a symbol? Tillich would probably answer that symbol is not less but *more* than empirical reality.²⁷ However, this attitude is hard to accept, since it implies quite a strong version of epistemological antirealism.

Anyway, Tillich’s critique of Einstein’s maybe too simple refusal of a personal God (at least at that conference) is partly justified – especially having in mind Tillich’s later theological reflections in his main work *Systematic Theology* (1951), where he writes that “the God who is a person is transcended by the God who is the Person-Itself, the ground and abyss of every person ...”²⁸ – yet, on the other hand, Einstein’s critique of a personal God as a source of “vast power in the hands of priests” is surely justified too. I could not but agree with Einstein in his concluding sentence of his paper on *Science and Religion*:

“The further the spiritual evolution of mankind advances, the more certain it seems to me that the path to genuine religiosity does not lie through the fear of life, and the fear of death, and blind faith, but through striving after rational knowledge. In this sense I believe that the priest must become a teacher if he wishes to do justice to his lofty educational mission.”²⁹

The refusal of a personal God has several important (and not all pleasant) consequences, among them especially these two:

- a) disbelief in the immortality of the individual soul;
- b) senselessness of prayer as human invocation of God’s favors.

Concerning these two points, several Einstein’s sentences are often quoted, among them the famous concluding passage of *The World as I See It* (1930):

“I cannot conceive of a God who rewards and punishes his creatures, or has a will of the kind we experience in ourselves. Neither can I nor would I want to conceive of an individual that survives his physical death; let feeble souls, from fear or absurd egoism, cherish such thoughts. I am satisfied with the mystery of the eternity of life and with the awareness and a glimpse of the marvelous structure of the existing world, together with the devoted striving to comprehend a portion, be ever so tiny, of the Reason that manifests itself in nature.”³⁰

It is interesting to note that Einstein, in context of his critique of a personal God, says that a *will of the kind we experience in ourselves* is not to be expected in God – of course, here Einstein follows Spinoza again, yet we may ask: maybe an implicit presumption is hidden here, that *not every* kind of will (but

just such as we experience) is inappropriate for God? It seems obvious that Einstein's critique of a personal God is directed mainly against the *anthropomorphic* conception of God's predicates. However, in the traditional theology and/or philosophy of religion, God's Will and human will are considered only as *analogous*, so the essential question is: how far this analogy can be extended? Jammer, for example, points out that it is not only a question of God's *anthropomorphism*, but also of His "*anthropopathism*", i. e., whether God can have at least analogous feelings (*pathos*) as human beings.³¹ And even if we give a negative answer also to this question, still the most difficult question remains: is God's Mind (that mighty cosmic *Logos* who does not "play dice") at least *analogous* to our human mind(s)? Jammer says:

"It seems legitimate to ask whether an attribution of thoughts to God does not imply the notion of a personal God."³²

And he quotes a prophet: "My thoughts are not your thoughts, neither are your ways my ways." (Isaiah 55:8).

The "anthropomorphic" nature of God is, from Einstein's point of view, *par excellence* present in Christianity where God is incarnated in Jesus, "Son of Man". Needless to say, in spite of his great respect for Christianity as the highest form of a "moral" religion (and in spite of his never forgotten "first paradise", which he had found in religion as a boy), Einstein was far from being a Christian, he was closer to unorthodox Judaism and to the old Indian wisdom.³³ Yet, it is interesting to note that Einstein himself has often used

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M. Jammer, *ibid.*, p. 109.

25

Ibid., p. 112.

26

Hans Küng, quoted from: M. Jammer, *ibid.*, p. 113.

27

Paul Tillich, "Religious language as symbolic", in: *Philosophy of Religion*, Michael Peterson *et al.* (eds.), Oxford University Press, Oxford 1996.

28

P. Tillich, quoted from: G. Holton, "Einstein's Third Paradise", in Internet.

29

A. Einstein, *Ideas and Opinions*, p. 49.

30

Ibid., p. 11. – In this respect, Einstein's views, written in letters to various people, from priests to a schoolgirl, are quite explicit as well, for example (here quoted from Internet):

- "I cannot conceive of a personal God who would directly influence the actions of individuals, or would directly sit in judgment on creatures of his own creation. ... Morality is of the highest importance – but for us, not for God." (1927)
- "Since our inner experiences consist of reproductions and combinations of sensory impressions, the concept of a soul without

a body seems to me to be empty and devoid of meaning." (1921)

- "I do not believe in immortality of the individual, and I consider ethics to be an exclusively human concern with no superhuman authority behind it." (1953)
- "Scientific research is based on the idea that everything that takes place is determined by laws of nature, and therefore this holds for the actions of people. For this reason, a research scientist will hardly be inclined to believe that events could be influenced by a prayer, i.e. by a wish addressed to a supernatural Being." (1936)

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M. Jammer, *Einstein and Religion*, p. 141.

32

Ibid., p. 123.

33

However, Einstein saw traces of "anthropomorphism", although on the highest level of knowledge, also in the Eastern wisdom. This is evident from his meeting and discussion with Rabindranath Tagore: while Tagore believed that "the truth of the Universe is human truth", Einstein protests that "this is the purely human conception of the universe" (see: A. Pais, *Einstein Lived Here*, p. 102–103). But the main question remains: can our conception of the universe be other than essentially human?

anthropomorphic predicates when speaking about his cosmic God. Beside addressing Him, quite traditionally, in the masculine gender, saying that “He does not play dice” (not She or It), or speaking of “the old one” (*der Alte*), Einstein also maintains, for example, that God is “subtle”, but not “malicious” (*Raffiniert ist der Herr Gott, aber boshaft ist Er nicht*). From the theological and/or philosophical point of view, these linguistic details are maybe not very important, but it is surely important to distinguish between God as a *person* and an *anthropomorphic* God, since it is not necessary that every possible (conceivable?) God’s person is “anthropomorphic” in Einstein’s sense. This distinction is introduced also in a recent article of Alen H. Batten under the title “Subtle are Einstein’s Thoughts”, published in the renowned journal *Physics World* (September, 2005). Batten writes:

“But why did Einstein not believe in a personal God? To answer that question, we have to understand what he meant by the term. I would define a personal God as a God with whom human beings can have a relationship, analogous to those they have with one another. Although this idea might seem to indicate that God has a human form, I think it is perfectly possible to believe in a personal God who is not anthropomorphic. I suspect – but cannot clearly demonstrate – that Einstein sometimes confused the two ideas.”³⁴

Of course, the trouble is, as usually, in details – namely, what is here meant by “a human form”: just visual, organic form, or also *forma mentis*? Anyway, I agree with Batten that the distinction between “personal” and “anthropomorphic” has to be considered when we speak about Einstein’s God. But next to this distinction I would add the *third* term: “God as Person” (this term could be meant also in Tillich’s sense as “God who is Person-Itself”). And if we introduce this second distinction, the difference between *personal God* and *God-as-Person*, the following question is raised: is God-as-Person indeed incompatible with Einstein’s “cosmic religion”? Why a “pantheistic” cosmic God would not be Person-Itself, why He (or She or It) would not have *His* (or *Her* or *Its*) Will, after all? Not a will akin to ours, not analogous to our human will, but *God’s* Will. Let us remind that also Christian *Lord’s Prayer* says: “Let Thine will happen” – not mine, but Thine! And in *this* sense, pantheism and theism may finally converge. I wonder how would Einstein comment this idea. I have the impression, together with Alan H. Batten, that Einstein’s principal in actually the only relevant target in his critique of a “personal God” was his refusal to accept a “limited God”, a god too much akin to ourselves. However, the concept of a limited “anthropomorphic” god is not implied by the concept of a personal God, and not at all by the concept of a God-as-Person. The latter is not inconsistent with Einstein’s God, who is “subtle”, but “not malicious”, and who presumably does not “play dice”.

Ad II. What has Einstein really meant with determinism? Why has he insisted that *Herr Gott würfelt nicht*? Does determinism in Einstein’s sense necessarily imply the negation of the freedom of the human will?

On the level of “practical reason”, namely in ethics and social life, Einstein, as most other determinists, implicitly presupposed some “compatibilism” between deterministic laws of nature and human free will, since it is indispensable for ethical responsibility of our decisions and deeds. On the other hand, Einstein several times explicitly rejected the philosophical concept of freedom of the human will, for example in his contribution for *Festschrift für Professor A. Stodola* (1929):

“Honestly I cannot understand what people mean when they talk about the freedom of the human will. I have a feeling, for instance, that I will something or other; but what relation this has

with freedom I cannot understand at all. I feel that I will to light my pipe and I do it; but how can I connect this up with the idea of freedom? What is behind the act of *willing* to light the pipe? Another act of willing? Schopenhauer once said: ‘*Der Mensch kann was er will; er kann aber nicht wollen was er will*’ (‘Man can do what he wills but he cannot will what he wills.’)³⁵

Einstein is even more explicit in his already quoted, famous speech *The World As I See It* (1930):

“I do not at all believe in human freedom in the philosophical sense. Everybody acts not only under external compulsion but also in accordance with inner necessity. Schopenhauer’s saying, ‘A man can do what he wants, but not want what he wants,’ has been a very real inspiration to me since my youth; it has been a continual consolation in the face of life’s hardships, my own and others’, and an unflinching well-spring of tolerance. This realization mercifully mitigates the easily paralyzing sense of responsibility and prevents us from taking ourselves and other people all too seriously; it is conducive to a view of life which, in particular, gives humor its due.”³⁶

From the point of the so-called “common sense”, which considers the negation of human freedom as something undesirable and troublesome, it is rather strange that Einstein finds “consolation” in the “inner necessity”, and even derives the source of tolerance out of it. Somebody might also remark that Einstein’s “humor” in taking people not “too seriously” is close to cynicism. However, it is far from that. Einstein follows Spinoza again in this mild and gentle sage’s attitude towards human affairs and life in general. Max Jammer truly says that Einstein’s “theoretical endorsement of determinism in no way affects the demands of practical ethics”.³⁷ Nevertheless, for rationally based compatibilism of necessity and human freedom some troubles and worries remain, since the question of compatibility in the proposed solution, following Schopenhauer, is just transferred to the “metalevel”; yet, if we cannot want what we want, isn’t it actually the same as not doing what we want?

However, it seems that Einstein was more as in freedom of the human will interested in the freedom of God’s will, and within this context he usually placed the question whether determinism obtains or not. In a letter to one of his assistants in Princeton, Ernst Straus, he wrote:

“What really interests me is whether God had any choice in the creation of the world.”³⁸

In the history of philosophy there were different answers to this for our human brain indeed difficult question – for example, Spinoza’s answer was negative, while Leibniz’s positive. In order to better understand Einstein’s troubles concerning God’s choice (i. e., His freedom of Will) in creation of the world, we have to specify the context a little more.

Einstein did not ask himself as Leibniz, if the Creator had the free choice to select in his Mind the world which He was going to create (and, as stands in *Theodicy*, God allegedly selected the best possible world), but he asked himself if *Herr Gott* had the choice to select an *imperfect* world: imperfect as un-finished, namely from the physical point of view, world in whose very depth, in its deepest foundations, is hidden (and presumably revealed by

34
Alen H. Batten, “Subtle are Einstein’s thoughts”, *Physics World*, Forum, Sept. 2005, quoted from Internet.

35
A. Pais, *Einstein Lived Here*, p. 132.

36
A. Einstein, *Ideas and Opinions*, p. 8–9.

37
M. Jammer, *ibid.*, p. 86.

38
A. Einstein, quoted from: G. Holton, “Einstein’s Third Paradise”, in Internet.

quantum mechanics) an irreducible *contingency*, “just chance”, which was in Einstein’s eyes a terrific gap in God’s creation, an inadmissible absence of the “objective reality”. This gap can be, in the best but still bad case, fulfilled only *post festum*, namely with human (or “observer’s”) intervention, when that formidably unreal quantum “superposition” finally “collapses” into some definite, “objective” state. In this sense, *also* in this sense, we can understand Einstein’s most famous dictum that God does not – and should not – “play dice”. As the legend says, Einstein’s main opponent Niels Bohr, the proponent of the “Copenhagen interpretation” of quantum phenomena, which has become standard, advised Einstein not to tell God what He should do. However, the great problem of the “objective reality” has never been adequately solved in (QM), and also some of the main quantum physicists, especially Schrödinger who discovered the wave-function equation, were not satisfied with Bohr’s “phenomenological” interpretation.

Einstein’s worries about *indeterminism* of (QM) can be formulated in several ways which are basically equivalent. The classical formulation can be found also in Abraham Pais’ second monograph. Pais puts the question:

“What did Einstein mean by God not playing dice?”³⁹

And he explains that in the classical mechanics, given the initial positions and velocities of the particles, it is possible to predict their positions and velocities at any later time for any individual collision – but not so in (QM), as Einstein’s close friend, quantum physicist Max Born has written:

“One obtains the answer to the question *not* ‘what is the state after the collision’ but ‘how probable is a given effect of the collision’... Here the whole problem of determinism arises. From the point of view of quantum mechanics there exists no quantity which in an individual case causally determines the effect of a collision... The motions of particles follow probability laws.”⁴⁰

Probability laws *themselves* are of course *necessary* as well as all other scientific laws (for example, Heisenberg’s uncertainty principle or Schrödinger’s wave-function equation *as such* are perfectly necessary, not in the least probable), however, necessity of quantum laws on their “metalevel” does not solve Einstein’s concern about the absence of “objective reality” and causation in quantum phenomena, where, as everywhere in nature, God should not “play dice”. Probability laws express *contingency* of the physical world, which is, following the Copenhagen interpretation, only phenomenologically “real”, without some deeper ontological foundation. This irreducible contingency of quantum phenomena threatens to undermine that magnificent necessity of the “pillars of creation” whose outlines have begun to be discovered by Einstein’s “field equations” of (GTR).

Confronted with quantum mechanics, Einstein reacted in a very rational way, in His way. Pais quotes one of Einstein’s earliest expressions of dissent with the new (QM), dating from 1926, contained in his reply to one of Born’s letters:

“Quantum mechanics is certainly imposing. But an inner voice tells me that it is not yet the real thing. The theory says a lot, but does not really bring us any closer to the secret of the ‘old one’. I, at any rate, am convinced that *He* is not playing at dice.”⁴¹

Einstein refers to his “inner voice”, to his deep intuition which enabled him to formulate his great theory (GTR). And, we may ask: who can state with certainty that he was not right in an essential sense, after all? Namely, even if strict determinism does not obtain, was Einstein’s insisting on necessity of *causation* and *objective reality* indeed a mistake? Let us remind here of

some other Einstein's "mistake" which he himself considered as the greatest – the cosmological constant λ . Cosmological investigations in the last decade suggest that maybe it was not a mistake at all, but a precious idea, born from Einstein's brilliant intuition.⁴²

But let us return to God who does not play dice. What is actually the main Einstein's concern here? Determinism or validity of the universal "Law of Causation"? Some people think that these two terms are equivalent, and Einstein himself does not distinguish them explicitly, however, from the philosophical point of view, they have to be clearly distinguished. Consequently, I think that the principal, albeit somehow overlooked or rather misinterpreted philosophical problem here is the *universal validity of causation*, not just determinism in the strict (Spinozistic) sense. We may see Einstein's concern for causality also from his already considered opposition to a personal God in his first essay on *Religion and Science* (1930):

"The man who is thoroughly convinced of the universal operation of the *law of causation* cannot for a moment entertain the idea of a being who interferes in the course of events – provided, of course, that he takes the hypothesis of *causality really seriously*."⁴³

And also in his later years, Einstein never ceased to stress the importance of causal explanations, as we can see, for example, in his letter to a close friend Michele Besso (1948):

"But for me, the cogitative basis is the trust in an unrestricted causality."⁴⁴

It means: seriously has to be taken the *universal causal determination* of events, but it does not mean that *eo ipso* all events are determined in advance as far as we go to the future.⁴⁵ Determinism and the universal "Law of Cau-

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A. Pais, *Einstein Lived Here*, p. 129.

40

Max Born, in *Zeitschr. für Phys.* 37 (1926), here quoted from A. Pais, *Einstein Lived Here*.

41

A. Einstein, in the letter to Born, dated December 4th, 1926 (quoted from: Marx Born, *The Born–Einstein Letters 1916–1955*, Macmillan Press, New York 2005, p. 88).

42

In a letter to John Moffat, on May 25, 1953, Einstein wrote: "Every individual [...] has to retain his way of thinking if he does not want to get lost in the maze of possibilities. However, nobody is sure of having taken the right road, me the least." (*Discover – Special Einstein Issue*, September 2004, p. 68.)

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A. Einstein, *Ideas and Opinions*, p. 39 (*italics* by the author).

44

Quoted from: M. Jammer, *Einstein and Religion*, p. 87.

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Einstein, of course, knows well that many processes in nature, especially those which

involve thermodynamics, are too complex to be predicted by any available physical theory, however, this complexity does not mean that causality does not work. In his already quoted paper *Science and Religion* (1941), he wrote: "To be sure, when the number of factors coming into play in a phenomenological complex is too large, scientific method in most cases fails us. One need only think of the weather, in which case prediction even for a few days ahead is impossible. Nevertheless no one doubts that we are confronted with a causal connection whose causal components are in the main known to us. Occurrences in this domain are beyond the reach of exact prediction because of the variety of factors in operation, not because of any lack of order in nature." (Einstein, *Ideas and Opinions*, p. 47) – So we have to distinguish two different meanings of uncertainty: on the one hand uncertainty of predictions in thermodynamics which is just "factual", deriving from hypercomplexity of processes, and on the other hand *principal* uncertainty in quantum mechanics (Heisenberg). Nevertheless, can we guess that behind Einstein's critique of (QM) there is some implicit belief that these two kinds of uncertainty have, from the epistemological point of view, yet *something* in common?

sation” *would* be equivalent under (at least) two conditions: 1) *if* we had some *well-formed* “Final Theory”, some scientific “Theory of Everything” (TOE) or simply *the Theory (T)* in Einstein’s ideal sense, and 2) *if* the causal relation in (T) were *well-defined* (for example, defined as being transitive, asymmetric etc.) – but actually we do *not* have any well-formed (T), *neither* we have an exact and comprehensive *scientific* concept of causality ... so, we have to ask: what do we actually mean when we talk of strict determinism in scientific contexts?

I think that the term ‘determinism’ can have an exact scientific sense only *within some well-formed theory*. Several definitions of determinism which occur in philosophical literature, especially in analytic philosophy, have to be read only as *schemes* of definitions, for example:

“*Determinism*. The world is governed by determinism, if and only if, given a specified way things are at a time *t*, the way things go thereafter is fixed as a matter of natural law.”⁴⁶

This is a nice definition-*scheme*, but not a proper definition of determinism itself. In order to obtain it, we have to precise what actually is the “natural law” in the *definiens*, otherwise said, we have to presuppose a *well-formed theory* which expresses this law, actually a set or a *system of laws* – for example Newton’s classical mechanics or Einstein’s (GTR) etc. Only within some well-formed theory the question of determinism can have a proper scientific sense. But we do not have any well-formed “theory of everything” (T), so the traditional philosophical concept of “universal determinism” (“everything is determined”, namely in advance, as far as we go) cannot be well-defined as a scientific concept.

It is interesting to note that in some Einstein’s late statements “his insistence on the primacy of an unrestricted determinism somewhat abated”.⁴⁷ Jammer refers to a passage from Wolfgang’s Pauli’s letter to Max Born, dated 31 March, 1954:

“In particular, Einstein does not consider the concept of ‘determinism’ to be as fundamental as it is frequently held to be (as he told me emphatically many times), and he denied energetically that he had ever put up a postulate such as (your letter, para. 3): ‘the sequence of such conditions must also be objective and real, that is, automatic, machine-like, deterministic’. In the same way, he *disputes* that he uses as criterion for the admissibility of a theory the question ‘Is it rigorously deterministic?’ – Einstein’s point of departure is ‘realistic’ rather than ‘deterministic’, which means that his philosophical prejudice is a different one.”⁴⁸

Jammer comments this interesting passage that

“... this shift in Einstein’s position was, partially at least, the result of his failure to disprove the Heisenberg indeterminacy relation, which form an integral part of the standard version of quantum mechanics”.⁴⁹

We may agree with this statement, however, it has to be added that Einstein’s polemic with proponents of (QM), especially with Niels Bohr (in Solvay Conferences) and Max Born (in letters) has been from its beginnings in twenties more orientated against the “standard” (“Copenhagen”) *interpretation* of indeterminacy laws than against these laws themselves.

As it has been already said, we have to distinguish between determinism in the strict philosophical sense and the universal validity of the “Law of Causation”, especially from the point of the epistemology of science. Namely, in spite of the fact that we do not have any exact and comprehensive *scientific* concept of causality (so as we do not have any exact scientific concept of determinism), the “Law of Causation” – with contrast to the “hypothesis of determinism” – has a status of a *principle* in every scientific investigation. It is *supposed* to be valid universally, even if we do not know or cannot prove

it in some occasions, especially in (QM); namely, we cannot disprove it neither. The universal validity of causation, understood as the general *principle that every event should have its cause* (even if we do not know and cannot explain the nature of some presumably causal relations), *has not been strictly disproved* in (QM), neither strictly demonstrated as incompatible with the indeterminacy laws, which, as we know, have very convincing empirical support. The *rational thought presupposes causality “in principle”*, regardless of the specific concept of causality which may differ in various theories or historical epochs (for example, in Aristotelian *epistème*, the “final cause”, *causa finalis*, was included among the “natural” causes, what is after Galileo and Newton, up to Einstein, of course not the case).

The principle of universal causality is by its *epistemological* status similar to Leibniz’s principle of sufficient reason. Both principles have to be *a priori* valid in order to develop science as rational discourse. Miracles are excluded from science, also from (QM). Speaking about Einstein’s rejection of miracles, namely from the scientific point of view, Max Jammer says that Einstein’s belief in an unrestricted “determinism” (i. e. causality) in science can be understood as his belief that “an unalterable antecedent–consequent relation is a necessary condition for the *comprehensibility* of experience ([that is] essentially a Kantian idea).”⁵⁰ From this point of view, which is close to mine, causality has the epistemological status of a *category* of reason. Here I cannot go further into discussion if causality is a *transcendental* category in Kantian sense, if it is known *a priori* etc. My intention here is just to point out that Einstein’s “intuition” that (QM) is not a complete theory, that it is somehow provisional, “not yet the real thing”, since (QM) does not yield causal explanations – has a strong philosophical support, and that it is “in principle” *maybe right*, in spite of the well-verified quantum indeterminacy. Otherwise said, that (GTR) is *maybe compatible* with the (QM) on some level which has not been discovered yet.

Let us resume: Einstein’s principal objection against (QM) is sometimes understood mainly as his insisting on the strict determinism in science. But things are more complicated, since the question of “objective reality” is deeper than the question whether determinism obtains or not. We have pointed out that Einstein did not want to sacrifice causality, not just determinism as we usually understand it. Namely, if we give up the “Law of Causation” as a general principle of science, we come too close to some deficient “agnostic” attitude which only “saves the phenomena” with successful mathematical models, without really *understanding* them. (“Saving phenomena ...” – it sounds familiar, like some *déjà vu*.) That’s why it is important to take into account the epistemological distinctions between some basic concepts which we are inclined to confuse.

Of course, I do not think that Einstein’s old “Universal Field Theory” (UFT) is going to prevail over contemporary (QM). It is more probable that the rela-

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Carl Hofer, “Causal Determinism”, in: *Stanford Encyclopedia of Philosophy*, available in Internet.

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M. Jammer, *Einstein and Religion*, p. 53.

48

Wolfgang Pauli, in: *The Born–Einstein Letters*, p. 216.

49

M. Jammer, *Einstein and Religion*, p. 53–54.

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M. Jammer, *ibid.*, p. 88 (*italics* added by the author).

tivistic “locality” has to be sacrificed for some new type of “holism” in physics, and maybe also anisotropy of time has to be reconsidered. For the moment, these are just “queries”, if we use Newton’s term. Anyway, it is difficult to imagine that the principle of causation itself would be given up in science, since human reason cannot be satisfied with “phenomenological” descriptions only, nevertheless how sophisticated and mathematically elegant they might be. Let us remind of another Einstein’s well-known remark that “the most incomprehensible thing about the universe is that it is comprehensible”.

In the end, I will quote Einstein’s famous passage concerning his “experience of mystery”. But before quoting this passage, let me hint the following speculation: in case, if Einstein indeed found his great final Theory (**T**) – otherwise said, in case if absolutely no “hidden variables” remained in explaining our world – would then still be possible our “experience of mystery”? Could we still admire with “wonder and awe” the magnificent God’s “Design” of the Cosmos? Or, is it maybe opposite the case: that just then our admiration of His Subtlety, Beauty and Truth would be perfect? Of course I have to leave this dilemma open.

And here is the famous passage from *The World As I See It* (1930):

“The most beautiful experience we can have is the mysterious. It is the fundamental emotion that stands at the cradle of true art and true science. Whoever does not know it and can no longer wonder, no longer marvel, is as good as dead, and his eyes are dimmed. It was the experience of mystery – even if mixed with fear – that engendered religion. A knowledge of the existence of something we cannot penetrate, our perceptions of the profoundest reason and the most radiant beauty, which only in their most primitive forms are accessible to our minds: it is this knowledge and this emotion that constitute true religiosity. In this sense, and in this alone, I am a deeply religious man.”⁵¹

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Marko Uršič

Albert Einstein – Wissenschaft und Religion

Zusammenfassung

Der Artikel setzt sich vornehmlich mit der Frage auseinander, was es mit Einsteins berühmtem Dictum Gott würfeln nicht im philosophischen und/oder theologischen Sinne auf sich hat. Welches ist das grundlegende Konzept der Notwendigkeit, auf der dieser Satz beruht, und vor allem: Welcher Gott, der nicht spielt, ist hier gemeint – der theistische, der deistische oder der pantheistische? Einige Abschnitte aus Einsteins Schriften und öffentlichen Reden legen die Vermutung nahe, dass er dem Pantheismus zugeneigt war, in Anlehnung an Spinoza, den er stets bewunderte und von allen Philosophen am meisten schätzte. Allerdings setzt Spinozas Pantheismus Determinismus voraus, was vermutlich nicht der Hauptgrund für Einsteins Protest gegen einen „würfelnden Gott“ in der Quantenphysik gewesen sein mag... Sollte demnach Einsteins Gott dem Newton'schen Pantokrator oder Spinozas Deus sive natura näher stehen? Das ist möglich, aber nur wenn der Universalherrscher seine Kreaturen, uns winzige Geschöpfe, in einem immensen und vor allem „wohltemperierten“ Universum weder bestraft noch belohnt. Das Änigma des berühmten Satzes bleibt ungelöst.

Schlüsselwörter

Gott, Würfeln, Pantheismus, Determinismus, Religion, Wissenschaft, Albert Einstein

Marko Uršič

Albert Einstein – Science et Religion

Sommaire

Le problème principal présenté dans cet article est le point de vue philosophique ou théologique d'Einstein dans sa phrase célèbre: Dieu ne joue pas aux dés. Quel en était le concept « fondamental » de nécessité? Et avant tout: quel est ce Dieu qui ne joue pas aux dés? Est-ce un Dieu théiste, déiste ou panthéiste? Certains autres passages des écrits informels d'Einstein et de ses discours montrent qu'il était très proche du panthéisme, admirateur de Spinoza qu'il considérait comme le plus grand des philosophes. Pourtant le panthéisme de Spinoza implique le déterminisme qui, probablement, n'a pas été la raison principale de son désaccord avec Dieu qui joue aux dés dans la physique quantique.

Donc il est sans importance que le Dieu d'Einstein soit plus proche du Pantocrator de Newton, ou plutôt de Deus sive natura de Spinoza. Peut-être que oui, mais seulement si le Souverain universel ne punit ni ne récompense ses créatures, donc nous-mêmes, ces êtres minuscules dans ce monde immense et bien harmonisé. L'énigme est toujours posée.

Mots clés

Dieu, jouer aux dés, panthéisme, déterminisme, religion, science, Albert Einstein