The Music of Chance: On the Origin of Species from a Jewish Perspective

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The title of this article, “The Music of Chance,” comes from a novel by Paul Auster, although that is the article’s only link to the novel. I chose this title because I would like to convey the message that even though life developed on Earth as a result of chance (as well as of necessity), which is one of the major tenets of the modern evolutionary theory, this fact should not scare us, as observant and devoted Jewish people. Randomness is entirely consistent with biblical and rabbinic sources. However, we should rethink our views on creation of life and humankind.

Chance occurs in the evolution of life at different levels. On the cellular level, the sorting of paternal and maternal chromosomes is an instance of randomness. At the molecular level, mutations take place in the genetic material (DNA or RNA) either spontaneously, during its replication, or due to external causes, such as radiation or chemicals. Moreover, genes or entire parts of chromosomes may recombine. These are random events because there is no way to predict them. Only their frequency could be estimated, but not the exact place where the mutation or the fusion between different DNA segments will occur (unless artificially induced). These kinds of events are routinely observed in any laboratory of molecular biology all over the world.

On the macroscopic level, chance (or, as it is often called, historical contingency) occurs in the environment in which living organisms are found. Natural catastrophes such as earthquakes, floods, meteorite impacts, and so on are the most dramatic events. But there are other, less spectacular instances that could be random, such as the migration of a small, particular group of individuals into an isolated place (*genetic drift*). These contingent events could direct the evolution into one direction instead of another.

An important point should be stressed. All these changes, at a genetic level as well as at a macroscopic one, are not to be considered accidents that it would be preferable to avoid. The opposite is true. If the DNA replication machinery were extremely defective, by inserting many errors in each cycle of replication, then life could not be perpetuated; however, on the other hand, if the same mechanism were absolutely perfect, no evolution would occur. Genetic shuffling and mutations are the engine that promotes evolution. The same could be said regarding environmental changes. A fixed ecosystem would not allow the selection of new variants, and thus would prohibit evolution.

Primo Levi, the renowned Italian-Jewish writer and chemist and survivor of Auschwitz, makes a similar point, though in a different context, adding a very stimulating analogy. In *The Periodic Table*, he speculates on the resistance of pure zinc to chemical reactivity. Here are his words:

One could draw from this two conflicting philosophical conclusions: the praise of purity, which protects from evil like a coat of mail; the praise of impurity, which gives rise to changes, in other words to life. I discarded the first, disgustingly moralistic, and I lingered to consider the second, which I found to be more congenial. In order for the wheel to turn, for life to be lived, impurities are needed and the impurities of impurities in the soil too, as is known, if it is to be fertile. Dissension, diversity, the grain of salt and mustard are needed: Fascism does not want them, forbids them… it wants everybody to be the same […] I am Jewish…I am the impurity that makes the zinc react, I am the grain of salt or mustard. Impurity, certainly, since just during those months the publication of the magazine *Defense of the Race* had begun, and there was much talk about purity and I had begun to be proud of being impure. (P. Levi, *The Periodic Table*, "Zinc," translated from the Italian by Raymond Rosenthal, Everyman 1995).

What was the Jewish reaction to the theory of evolution, after its appearance in the years 1858 (in a short, joint communication by Charles Darwin and Alfred Wallace) and 1859 (with the publication of Darwin's 400-page book *The Origin of Species*? The first important Jewish philosopher who dealt with Darwin was probably the Italian Rabbi and kabbalist Eliyahu Benamozegh (1822–1900). He referred repeatedly to Darwin and to natural selection in a long passage in his commentary to the Torah (*Em laMikra*, *Devarim* 22:10, Livorno 1863, pp. 87a–88b). R. Benamozegh highly estimated Darwin, quoting him throughout several of his writings. Although R. Benamozegh did not consider Darwin's theory convincing, he did not see an essential contradiction between Darwin's view and the Torah (see Jose Faur, "The Hebrew Species Concept and the Origin of Evolution: R. Benamozegh's Response to Darwin, *La Rassegna Mensile di Israel* 63, 3, 1997, pp. 42–66, where the entire passage by R. Benamozegh is quoted in its original Hebrew and in English translation).

Among the not-many Jewish thinkers and rabbis who addressed the theory of evolution, Rabbi Shimshon Rephael Hirsch (1808–1888) wrote that although at that time he did not consider it a solid hypothesis, if science ever did prove the factuality of evolution, it would not pose a problem to Judaism's beliefs [at the end of this article I will quote a remarkable passage from R. Hirsch's writings].

In the twentieth century, Rabbi Avraham Isaac Kook (1865–1935), the first Chief [DEA2] Rabbi of Eretz Israel, treated evolution in many works and letters, pointing to a general agreement between this theory and the Torah. See, for example, the following two extracts (from "Abraham Isaac Kook on Evolution: How evolutionary theory supports a mystical worldview," by Shai Cherry, *Three Twentieth-Century Jewish Responses to Evolutionary Theory*, Aleph: Historical Studies in Science and Judaism, 3, 2003):

The theory of evolution (*hitpattehut*) is increasingly conquering the world at this time, and, more so than all other philosophical theories, conforms to the kabbalistic secrets of the world. Evolution, which proceeds on a path of ascendancy, provides an optimistic foundation for the world. How is it possible to despair at a time when we see that everything evolves and ascends? When we penetrate the inner meaning of ascending evolution, we find in it the divine element shining with absolute brilliance. It is precisely the Ein Sof *in actu* which manages to bring to realization that which is Ein Sof *in potentia*. (Rav Kook, *Orot Hakodesh* II:537)

Even if it were clear to us that the order of creation was through the evolution of the species, there would still be no contradiction. We calculate time according to the literal sense of the biblical verses, which is far more relevant to us than is ancient history .... The Torah obviously obscures the account of creation and speaks in

allusions and parables. Everyone knows that the account of creation is part of the secrets of the Torah. And if all these statements were taken literally, what secrets would there be? ... The essence [of the Genesis narrative] is the knowledge of God and the truly moral life. (*Letters of Rav Kook*, Letter 91.)

If we now examine the approach of contemporary Jewish thinkers, it could be seen that among religious physicists, not only Jewish, the theory of evolution is often considered to be unconvincing and incomplete. This viewpoint is well described in an excellent paper by Dr. Baruch Sterman:

The attitude of people who reject Darwin and his theories usually ranges from condescending dismissal to indignant derision. The tacit respect afforded physics or chemistry (often grudgingly) is conspicuously absent with regard to evolutionary biology. Evidence such statements by the Lubavitcher rebbe [ztzl] as, "If you are still troubled by the theory of evolution, I can tell you without fear of contradiction that it has not a shred of evidence to support it" [*Challenge: Torah Views on Science and its Problems*, A. Carmell and C. Domb, eds. (Jerusalem: Feldheim, 1976), p. 148]. Even the great advocate of harmony between Science and Torah, Prof. Leo Levi, derides the theory in his discussion of evolution: "Looking at this theory [Darwinian evolution] as an attempt at a scientific formulation, it is very unconvincing, to say the least. Despite the beautiful and convincing descriptions in popular science books and high school texts, with their persuasive pictures, not only is the theory of evolution totally unproven, it is practically disproven" [Leo Levi, *Torah and Science*, (Jerusalem: Feldheim 1983), p. 105].

Evolution nevertheless evokes a disposition of derision and contempt in religious thinkers, even among those who are generally favorably disposed to *Torah uMadda*. It is constantly adorned with pejoratives: the "so-called" or "alleged" theory is unscientific, implausible, disproven…

Professor Nathan Aviezer, a physicist at Bar-Ilan University, recently published a book, *In the Beginning*, … [in which he] has no problem accepting virtually all the regnant scientific theories including the Big Bang theory and the fifteen billion year age of the universe… Prof. Aviezer's tone is markedly different in his discussion of evolution than in the rest of his book. Whereas throughout his work he tries to reconcile regnant scientific thought with the Torah, here he goes out of his way to show that the theory of evolution, at least in its most popular form, is not valid scientifically. One reason for Aviezer's presentation is that evolution is seen as the scientific theory most at odds with Judaism. Many believing Jews are unwilling to accept the notion that there can be compatibility between the two. (B. Sterman, "Judaism and Darwinian Evolution," *Tradition* 29,1, 1994).

Prof. Aviezer's case is an interesting one, and he has been attacked from two opposite sides. The Hareidi community could not accept that he, as a religious and observant Jew, wrote that the universe was created billions of years ago, that dinosaurs existed in the past, and that life evolved in some manner. From the other side, he has been very sharply criticized by some evolutionary scientists, such as Prof. Raphael Falk from the Department of Genetics of the Hebrew University of Jerusalem, who wrote that Prof. Aviezer is a "fundamentalist," writing "pseudo-science," "manipulating scientific evidence," "committing scientific rape," and so forth. (See both authors in *Alpayim—A Multidisciplinary Publication for Contemporary Thought and Literature* 9, 1994, [in Hebrew]; see also N. Aviezer, "The Anthropic Principle," *B'Or Ha'Torah* 17 (5768/2007), pp. 69–84 and especially p. 78.)

The situation is quite different for observant Jewish life-scientists, who are generally much more well-disposed toward the theory of evolution. See for example the following excerpt from a valuable paper by Dr. Carl Feit, Head of Biology Department at Yeshiva University:

The theory of evolution … is not a dead theory as some have claimed, but I believe it to be central to the whole enterprise of biology today…[and] stands as the central pillar of modern biology. It provides a way of explaining and predicting scientific results as any good theory should, with thousands of facts as its empirical base. At the moment, there is no alternative or competing scientific theory to explain the phenomena with which it deals…. The theory of evolution is a firmly rooted one, on the level of the theories of quantum mechanics, relativity, electricity and other well established ways of explaining reality. Indeed, the theory of evolution is *the* scientific theory of contemporary biology. (C. Feit, "Darwin and Drash: The interplay of Torah and Biology," *The Torah U-Madda Journal*, 1990, II, pp. 29–30)

Or, as Dr. Sterman puts it in the above-cited *Tradition* paper:

Anyone who has ever been instructed to take antibiotics for a full ten days in order to avoid selection of strains that are resistant to the medicine, should be aware of the basic mechanism of Darwinian evolution. That mutations occur and that organisms better suited to an environment are most likely to survive are facts that virtually no one would question or doubt. It is clear that evolution as Darwin described it is currently taking place, continually and consistently.

This favorable attitude of biologists to the theory of evolution, however, is not always well accepted. Recently, a big scandal has arisen around Rabbi Natan (Nosson) Slifkin, the so-called "Zoo Rabbi." This young England-born Orthodox rabbi, now living in Israel, has become known for his interests in biology and zoology, on which he wrote several books. His works were quite popular in the Orthodox and even the Hareidi world, until somebody discovered in them several concepts that were considered "heretical." As a consequence, in 2004, between Rosh Hashanah and Yom Kippur, Rabbi Slifkin was requested by four important rabbis of the Hareidi camp to retract his books at once. Since Rabbi Slifkin did not agree with the charge and did not retract his books, the rabbis' public condemnations were posted on synagogue walls a few hours before Kol Nidre. Eventually, about twenty important Hareidi rabbis in Israel and in the United States put a ban concerning all Slifkin's books. The ban caused a strong debate, mainly on the Internet, in which rabbis and scholars with different positions participated all over the world. (The entire story and a lot of texts and documentation could be found in Rabbi Slifkin's website, www.zootorah.com.)

After the ban, Rabbi Slifkin wrote *The Challenge of Creation, Judaism's Encounter with Science, Cosmology and Evolution* (Yashar Books, New York, 2006, 2008), which is a revised and expanded edition of his previous work *The Science of Torah* (Targum Press, 2001—this publisher discontinued distribution of Slifkin's books after the ban). *The Challenge of Creation* is an extremely and unusual lucid book on the relationship between Torah and Science in general, and on evolution in particular. It is an invaluable resource on these subjects, certainly the best work after the collective volume edited by Rabbi Aryeh Carmell and Prof. Cyril Domb, *Challenge: Torah Views on Science and its Problems* (Feldheim, 1976). It is worth to quote the beginning paragraph of Rabbi Slifkin's book (in the following part of this artoc;e. I will quote several other passages):

This book was written for those who are committed to the tenets of Judaism, but also respect the modern scientific enterprise and are aware of its findings, and who are therefore disturbed by the challenges that are raised for their understanding of Torah. It addresses these challenges by following the approach of Rambam (Maimonides) and other similar Torah scholars towards these issues, which, while firmly within the framework of authentic Orthodox Judaism, is not the method of choice in many segments of the ultra-Orthodox community. But many have found that no other approach works as well in solving these difficulties. Other people may not

possess as extensive a background in the sciences or may dispute the validity of the modern scientific enterprise. They may therefore simply not be bothered by the questions discussed in this book, or they may have different ways of dealing with such conflicts. Such people are not the intended audience of this book and they are advised not to read it. (N. Slifkin, *The Challenge of Creation*, p. 11)

That the way of thinking in some Jewish environments is not at all favorable to the theory of evolution is well illustrated by an account reported by Rabbi Marc Angel. A ten-year old boy was told by his Torah teacher that dinosaurs never existed. The boy then said to him that he had visited the Museum of Natural History in New York City and had seen dinosaurs with his own eyes. No problem, the teacher said. They were not dinosaur bones, but dog bones that became swollen during Noah's flood (Marc D. Angel, "Reflections on Torah Education and Mis-Education," *Tradition* 41:2, 2008, pp. 10–23; see also the comments in *Tradition* 42:1, 2009, pp. 108–110.)

Why is there such a strong resistance to accept evolution by religious believers, even, or perhaps, especially among the educated individuals?

In order to illustrate where the problem lies, it is useful to make a comparison with another great case of the past in which science and religion came into conflict—the "Galileo affair." Today, there is no disagreement about the Copernican theory, which Galileo supported and because of which was consequently taken to court by the Church twice, in 1616 and in 1633, until he was condemned to house arrest. From a theological and doctrinal standpoint, it does not make any difference whether the sun revolves around the Earth or the other way. It is an issue that solely concerns historians of science and of its relation with religion. Today, nobody would ever dream of saying that the statement "the Earth revolves around itself and the sun" is incorrect and heretical. Likewise, nobody is of the opinion that the fact that we are no longer located at the center of the universe, but rather on a small planet that revolves around an average-size star in a peripheral area of one out of billions of existing galaxies, should be conceived as a serious problem from a religious point of view.

Regarding Darwin's theory of evolution, however, it's a different story. The problem is still alive. We are not dealing only with the fact that science provides us with a different description from that of a literal and plain reading of the biblical text. If this were the only problem, then, just like we have read differently the (few) biblical references that talk about the mobility of the sun and the fixity of the Earth and interpreted them not literally, so too we could do the same when reading the first chapters of *Bereshith* that talk about the creation of the world. There are plenty of classical sources that allow a non-literal interpretation of some passages of the Torah. Rambam deals with the allegorical interpretations in several works: see for example in the *Guide of the Perplexed*, Introduction, and Part II, chapters 25 and 29; *Letter on the resurrection of the dead*. (For other classical and modern commentators, see N. Slifkin, *The Challenge of Creation*, chapter 7; Carmell and Domb (eds.), *Challenge*; Rabbi Dr. Avraham Steinberg, "Creation and the Theory of Evolution," in *Encyclopedia of Jewish Medical Ethics*, translated by Dr. Fred Rosner, Feldheim, Jerusalem-New York, vol. I, pp. 151–166).

Why wouldn't it be sufficient to explain the biblical text in a non-literal way? The problem is that at the foundation of the theory of evolution lies the notion of chance and contingency. These are not the only components; there is also a remarkable amount of "necessity," yet the aspect of chance is certainly fundamental. To use Stephen J. Gould's famous image, if we rewound back the film of the history of life on Earth and then play it forward again, we would not get the same film. And we, all human beings, would most likely not be part of this film. In his own words:

Let the “tape of life” play again from the identical starting point, and the chance is vanishingly small that anything like human intelligence would grace the replay.

It fills us with amazement (because of its improbability) that human beings exist at all. Replay the tape a million times from the same beginning, and I doubt that *Homo sapiens* would ever appear again. It is, indeed, a wonderful life.

Consciousness would not have appeared on our planet if a cosmic catastrophe had not claimed the dinosaurs as victims. In a literal sense, we owe our existence, as large reasoning mammals, to our lucky stars. (S. J. Gould, *Wonderful Life*, New York: W.W. Norton, 1989, p. 14, p. 289, p. 318)

On the same line of thought was Jacques Monod, one of the founders of molecular biology, Nobel prize winner in 1965, who stated in his best-seller *Le Hasard et la Necessite*: “The Universe was not pregnant with life, nor the biosphere with man” (*Chance and Necessity*, trans. A. Wainhouse, New York: Knopf, 1971, p. 145).

In truth, not everyone agrees with this idea. C. de Duve, a Belgian biochemist, Nobel prize winner in1974, maintains, on the contrary, that the appearance of life and intelligence are ineluctable phenomena, judging by the physical and chemical characteristics of the universe, and that therefore we would have eventually made our appearance on the scenery of the Earth. To Monod, de Duve responded sharply: “You are wrong.”

My reasons for seeing the universe as meaningful lie in what I perceive as its built-in necessities. Monod stressed the improbability of life and mind and the preponderant role of chance in their emergence, hence the lack of design in the universe, hence its absurdity and pointlessness. My reading of the same facts is different. It gives chance the same role, but acting within such a stringent set of constraints as to produce life and mind obligatorily, not once but many times. To Monod's famous sentence "The universe was not pregnant with life, nor the biosphere with man," I reply: "You are wrong. They were." (C. de Duve, *Vital Dust: Life as a Cosmic Imperative*, Basic Books, New York, 1995, p. 300)

The same divergence of opinions can be traced regarding the probability of finding life (and intelligent beings) on other planets. If we think that the appearance of life is a coincidental event, a fortunate number that came up in the lottery, then it is very likely that the appearance of life on the Earth is a unique case in the whole universe. If, on the contrary, wherever there are conditions that are similar to those of the Earth, it is probable—or rather, inevitable—that life has arisen on other planets as well (on this issue, see Amir D. Aczel, *Probability 1*, Little Brown, 1998).

There is no doubt that de Duve’s and others’ (like Simon Conway Morris) opinions pose less questions from a theological point of view: The Creator puts the Universe in motion, in the beginning of time, and life (and Man) will eventually appear. The concept of “eternity of God” actually means that it makes no difference, to the Creator, whether life and Man appear after 10 or 20 or 100 billion years after the Big Bang. God is eternal and is, so to speak, patient. Whenever Man comes, he comes.

On the contrary, the other opinion, shared by Gould, Monod and many other scientists, is not as easily acceptable within the religious dimension. It is no longer enough to claim that God is the *primum movens*. According to this opinion, giving the world “the first push” and letting it follow its course would not necessarily generate life or humanity. Thus, if we are the fruit of mere chance and contingence, what’s the point of speaking about a Creator? This is indeed a “formidable difficulty,” as B. Sterman says in a note of his *Tradition* paper (but without dealing with this problem and only

referring to Rabbi Jonathan Sacks' article on evolution in *Issues in Jewish Thought*, United Synagogue Publication, 1982).

Is it possible to accept randomness within a religious and, specifically, Jewish view? My answer is: Yes, it is.

One way to reconcile the idea of a living world (a world that includes humanity) born by chance with a religious view and with the concept of God as Creator may be the assertion that whatever appears to our eyes as accidental, it really isn't and is in fact "directed" by the Creator. It could be imagined that God sometimes "gives a push" to some meteorite, such as the one that hit the Earth 65 million years ago (specifically, in the Yucatan peninsula) and determined the extinction of the dinosaurs, thus allowing the mammals and, ultimately, humans to take over. We are not meant to know the way God can carry out such a thing. Almost 3,000 years ago, the prophet Isaiah said already: "For My thoughts are not as your thoughts, nor are your ways as My ways, says God" (Isaiah 55:8). Another quotation that is particularly appropriate in this context is from Darwin himself:

> On the other hand I cannot anyhow be contented to view this wonderful universe and especially the nature of man, and to conclude that everything is the result of brute force…. I feel most deeply that the whole subject [the theological view of evolution] is too profound for the human intellect. A dog might as well speculate on the mind of Newton (Ch. Darwin, Letter to Asa Gray, May 22, 1860)

The idea that what appears as random is in reality guided by a supreme being is followed by a great number of believer and devoted Jewish scientists. They accept evolution as a given, even though they confer a theological explanation to it. A biblical support for this concept is a passage in the Book of Proverbs (16:33): "[When] the lot is cast in the lap, its entire verdict has been decided by God." On this verse, the Malbim, one of the most important commentators in the XIX century, elaborates:

> There are things that appear given to chance but are actually providentially determined by God... "the lot is cast in the lap," hidden from the eye of man, handed over to chance, but nevertheless the eye of God's providence is displayed in it, and the verdict that the lot brings up is not chance but is from God; just as with the apportioning of the land [see *Bemidbar* 26:52–56; Talmud, *Baba Batra* 122a] and so on, where the lot was under God's providence. (Malbim, Commentary ad loc., transl. by R. Slifkin in *The Challenge of Creation*, p. 292)

The story of Purim is another example of how seemingly random events are, in truth, guided by Divine Providence. The same could be said for Jonah and the terrible storm that came upon the ship he was in.

However, the idea that God sometimes pulls some strings here and there is not easily acceptable from both a scientific-philosophic and a theological point of view. After all, this way of thinking would not be so different from the theory that asserts that there exists an *Intelligent Designer* who designed cellular structures and components of biochemical reactions. Scientifically speaking, the Intelligent Design (ID) theory is rejected since it implies the existence of something real that is not explicable in rational terms. Theologically speaking, it is not easily tenable since it depicts a "God of the gaps," a Creator who is invoked whenever we don't have a valid scientific explanation, and then becomes unnecessary when the explanation is finally found. Still, it could be argued that the intervention of the Creator is not believable on a cellular and microscopic level (in order to design the bacterial flagellum or the blood-clotting system—two favorite examples of the ID movement), yet it may be so on a macroscopic level (mass extinctions, and so forth). The latter case would be similar to

the miracles that the Torah tells about, such as the crossing of the Red Sea and others. This seems to be the way many believer Jewish scientist see the matter, as Gerald Schroeder in his best-seller *Genesis and the Big Bang*.

There is a second way to reconcile the idea of chance with a religious view, which seems preferable. A known Midrash by Rabbi Yehudah bar Shimon, interpreting the verse from the Torah "and it was evening, and it was morning" (*Bereshith* 1:5), states that before the first day there was a "succession of times" (*seder zemanim*). In response to the question of what God was doing during this primordial time, Rabbi Abbahu replies: "He created worlds and destroyed them, saying: I like this one (world), I disliked the previous ones." (*Bereshith Rabbah* 83; see also in *Torah Shelemah* by Rabbi Menachem Kasher, I, 423). It is true that the Rambam, in the *Guide of the Perplexed* (II, 30), regards this Midrash as "incongruous" (Pines' translation; *megunne* in the Hebrew translation by Ibn Tibbon), because it seems to point at the concept of an eternal universe; however, we may hypothesize that had the Rambam known, as we know today, that the Earth has indeed undertaken several mass extinctions, he would have probably taken R. Abbahu's statement with more benevolence, as Rabbi Yehudah Halevi in fact did in the *Kuzari*, I, 67.

Im lo de-mistaphina, I would dare to say that R. Abbahu may be saying that not even the Creator Himself knew, as He began the creation, how it would have turned out. In other words, there wasn't a completely pre-arranged scheme of the creation; rather, the creation was a sort of "work in progress," with a development that was also dependent on chance and contingency. When finally, in the last created world (or, if we may, after the last mass extinction), the *Homo sapiens* makes his appearance, God reveals Himself to him and begins to interact with mankind. God has at last someone to talk to. After all, the history of the relationship between God and Human is that of God seeking Human, who sometimes answers back, and vice versa.

Rabbi Slifkin comments on this Midrash as follows:

> The "loving deity" clearly manifests His love in more subtle ways than by simply letting everything live forever. Some may still ask how the idea of "trial and error" fits with the concept of a God Who knows the consequences of His actions. Still, it is clear from this Midrash that such was part of the Jewish understanding of God many thousands of years before extinctions were discovered by science. If such phenomena were always our understanding of how God works, then the explanation of the physical mechanisms via evolution cannot be said to challenge religion. (N. Slifkin, *The Challenge of Creation*, p. 315)

Even the words, which recur several times in the beginning of *Bereshith*, "and God saw that what He had done was good," point at this interpretation. This is how the Malbim interprets them:

> Everywhere in the creation narrative, it concludes with, "And God saw that it was good." This was meant to emphasize that notwithstanding the fact that each successive stage of creation was *yesh mi-yesh* [existing from existing], which means that it came about at the expense of the destruction of what had been before—in the pattern of God creating worlds and then destroying them—and all annihilation is evil from the perspective of that which is annihilated, nevertheless, since its purpose was to effect an improvement, a higher stage in creation, it was seen by God as good. (Malbim, Commentary to Genesis 1:4, in Rabbi Slifkin's translation, *The Challenge of Creation*, pp. 315–316)

Randomness has been discussed by several contemporary observant and religious Jewish

thinkers, as David W. Weiss (see “Randomness and determinism in nature: a consideration,” in his book *The Wings of the Dove, Jewish Values, Science and Halachah,* B’nai B’rith Books, Washington, D.C., 1987; “Judaism and Evolutionary Hypotheses in Biology: Reflections on Judaism by a Jewish Scientist,” *Tradition* 19(1), 1981, pp. 3–27). [If I can add a personal note, both Prof. Weiss and the above-quoted Prof. Falk, who has been called a “militant secularist,” were my teachers at the Life Science Department of the Hebrew University of Jerusalem. I report this fact to emphasize how two opposite approaches can be equally reconciled with the theory of evolution.]

A discussion on the “theology of randomness” can be also found in a valuable paper by Dr. John D. Loike and Rabbi Prof. Moshe D. Tendler, together with many other relevant points and references. Specifically, these authors refer to the Ramban and the Netziv and conclude in this way:

> In short, randomness is not a synonym for atheism and need not conflict with a Torah-based outlook. When evidence of randomness is used to deny the existence of a supreme being, we have a *non sequitur* that rests on a simplistic understanding of theology, the persistence of which may reflect an antecedent personal belief or bias. (J. D. Loike and M. D. Tendler, “Molecular Genetics, Evolution, and Torah Principles,” *The Torah u-Madda Journal*, 14, 2006–07, pp. 173–192)

The concept of randomness is not at all a new one in philosophy and theology. The Rambam says in his *Guide*:

> As for my own belief with regard to this fundamental principle, I mean divine providence [*hashgaha elokit*, in Ibn Tibbon’s translation], [… it is] nearer than [the other opinions] to intellectual reasoning. For I for one believe that […] divine providence watches only over the individuals belonging to the human species and that in this species alone all the circumstances of the individuals and the good and the evil that befall them are consequent upon the deserts, just as it says: *For all His ways are judgment* [*Devarim* 32:4]. But regarding all the other animals and, all the more, the plants and other things, my opinion is that of Aristotle. For I do not by any means believe that this particular leaf has fallen because of a providence watching over it; nor that this spider has devoured this fly because God has now decreed and willed something concerning individuals; nor that the spittle spat by Zayd [*Reuven*] has moved till it came down in one particular place upon a gnat and killed it by a divine decree and judgment; nor that when this fish snatched this worm from the face of the water, this happened in virtue of a divine volition concerning individuals. For all this is in my opinion due to pure chance [*mikre gamur*], just as Aristotle holds. […] If, as he [Aristotle] states, the foundering of a ship and the drowning of those who were in it and the falling down of a roof upon those who were in the house, are due to pure chance, the fact that the people in the ship went on board and that the people in the house were sitting in it is, according to our opinion, not due to chance, but to divine will in accordance with the deserts of those people as determined in His judgments, the rule of which cannot be attained by our intellects. (Rambam, *The Guide of the Perplexed*, II, 17, transl. by Sh. Pines, The University of Chicago Press, 1963) [This passage should be read in conjunction with chapter 51 of Part III, in particular the passage beginning with: “A most extraordinary speculation has occurred to me just now through which doubts may be dispelled and divine secrets revealed.”]

Rambam’s words, where he says that there is no divine providence when a spider devours a fly or the like, are quite similar to Darwin’s words in the above-quoted letter to Asa Gray about a dog and Newton’s mind:

But I own that I cannot see, as plainly as others do, and I should wish to do, evidence of design and beneficence on all sides of us. There seems to be too much misery in the world. I cannot persuade myself that a beneficent and omnipotent God would have designedly created the Ichneumonidae (a wasp with parasitic larvae) with the express intention of their feeding within the living bodies of caterpillars, or that a cat should play with mice. (Ch. Darwin, *Letter to Asa Gray*, May 22, 1860)

In conclusion, Rabbi Slifkin's own final words are appropriate:

Each generation attains new insights into both Torah and the natural world. The revelations of science, which have challenged scientists to account for the extraordinary lawfulness of the universe, have enhanced our appreciation of the wonders of God's creation. They have enhanced our grasp of the unity of existence. And they have also enhanced our under standing of the "creative wisdom" of God, as Rabbi Hirsch phrased it. There is grandeur in this view of Creation. (N. Slifkin, *The Challenge of Creation*, p. 345)

And surely it is no coincidence that his last words refer to Darwin's conclusive words:

There is grandeur in this view of life, with its several powers, having been originally breathed [by the Creator] into a few forms or into one; and that, whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved. (Ch. Darwin, *On the Origin of Species*, 6th edition, 1872; the words in brackets are not present in previous editions)

Two hundred years after Darwin's birth, this idea should sound reasonable and acceptable to every open-minded person. It certainly was reasonable to Rabbi Shimshon Rephael Hirsch, who wrote the following words in the XIX century:

This will never change, not even if the latest scientific notion that the genesis of all the multitudes of organic forms on earth can be traced back to one single, most primitive, primeval form of life should ever appear to be anything more than what it is today, a vague hypothesis still unsupported by fact. Even if this notion were ever to gain complete acceptance by the scientific world, Jewish thought, unlike the reasoning of the high priest of that notion, would nonetheless never summon us to revere a still extant representative of this primal form as the supposed ancestor of us all. Rather, Judaism in that case would call upon its adherents to give even greater reverence than ever before to the one, sole God Who, in His boundless creative wisdom and eternal omnipotence, needed to bring into existence no more than one single, amorphous nucleus and one single law of "adaptation and heredity" in order to bring forth, from what seemed chaos but was in fact a very definite order, the infinite variety of species we know today, each with its unique characteristics that sets it apart from all other creatures. (R. Hirsch, *Collected Writings*, vol. 7 pp. 263–264)

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