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Сборник состоит из статей, подготовленных на основе докладов, сделанных на международной конференции "НАУКА И ОБЩЕСТВО", проходившей с 21 по 25 июня 1999 г. в Санкт-Петербурге и организованной Санкт-Петербургским филиалом Института истории естествознания и техники РАН и философским факультетом Санкт-Петербургского государственного университета.

Тематически сборник включает четыре раздела: наука и этика, наука и религия, эволюция и гуманизм, современное прочтение философии Фридриха Ницше, которые соответствуют общему замыслу конференции – рассмотреть предельно актуальную (особенно для России) проблему соотношения и взаимодействия науки и общества через призму четырех аспектов – наука и этика, наука и религия, наука и гуманизм (в том числе эволюционный гуманизм), наука и философия с логической и исторической точек зрения.

The volume consists of articles prepared on the basis of reports which were made at the International conference "SCIENCE & SOCIETY" held June 21–25, 1999 in St. Petersburg. The conference was organized by St. Petersburg Branch, Institute of the History of Natural Sciences and Technology, Russian Academy of Sciences and by Philosophical faculty, St. Petersburg University.

The book has four sections: science and ethics, science and religion, evolution and humanism, modern interpretation of Friedrich Nietzsche which are arranged according to main idea of the conference – to look through an actual (especially in Russia) problem of correlation and relation between science and society through the glass of four aspects that are science and ethics, science and religion, science and humanism including evolutionary one, and science and philosophy from logical and historical points of view.

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Evolution and “Scientific” Creationism in the Earth Sciences Geological and Paleontological Arguments

The main objection usually argued to the evolution paradigm by antievolutionists (creationists, relativists, postmodernists, etc.) refers to the questionable scientific status of Darwin's theory. The antievolutionists resort to two arguments: unrepeatability and circularity. Being a process of events that has happened in the past, evolution is held to be outside of any possible experimental verification, and the explanatory mechanism of natural selection as the survival of the fittest implies circular reasoning. To refute the possible tautological nature of Darwinism as well as other biological and philosophical aspects would extend this paper too much and, furthermore, many authors have done it previously (Kitcher, 1982; Newell, 1982; Gastaldo and Tanner eds., 1984; Gould, 1984; McGowan, 1984; Berra, 1990; Molina, 1992a,b, 1996; Alemañ Berenguer, 1996). So, in this paper, only the main arguments affecting the earth sciences (geology and paleontology) are briefly presented and discussed.

The “scientific” creationists call themselves scientists and researchers, while in fact they show an enormous disdain for science. According to these creationists, the enormous scientific problems of the evolution theory have been concealed by a vile conspiracy from professional scientists. It is evident that this is not true. They also try to question more specific aspects. Their arguments against evolution in the fields of geology and paleontology were extensively developed in the main book by Whitcomb and Morris (1961, 1982). Their efforts were focused on refuting the principle of actualism (the present is the key to the past), which is the fundamental principle of geology that has influenced the development of this science from the time of James Hutton and Charles Lyell. As creationists, Whitcomb and Morris criticized actualism because it does not need supernatural catastrophes to explain the origin and evolution of the earth, life and the human being. Their alternative explanation consists in a supernatural catastrophism based on a literal interpretation of the Bible. Therefore, the biblical Creation, Fall of Adam (original sin) and the Deluge constitute their basic real facts to which all the other details of earth history data should refer. This means that scientific facts need to be reinterpreted according to biblical narration and, as a result, they must be adapted to a literal interpretation (since the Bible is believed to be God's truth).

For these creationists, the Deluge is a fundamental event that explains the whole geology and paleontology of the earth. Thus the Deluge, the scope and effect of which they consider to be world-wide, provided (for

them) the most favorable conditions for the fossilization of plants and animals, to the extent that all fossils have been produced by the Deluge itself. Even the mammoths fossilized in the Siberian ices would be the result of the immediate postdiluvian geological activity. Consequently, all the strata containing fossils would have been deposited after the creation of Adam and, therefore, the geological and paleontological time scale is rejected by them as completely erroneous; the creationists are claiming a biblical catastrophism based on a one-year-long Deluge to be the correct alternative explanation to geological actualism.

Once these premises are stated, it is obvious that they intend to refute the scientific data provided by geology and paleontology. Instead of established empirical evidence, they offer their sensationalistic religious claims. They devote a great effort to rejecting the many geological and paleontological facts that contradict the Bible. Obviously, these data that they preferentially try to discredit are the geological dates, both relative and absolute. The scientific dates based on radiometric methods allow one to conclude that the earth is very old, its age being measured in billions of years. This age radically opposes their ideas that the earth has been created very recently, from a barely 6,000 years ago to a maximum of 10,000 years ago. Their attacks are based on insignificant methodological problems considered out of context; the margin of error and the impossibility of application (in certain circumstances) are usually referred to in order to deny their value.

Fossils are one of the data that they criticize more frequently. Usually their arguments are very ingenuous and crude. Thus, they claim that dinosaurs and humans coexisted as the prints found in the Cretaceous of Paluxy River and other would-be older sites (even Carboniferous and Precambrian times) suggest. Some of the supposed human prints are several times bigger than a normal foot, which make creationists believe that these prints belonged to the biblical giants (Genesis 6.4). Furthermore, they believe that the Deluge was the main cause of the dinosaurs' extinction; except for some juvenile specimens which survived in Noah's ark. Creationists believe that most of the dinosaurs died due to the sudden climatic changes after the Deluge while some other dinosaurs would have survived longer, thereby explaining the supposed existence of the "dragons" in ancient mythologies.

Nevertheless, some of their arguments about the fossil record are more developed and reveal a certain knowledge of the paleontological data, although their interpretations are not plausible and hence completely erroneous. Many creationists seem to have no idea about the nature of the fossil record. Consequently, the Spanish translator of the creationist publishing house, Santiago Escuin (1988), to whom no degree in paleontology is known, dares to claim in a paper about the discontinuities of the fossil rec-

ord (using capital letters): THE FOSSIL RECORD NOT ONLY PROVIDES NO SUPPORT TO EVOLUTIONISM, BUT EVEN IS COMPLETELY HOSTILE TO IT. This kind of erroneous sensationalistic claim is based on the American biochemist D.T. Gish's papers; Gish is the person who has developed this paleontological argument in greatest detail.

One of their main developed arguments offered to reject evolution consists in denying the existence of intermediate forms among species, what are called missing links. The problem is that evolution is not always a gradual and constant process, but a punctuated process where long periods of stability alternate with short periods of rapid change in small populations. The fossil record is usually deteriorated and only preserves a minor part of the organisms that lived in the past (being fragmentary at a local scale). But considered on a world-wide scale, the fossil record is much more complete and very representative of the way organisms lived and evolved in the past. Even so, the creationists use the incompleteness of the fossil record to claim that no intermediate forms existed. Although intermediate forms do exist at both specific and population levels, the fact remains that those populations which had become reproductively isolated in time and space and then evolved into new species were very small and, consequently, are extremely rare in the fossil record. Furthermore, due to both the variability of species and the taxonomic methodology that classifies forms with intermediate characters in one or another species, tracing a line of descent in a continuous process results in a methodological simplification that could give the impression that intermediate forms do not exist (a problem which any taxonomist is aware of).

On the other hand, one of their apparently more solid arguments regards the rapid adaptive radiation at the Cambrian base, which is also known as the "Cambrian explosion" of marine invertebrate life forms. In their opinion, this rapid evolution could only be possible thanks to a creation cause; although it seems to be very rapid, it is not so when studying in detail the developing sequences more lithologically. In this way, the soft body fauna exceptionally well preserved in Ediacara shows that the transition from the Precambrian unicellular organisms to the Cambrian base multicellular organisms was not so sudden. Moreover, both the synthetic theory of organic evolution and, in particular, the explanatory model of punctuated equilibrium (offered by paleontologists Eldredge and Gould) no longer support the original gradualism of Darwin which requires longer periods of time for biological evolution.

Nonetheless, organic evolution is also evidenced in taxa which have intermediate characteristics among others of their same level; this can be observed in the morphological features of any taxon. Some of them are also

links between groups of organisms. The most classic example is *Archaeopteryx*, which shows feathers indicating its affinity to later birds as well as teeth and other features revealing its affinity to earlier reptiles. Yet, even this excellent intermediate fossil has been criticized by those creationists who claim that it is not an intermediate form but that it is, indeed, a true bird. Of course, it is possible that another genus having more primitive and intermediate features exists in the fossil record. But in any case, *Archaeopteryx* is a member of a family which constitutes the transition between two very important groups of organisms: reptiles and birds. Its importance was confirmed in 1984 through the finding of another fossil with intermediate features between *Archaeopteryx* and true birds by paleontologist José Luis Sanz in Cuenca (Spain).

The creationists are surprised by the fact that certain organisms, very stable in their morphology without evolution millions of years, do still exist: e. g., the brachiopod *Neopilina*, the cephalopod *Nautilus*, the fish *Coelacanth* and the trees *Metasequoia* and *Ginkgo*. These organisms are popularly known as living fossils (panchronic), since they have survived several extinction events. Even so, this is not surprising for scientists because these organisms are rare in the living world. Their adaptive strategy and even the chance factor prevented them from extinction, but these exceptions do not contradict the fact of organic evolution.

The fossil record shows that there are species able to survive extinction events, even though some of these extinction events do affect great numbers of other species. Five major mass extinction events throughout earth history have been identified. Both panchronic fossils and mass extinctions are exceptions to the normal process of species renewal throughout evolution by means of the two processes of extinction and speciation.

Another more technical argument is what is called fossils out of place. In fact, some fossils were removed from the place where they were initially buried to another place where they were definitively buried (which can be close by but from a younger age). These are called resedimented or reworked fossils, which are not considered by paleontologists when dating the sediments; although in some cases this kind of fossil can lead some amateurs to make mistakes. The explanation about the nature of these reworked fossils is quite simple and it is not necessary to turn to the biblical Deluge to explain it. The most usual case is explained by the erosion of older sediments, causing those fossils that are not destroyed during this process to be sedimented again in younger sediments.

The essential topic of the origin of our species was discussed by several creationist authors and updated by Morris (1979, 1988). In the opinion of creationists, the most primitive hominids (*Ramapithecus*, *Australopith-*

ecus, *et al.*) are true apes which have no relation at all with the origin of our species since they do not represent intermediate forms between fossil apes and true hominids. Moreover for them, *Homo sapiens* would have lived before the Neandertal people, *Homo erectus*, and even *Australopithecus*. And according to them, *Homo erectus* would be a decadent descendant. In his book *Ape-man, fact or fallacy?* (1984), Malcom Bowden has discussed, both exhaustively and apparently scientifically, the problem of the origin of humankind. He also concluded that *Homo sapiens* has been discovered in older strata than his ancestors: he also appealed to the false example of the Cretaceous of Paluxy River to demonstrate that our species had once coexisted with dinosaurs.

Finally, the main "scientific" creationist argument refers to the young age of the earth, the creationists claiming it to be only around 6,000 years old (ignoring the radiometric dating methods). Consequently, the fossil remains are held to be very young and our species had once coexisted with dinosaurs. The fossils are attributed to the universal Deluge, thereby denying the most basic principles of geology: actualism, superposition of strata, etc. Creationists imply that all fossils would be almost the same age. They also reject all geological and paleontological facts that do contradict the Bible but support the evolution theory. They emphasize that fossils have no value in proving the evolution theory. Thus they deny the existence of intermediate fossils, such as *Archaeopteryx* and primitive hominids. The debate between gradualists and punctuationists is considered out of context, ignoring that neither group questions the fact of organic evolution.

Creationists only discuss some aspects of evolutionary mechanisms. They use the small differences among scientists to support their sensational claims. However, during this century, many fossils have been found that allow for the reconstruction of many phylogenetic lines. Regarding human phylogeny, in the last decades many fossils have been discovered that permit detailing the hominid evolution process up to *Homo sapiens*. All of this enables one to state that fossils are the best historical evidence that clearly documents the fact of evolution. But paradoxically, the "scientific" creationists now claim that fossils have no value and that fossils even represent one of the main problems for the evolution theory.

Conclusion

The sensational claims of "scientific" creationists (Protestant fundamentalists and some Catholics), declaring that they have refuted scientifically the evolution theory, are based mainly on statements or data taken out of context, e. g., old statements from scientists who no longer support them as well as on their own creationist ignorance. Furthermore, they base their

claims on both a literal interpretation of and the inerrancy of the Bible, which they consider impossible to be wrong since the Bible is believed to be God's truth. Briefly, the Genesis story is believed to be the best explanation for all of geology and paleontology. Creationist publications evidence a strong ignorance of the earth sciences data and the lack of scientific method. Nevertheless, creationists call themselves scientists and researchers, while in fact they show an enormous disdain for scientific evidence and evolutionary scientists.

In fact, the creationist argumentation is irrational and their interpretation is implausible in terms of scientific data and, consequently, "scientific" creationism constitutes one of the more typical pseudosciences. A literal interpretation of the Bible leads creationists to a rigid, involuted and apocalyptic ideology. Actually, they confuse their ideas with reality, resulting in a kind of wishful science. Their ignorance and lack of rigor is evidenced by their claiming that in all fields of research (e. g., paleontology, geology, biology, and anthropology), it is easy to see that the evolution theory has no scientific support. This old strategy which consists of responding with the same accusations led them to conclude that evolution is a myth, a religion and a fraud. Such statements are always present in their publications, which evidences that creationists are lying and/or ignorant.

Besides a pseudoscience, "scientific" creationism is a serious political problem. It represents an ultraconservative revival of fundamentalism among many Protestants and some Catholics. The creationist activity resulted in the approval of laws against the teaching of evolution and even, in some cases, the obtainment of governmental support for their pseudoscientific activities. The American antievolutionist Protestant sects (Seventh Day Adventists, Jehovah's Witnesses and Mormons, etc.) are spreading all over the world and other Catholics, such as the European cult named CESHE, are appearing. Adding insult to injury, they are infiltrating universities and other academic organizations, even collecting support from doctors in different sciences and publishing many books and some journals. The few scientists that do give them support are not prestigious in their fields, but unfortunately they make incursions into other fields of research in which they are not specialists; this disturbing fact is one of the main reasons for their false conclusions.

At present, in the European Union, creationists are still an irrelevant minority of fanatic ultraconservatives. But in the USA, they have reached a strong influence on society and represent significant political power. Their development is a serious danger to the popularization of scientific ideas and theories since, in the debates that they promote against science, both conservative politicians and the mass media are frequently unable to discrimi-

nate between science and pseudoscience. Clearly, it is necessary for scientists not to underestimate the pseudoscientists' social activities and political power. Lastly, the mass media and governmental institutions should not give them intellectual or financial support, since biblical fundamentalism is a real threat not only to science but also to society.

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