

Created in Eons

Peter Rüst, Biochemiker, CH-3148 Lanzenhäusern, Schweiz; <paraske@aneste.ch>
Translation (2007) of: P. Rüst, "Erschaffen in Äonen", Bulletin aus dem VBG-Institut 1/2003

In the beginning there are worldviews

Creationists accept the bible, and therefore the biblical creation account, unreservedly as God's Word. But there is a broad spectrum of very different models of creation. The main difference between them lies in the different timescales taken as a basis for their interpretations. Young earth creationism represents an extreme view which takes the creation as an event that happened within 6 times 24 hours a few thousand years ago.

The claim of "simply believing what the bible says" is based on self-deception. It confuses the given facts of the text with one's own interpretation of it. Two different persons may both believe in the divine inspiration of the text, yet they perhaps interpret it very differently.

Young earth creationists and atheists profess extremely different worldviews, as the former give absolute priority to the bible, the latter to science. They agree, however, in claiming that the biblical creation story and the scientific theories of origins contradict each other absolutely. This opinion is based on the supposition that science is completely unreliable, in the one case, or that this applies to the bible, in the other. Both groups have adopted for themselves unnecessary blinders, which perhaps may be explained psychologically. The atheist has possibly chosen his worldview because he wants to be autonomous, not responsible to anyone. But this has nothing to do with science. The young earth creationist has perhaps decided to ignore all scientific refutations of his worldview because he wants to have a simple, fixed system of faith which does not lead to problems of interpretation. But this has nothing to do with biblical faith.

On both sides, one is blind to the obvious possibility that God might sometimes want to create by means of natural processes. The atheist closes his eyes before the fact that there is an absolute truth and that reality is not necessarily forced to respect his wishes. The young earth creationist does not want to believe that science is a divine assignment to humanity, such that its results, as far as they are confirmed, describe a reality that cannot be neglected with impunity.

Data, facts, reality, interpretations, and faith

Interpretation of observational data

What are data? What are facts? How can we know whether a given statement corresponds to reality? Is there a reality anyway – or only opinions? Occasionally, our life depends on how we interpret our sensory perceptions, e.g. on the road. There is in fact an objective truth, and if we want to survive in everyday life, in science, and in the Christian faith, a fundamental prerequisite is that we have to respect reality. Facts are part of reality. Data are what is objectively there, e.g. that the so-called fixed stars appear in practically invariable constellations, or that the bible begins with the Hebrew words "bereshit bara' 'elohim..." Thus, data, too, are facts. But interpretation begins when we ask for the significance of these facts. An interpretation may be correct with a higher or lower probability. A correct interpretation results in more facts.

During the course of a year, certain stars appear to travel around small elliptical orbits. From this observation, we conclude that they are relatively close to us. With the aid of earth's orbital diameter, we can compute their distances. "In the beginning, God created the heavens and the earth" means for young earth creationists that the heavens and the earth were made out of nothing suddenly, in the first moment of creation. Does "in the beginning" really mean in a first moment? Or was it a first long epoch of the history of the universe? The earth, then, would have been formed in a later phase of that period. Did God prepare it out of nothing or out of preexisting material? Does he employ natural processes when creating?

Any formulation of a scientific theory, as well as any understanding of a text, inevitably implies an interpretation.

World models and faith criteria

Can interpretations be influenced by one's worldview or faith? One hundred years ago, many astronomers believed the universe to have existed for all eternity already. Einstein introduced a correction factor, the "cosmological constant", into his theory of general relativity because an eternally existing universe could only be stable if there were such a factor. But a few years later, when Hubble presented evidence for the expansion of the universe, he had to retract, calling the constant his "greatest blunder". Now, the model of the expanding universe, including the "big bang", became the cosmological standard. Even so, by a different interpretation of the data, Hoyle later postulated another equilibrium model without a beginning. But he no longer found acceptance for it, because a big bang explains the totality of the data in a simpler manner. Recently Hawking used quantum theory to formulate a model of the big bang which could not have an initial moment, because it postulated the origin of the universe not to be restricted to a limit situation or "singularity" (a point of infinite density and infinite temperature at time zero), but to represent a spontaneous, uncaused "quantum fluctuation" in four-dimensional space-time, in which the natural laws would not be invalidated by an impossible singularity. Other models speculate that the inevitable big bang might be but one of infinitely many. Every new "universe" would then correspond to something like the bursting of a bubble in a seething energy soup, making for an eternal past. The most recent model (for the moment) claims that our world and a counterworld shall, a certain time after their big bang origin, crash together in a fourth space dimension, again producing new worlds in another big bang, also resulting in an eternal recurrence.

Why do competent experts continue to search for a world model without a beginning? The fact that a beginning implies a Creator doesn't suit someone who would like to be autonomous – even though this might not be a conscious consideration. Hawking, however, formulated it explicitly: "What place, then, for a creator?"

One of the most interesting aspects of cosmology is the "anthropic principle": the universe looks as if it had been tailor-made for humans (Greek: anthropoi). I am talking about the fact that many variables essential for the evolution of the universe must assume values within certain limits if a planet inhabitable by humans is to be possible. But the combination of these values accidentally occurring is transastronomically improbable. While a theist will easily discern this as pointing to an intelligent Creator, an atheist will postulate an eternal system of infinitely many universes, where the variables would assume different values each time, so that an "anthropic" combination would occasionally be produced by mere happenstance.

Problems of interpretation occur in the history of life, as well. Is biological evolution a fact? For an atheist, who has no use for a creator, there must, of necessity, have been an evolution of life. For a young earth creationist, on the other hand, there must not have been any cosmological development or any evolution of life, because this would have required more than 144 hours.

The belief that evolution would contradict God's character is a question of interpretation. Different believers in divine inspiration of the bible have come to different conclusions. God is at work in all that happens, even in death and suffering, which we, out of our restricted perspective, consider to be wholly negative. God gracefully continues working even with what sinful creatures, be it fallen angels or humans, have spoiled, so that in most cases we are unable to differentiate between good and bad influences. Whether God, in fact, uses evolution has to be answered by science, not philosophical speculations.

The timeframe of creation

The history of the universe – the model of the big bang

How old is the earth, how old is the universe? At least before Adam, the bible does not give us an indisputable timeframe. But the scientific facts known today unequivocally point to a datable origin of the universe, which was also the beginning of space and time.

Because the velocity of light is limited, we are seeing all celestial objects such as they were at an earlier time. Thus, we can directly read the development of the universe by comparing objects at different distances (the farther away a lightsource is, the longer its light takes to reach us). The galaxies recede from each other with velocities which increase with distance. As a whole, the universe expands and cools in the process. By extrapolating back, one obtains an original cosmos of an incredibly high density and temperature, which exploded about 13.7 billion years ago in a "big bang".

Stars are formed when large gas clouds contract under their own gravity, getting heated up in the process, until in the center, at over 10 million degrees centigrade, nuclear fusion starts. Hydrogen nuclei (protons) fuse with neutrons, forming helium nuclei, which in turn fuse to form heavier nuclei like carbon etc. These nuclear transformations are irreversible. Therefore, as the universe still contains very much hydrogen, there must have been a beginning, because otherwise all the hydrogen would have been used up long ago. The observed distribution of chemical elements corresponds to the theoretical expectations of the standard model of the big bang.

About 300,000 years after the big bang, the expanding universe had cooled down to about 10,000 degrees centigrade. Now, electrons could be caught by the hydrogen and helium nuclei, forming atoms. As a consequence of this binding of the electrons and of the decreasing matter density, light quanta were scattered less and less frequently, allowing the radiation to spread freely. Its wavelength increased with the expansion of the universe, and today we measure microwaves of a temperature of slightly less than 3 degrees Kelvin (centigrades above absolute zero, which would be -273 degrees centigrade). This cosmic background radiation is distributed extremely uniformly throughout space. Its inhomogeneities of less than one part in a hundred thousand correspond exactly to what the standard model predicts. They began as quantum fluctuations, when the universe, then smaller than an atomic nucleus, was blown up in an extremely fast inflation by a factor of dozens of orders of magnitude within the first 10^{-32} seconds. Having become huge gas clouds, they formed the basis for galaxy clusters and galaxies. Here, as well, the wide-field observations agree with computer simulations based on the standard model.

The history of the earth and of life – dated by means of radioisotopes

A chemical element is defined by the number of protons the nuclei of its atoms contain. This number also corresponds to the number of electrons in the atomic shell, which form the basis of chemical reactions. Within certain limits, the number of neutrons in the atomic nucleus is variable, resulting in different isotopes of the same chemical element. Too many neutrons, however, destabilize a nucleus, leading to its disintegration after some random time. The element is therefore radioactive – a radioisotope. The half-life, the time within which half of the remaining nuclei disintegrate, is a constant specific for a given radioisotope. It is independent of any external influences.

Now, the inventory of isotopes found on earth shows that all theoretically possible stable ones and all radioactive ones with half-lives of over 500 million years are in fact detectable. All isotopes with shorter half-lives, however, are systematically missing, with the exception of very few (like C-14) which are continuously produced naturally. As after 10 half-lives (which usually corresponds about to the detection limit) $(1/2)^{10}$, that is about a thousandth of the initial amount of a radioactive isotope is still present, the material of which the earth consists must have been produced about 5 billion years ago. The actual measurements of the earth's age in fact indicate 4.56 billion years.

Of course, a simple radioactive dating of an object presupposes that none of the decomposition product was initially present or migrated into or out of the object afterwards. But for every dating method, there is an experimental procedure which provides for a reliable dating, taking into account possible sources of error and working with an internal control. With such procedures, the uncertainties of the measurements are below 1% in many cases. At least a dozen suitable radioactive isotopes with half-lives between 700 million and 100 billion years are available for dating any object containing one or more of these isotopes. Above all, this includes magmatic rocks, i.e. those crystallized out of the liquid state. What is measured is the solidification time of the rock. Later disturbances by high temperatures or water may of course mobilize some materials again, but the internal controls would indicate such events.

Radioactive carbon C-14 represents a useful short-time clock for dating carbon-containing objects younger than about 50,000 years. This is important especially for the history of humans. C-14 is produced by the impact of cosmic radiation on atmospheric nitrogen. Since this radiation is subject to certain fluctuations, C-14 dating has to be calibrated by independent methods, such as countable tree rings or yearly sediments or other periodic inhomogeneities.

Origin of life and biological evolution

Minimal data interpretation – minimal worldview prejudice

The interpretation of observational data begins with obvious and inescapable conclusions which don't imply any controversial suppositions. Interpretations going farther and generalizing theory formulations,

however, often depend on philosophical presuppositions. With these cases, I shall explicitly leave open the possibility that there is a Creator behind everything.

As far as the origin of the first life is concerned, we are, even today, still completely dependent on speculation. It is true that the minimal geochemical and biological conditions for life have been investigated thoroughly, and there are many hints from biochemistry. But a feasible way leading from lifeless matter to the first autonomous system which could be called living remains as fully unknown as ever. It is unknown whether there might be several or even many possible ways of a spontaneous origin of life (if any at all), so that the probability of such an event can hardly be estimated.

Darwin's theory of evolution describes the descent of all biological species from few, or possibly a single ancestral species. Clues for this are found in the similarities between different species on all levels, from small molecules to macromolecules like nucleic acids and proteins, metabolism, structure of cells, tissues, and organs, up to body plans and behaviors of organisms. Darwin attributed evolution to variant organisms arising, whereby those better adapted to their environment produce more surviving progeny, passing on their variation to them, an occurrence he called natural selection. As the earth's surface is limited, and all species produce more progeny than can possibly survive in the long term, natural selection must really work in this way.

The occurrence of competition between individuals and between different species can indeed be observed in various situations. Also, relationships between members of the same food chain, like predator and prey, herbivore and plant, or even parasite and host, show selection in action. But in many cases, there are also regulatory mechanisms for differential reproduction, signally reducing the "red-in-tooth-and-claw" cruelty.

Nevertheless, the problem of the origin of new variants as objects of natural selection remains unsolved. Variants which display substantially the same capabilities as their predecessors are unproblematical. The natural adaptability of all organisms to environmental fluctuations is astonishingly large. But the emergence of fundamentally novel functions remains as deeply as ever in the world of fantasy. Also, there are hardly any prospects of being able to critically test the probability of spontaneous formation of complex objects like specific protein domains, not to speak of higher-order complexes. Yet all these biological systems, which to date still largely defy understanding, are described in a kind of textual information in the genome (the totality of the genetic make-up of a species), whose decoding is now possible in principle.

Key observations – fossils and molecular biology

Direct indications pointing to events that really happened during the history of life, as well as their dating are available from the fossil record. Indisputable fossils of multicellular animals and plants are more than 500 million years old, while fossil unicellular organisms are much more difficult to recognize as such. Geochemical traces of life are certainly 2.5 billion, perhaps even 3.85 billion years old. Thus, life could already have originated shortly after the end of the heavy meteorite bombardement.

The fossil record of the last 500 million years shows clear lines of descent, within which slight changes with time may often be discerned. Yet, proof of unambiguous branching points of such lines turned out to be extremely difficult, and is missing completely in most cases by far. But this general picture is just what known processes of population genetics suggest. The model of punctuated equilibria describes large long-lived populations changing little, linked at branching points through very small populations which change relatively fast, with the result that these leave virtually no fossils. But new fossils continue to be found, most of which which can easily be incorporated into the suspected tree of life, and none producing irreconcilable conflicts.

At the most recent end of the timescale, there are the potential predecessors of humanity. Modern human fossils are up to about 100,000 years old. At the time of Noah's flood, which occurred about 4,900 years ago, there already were human populations on all of the presently inhabited continents, in most cases since many millennia. Fossils which are clearly human, but unmistakably different from the modern form go back to 2 million years ago, and there are intermediates. Earlier fossils, up to 6 million years old, are closer to the anthropoid apes, yet present features that are definitely closer to those of humans than chimpanzees do. How are we to interpret these similarities? The Creator certainly did not want to "lead us into temptation" by putting a "stumbling block" in our way through false pretenses!

The genetic material consists of nucleic acids (normally DNA), which are long chains of nucleotides representing the letters of an informative text. Some of this information is translated into the amino acid

sequences of protein chains which, in turn, are the functional units required for the construction of the cell and for the biochemical processes in them. DNA and protein sequences of different species normally show highly significant similarities which cannot be accidental. But what are the implications? Proteins performing the same function in different species must presumably, just for this reason, have the same or at least very similar constitutions, no matter whether or not these species descend from a common ancestor. Therefore, the similarities themselves are not yet proof of common descent.

But if a sequence does not perform *any* function, yet shows a highly significant similarity between species, common descent appears to be the only explanation. Nevertheless, in contrast to the demonstration of a biological function, evidence for non-functionality (specifically, evidence for not having *any* function) is never unambiguous, but a question of probability. Yet today's stream of DNA sequence data increases rapidly, including many virtually complete genomes. With this information, it has become more and more plausible that nonfunctional similarities are explainable by common descent only. Comparisons of the human and chimpanzee genomes have already provided a large number of such indications. They are either small DNA sequence differences (mutations) which by themselves don't change the function, or errors which destroy the function of the sequence, occurring in both genomes at exactly the same position. Similarly, pseudogene sequences (pseudogenes are genes inactivated by mutation) arising from genes, viruses, or other genetic elements which may "jump" into a genome at random places are often found at exactly the same place in both genomes. Are therefore humans and chimpanzees related by common descent? In law cases, copied errors are judged to be clear proofs of copying, leading to corresponding sentences. From a biological point of view, therefore, a common descent of humans and animals cannot be doubted any more. In the following, I shall show how this may be compatible with the theological view.

Harmonizing biblical creation and science

Revelation, history, and language

Christians take the biblical texts to express divine revelation. It would be a grave misunderstanding, however, to view this inspiration as some kind of mechanical dictation. God has created humans as persons. He therefore respects the individual freedom of such persons and will not misuse them as puppets or force them to act against their will. Humans can resist his will. Nor will God manifest himself in creation in an overpowering manner, compelling individuals to recognize him. It is only in the final judgment that the rebellious are expected to have to bow to God against their wills.

Such freedom is also given to the authors and readers of the biblical texts. Despite this restraint, God is able to achieve his global goal in every situation. An author is embedded in his time, culture and language, being influenced by this environment, but any language is flexible. God is able to guide the prophet's thinking to select, from his own vocabulary, a formulation corresponding to God's intention. Of course, God is also free to occasionally tell him to write down a given statement. This possibly applies where it is written: "Thus says the LORD".

The source-critical school among theologians takes into consideration the fact that the writer is embedded in his culture, but ignores divine guidance. As a consequence, these critics will often see a discrepancy between two different formulations in a given text, even attributing them to different authors, although simple believers may have no difficulty recognizing either a possibility of harmonizing the two statements, or a genuine contrast in a complex reality, or something not yet understood. How much out of touch with reality the source-critical line of thought is can be recognized by its destructive consequences. Its treatment of the Old Testament leads to a complete reinterpretation of Israel's history. Apparently, these people fail to notice that the theological content of a major part of the Old Testament is largely destroyed in the process – insofar as they care about this at all.

A realistic interpretation of the bible requires that the time, culture, and language of the original human author is taken into consideration, but also divine inspiration, and with it the global context of the whole bible. Scripture is to be interpreted by the Scripture. Accepting inspiration also implies taking for granted that all of Scripture is understandable and valid for people of all times and cultures. More, one even has to postulate that no honest and careful reader need find anything offensive in it. Under God's providence, this will exclude at least serious errors in the available copies of the original texts.

The creation account and its interpretation

In Genesis 1:1-2:4, unbiased readers will see a pre-mosaic revelation of what occurred in creation, combined with a clear theological message. In the Hebrew, as well as in good translations, it is obvious that the text is written in a poetical form.

The source-critical school, however, places this text into the time of the Babylonian exile, because a Babylonian creation myth formulates some details in a somewhat similar manner. Consequently, they assumed Genesis 1 to be a variant of that myth, purified from polytheism, immorality, and other defects, instead of seeing, on the contrary, the Babylonian myth as recounting and distorting some elements from Genesis 1. Today, the supposition that the first 11 chapters of Genesis are in fact mythological texts, in large part without any historical truth content, belongs to the allegedly "solid scientific results" of source-critical research. It is accepted by most theologians, even by evangelicals, if they don't find any feasible harmonization.

This situation is completely unsatisfactory insofar as it is to a great extent left to the readers' own discretion which parts of the text are to be accepted as theologically binding and which may be ignored as irrelevant mythological background or erroneous opinion of the writer. The only feasible way of dealing responsibly with a divinely inspired text is to find an interpretation compatible with the global alignment of the bible and avoiding serious contradictions with intra- or extrabiblical evidence.

Such an interpretation of the two texts, Genesis 1:1-2:4 and 2:5-25, is in fact possible. The most important stumbling blocks can be avoided, as I shall explain below. I am not saying that this is the only meaningful interpretation, and much less am I claiming the bible to be a "scientific textbook". Language has some flexibility, and a text, especially if it is revelation, may contain more than a single level of meaningful interpretation, e.g. theology, psychology, poesy, narrative, etc. But here, I want to show that harmonizing the biblical text and science is in principle possible. Some of the statements of the text which I will connect with realities known by today's science, but unknown earlier may have been interpreted differently in ancient times, but this does not change my main points. The interpretation given could have been understood by the first readers, as well. Thus, the biblical text does *not* provide us with any scientific information unknown then. But the possibility of harmonization with realities which may have been unknown in antiquity clearly distinguishes such texts from myths. This appears to be a noticeable pointer to their revelatory character, but of course not a proof.

The details of the following interpretations are supported by possible meanings of the Hebrew expressions, to a large extent on the basis of other occurrences in the Old Testament. The "beginning" and the "days" are long periods of unspecified duration. In the "beginning", the universe was created and further developed into the "heavens" with the stars including their light and their planets and moons. On (or "in") day 1, no new light was created, but diffuse sunlight penetrated through the diminishing layer of dust and water vapor over the earth when it cooled down. On day 2, no solid firmament with an ocean above was created, but the clouds separated from the ocean, so that the atmosphere below the cloud cover became transparent. On day 4, the heavenly bodies were not created, but further evolution of the atmosphere and reduced haze and cloud covering allowed them to be seen from the surface of the earth. On day 5, animals were not created out of nothing, but they were "insouled", i.e. in animals with a merely corporeal dimension or aspect, a novel soulish dimension was created, making them into sentient beings. On days 3, 5, and 6, no plants or animals were created *de novo*, but they developed out of precursors by means of biological evolution. In this process, the different kinds of plants and animals did not arise independently, but species related by common descent were separated from each other by means of changes accruing in the course of time. On day 6, humans were not created out of nothing, but they had evolved as sentient beings from similarly "insouled" animals, and their spiritual dimension (in the sense of God's image) was created in them as an absolute novelty out of nothing. Thus there were a total of three dimensions of creations out of nothing: the physical-bodily (v.1), the psychological-soulish (v.21), and the theological-spiritual one (v.27). Between these unique events, evolution occurred, which of course is also God's work. This evolutionary development is also reflected in the concept of God "making" something out of preexisting entities.

In theology as well as scientifically, human nature is seen as an indivisible unity, not as a body in which a soul and/or a spirit resides. But this holistic human being displays different aspects which penetrate and complement each other, like the three spatial dimensions. Body, soul, and spirit correspond to three new dimensions created at three very different times. That humans (1) arose out of lifeless matter, (2) descended from sentient animal precursors, and (3) were newly created in God's

image therefore does not constitute any contradiction, but represents three aspects of the human personality in a holistic sense.

On the basis of what is known by modern science, I suspect that in the creation of novelty and in the further development of existing entities new semantic information originates by means of invisible divine guidance.

The second text, Genesis 2:5-25, is not a second creation story, which would contradict the first text, but its continuation, with a clear transition in 2:4. Not the whole earth is in view here, but an area in southern Mesopotamia only. Nor does it deal with the creation of humanity, which occurred much earlier, but with the calling of Adam for a specific mission among the pre-adamic humans. The "spirit of life" God "breathed into his nostrils" did not impart earthly life, but the heavenly spiritual life of personally knowing God, which in the New Testament corresponds to the new birth – or in the Old Testament to callings like those of Abraham, Isaiah, or Jeremiah. The question of whether the "building" of Eve out of Adam's "side" represents a special miracle or a symbolically expressed calling into service remains open. In any case, Adam was not the first human being, but the typical representative of fallen humanity.

This interpretation represents an attempt to take seriously both the biblical text and the scientific findings by harmonizing them. Most alternatives contradict either science (young earth creationism) or biblical theology (source-critical mythologization). Like the sparsely available other attempts, this harmonization contains various explanatory gaps, possibly also mistakes. But even if there isn't yet any model which solved all problems, the possibility of harmonization should be discussed seriously. Today, it is irresponsible to talk about a creation of humanity a few thousand years ago or, on the other hand, of Babylonian myths in the bible.

A more detailed discussion of this interpretation of Genesis 1:1-2:7 can be found in: A. Held & P. Rüst (1999), "Genesis Reconsidered", *Perspectives on Science and Christian Faith* 51/4, 231-243: <http://www.aneste.ch/GenReco.pdf>; and: P. Rüst & A. Held (2003), "Der Genesisbericht und die Evolution" *Texte aus dem VBG-Institut* 1/03): <http://www.aneste.ch/GenEvo.pdf>.

Further texts and books

H.R. Brugger (2000), "Evolution oder Schöpfung: falsche Gegensätze", *VBG-Dossier* 1/00 (VBG-Verlag, Zürich).

R. Junker & S. Scherer (2001), *Evolution – ein kritisches Lehrbuch* (Weyel Lehrmittelverlag, Giessen, ISBN 3-921046-10-6).

P. Rüst (2003), "Ein evolutionskritisches Lehrbuch", Rezension des Buches "Evolution – ein kritisches Lehrbuch", *Texte aus dem VBG-Institut* 2/03 (VBG-Verlag, Zürich).

P. Rüst (1992), "How Has Life and Its Diversity Been Produced?", *Perspectives on Science and Christian Faith* 44/2, 80-94; <http://www.aneste.ch/HowHasLife.pdf>; P. Rüst (1994), "Die Herkunft des Lebens – Wissen und Glauben", *VBG-Dokumentation* 1/94 (VBG-Verlag, Zürich); P. Rüst (2001), "Die Entstehung des Lebens und seiner Vielfalt", 18 S.: <http://www.aneste.ch/EntLebVf.pdf>.

P. Rüst (2000), "Das Weltall – auf den Menschen abgestimmt", *VBG-Fachaufsatz* 1/00 (VBG-Verlag, Zürich): <http://www.aneste.ch/Weltall.pdf>.

Links

VBG-Institut, ein Kompetenzzentrum der VBG: www.vbginstitut.ch
Institut für Glaube und Wissenschaft der SMD: www.iguw.de