

The tension between science and religion: are these mutually hostile disciplines?*

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First, I wish to thank the organizers of The 15th ICCE for the kind invitation to present a plenary lecture on such a delicate theme as I have chosen. At the 14th ICCE, in Brisbane, Australia, we heard Sister Mary Virginia Orna discuss the Shroud of Turin. This year I intend to go a little further and make some comments regarding the relation between the educational process of science and religion, especially Christianity. I hope to introduce you to three writers who have guided my thinking. The first is Karen Armstrong [1], who evolved from a shy nun into an authoritative writer and communicator on religious issues. The second is a gifted physicist, Arie van den Beukel [2], who did much research into very thin metal films, but never forgot that he was a Christian which brought him into opposition with fashionable atheists in the scientific camp. The third writer I want to introduce is Willem Drees, who after three PhD degrees in physics, theology, and philosophy has attempted to reconcile these diverse branches of his advanced studies. Being a Protestant Presbyterian Christian, I shall not try to discuss how other religions address the issues I raise here. I shall, however, have occasion to refer to Jewish or Muslim thought, but not with any authority.

I do not intend to impose my ideas and thoughts on others, but fully expect that the discussion eventually will produce a commentary of the views of other religions. A particularly bad example of the tension that (perhaps unintentionally) often arises between science and religion occurred when a colleague was appointed to teach chemistry at a catholic school; he was asked to perform his teaching duties in a Christian spirit. He could not reconcile his thoughts on this combined point of view and inquired, referring to the miracle where Jesus changed water into wine, whether he was to produce the equation and mechanism for this mysterious change of water into ethanol.

It is not possible to teach a subject like chemistry value-free. I remember that chemistry books from the German Democratic Republic breathed a spirit quite different from those in my country. On close inspection I found that communist principles were injected, sometimes subliminally, sometimes overtly. For example, the teachers' instruction manual required explicitly that the Laws of mass conservation were to be taught, that matter was indestructible, everlasting, and not created. These instructions implied that there was no creation or a creator. Clearly, the mass conservation laws are the realm of science, but science is silent about the role of creation or the creator. However, the German Democratic Republic text books went out of their way to comment on this idea.

In my country there is freedom of education. This implies that every school that can comply with the national final examination is eligible for a subvention by the state. The schools are free to execute their own programs of education. Only at the end of the course does our national examinations system guarantee that the same questions are put to everyone and the same criteria applied to all. It is the Ministry of Education which, in consultation with those in education, establishes the final goals to be examined. When the program for biology was to be renewed, an enormous row developed. There are in my country, some fundamentalist Christian schools that are strictly opposed to teaching evolution as a proven fact. On

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the other side, a majority of biologists have not the least objection to evolution being taught. They proposed, on occasion of this review, to include evolution into the achievement goals, which would be obligatory for all pupils writing a final examination in biology as a part of the national examination scheme. The discussions which were sparked by this subject were of questionable character. Still, I think that both parties, the Christians and the biological scientists, were shown to be imbued with a zeal without really discussing the issues seriously.

Evolution is, in fact, a rather uninteresting point and I will not say very much about it. Perhaps just a few details are worthy of discussion. The first is that the press was unanimous in shifting the responsibility on the issue to the Christian right just as they did when dealing with homosexuality and the rights of schools to attend to their own affairs according to their own rules and institutions. Other people, for example orthodox Jews or fundamentalist Muslims, also may have had their problems with the propagation of comparable points of view and I think it is unfair to reproach only Christians for their inflexibility. A second striking point associated with the propagation of evolution as an idea is the reversal of positions. Just a century ago, science was on the side of the evolutionists; it was the church that, not keeping to the high principles they advocate, attacked the learned adversaries. Today it is just the opposite. The church wants equality for both viewpoints, but it is the scientists who defend their absolute right for their point with no room for deviation in their thoughts. Professor Van den Beukel [3] of Delft University of Technology points out that the Darwinists reproached the creationists because the latter start from a religious standpoint, however, the theory of evolution now is also portrayed as an article of faith.

Personally I do not see a real tension between the two views. But what I *do* see is that a scientific point of view has evolved into the equivalent of a religious belief. Evolution as the engine that makes the world change is the ultimate explanation for all that happens, without any more proof than a Christian, or a Hindu, has for his religious convictions. What I want to make clear in this contribution is that people should look at points of alleged tension with a clear eye and an undisturbed mind, and make their decisions free from emotional constraints.

I now should like to discuss an example to support my point of view which focuses on a miraculous story from the Bible, namely, where it is told that an 'angel of the LORD' appeared to Moses in the form of a burning bush. Although the bush was on fire, it was not being consumed [4]. Numerous explanations have been given to account for this special effect. A possible explanation of the story is that a natural gas source ignited and burned just at the spot of this bush. One could imagine that a religious man like Moses heard the bellowing of the flame and interpreted the noise as God's voice. The writings about what Moses 'heard' and saw still keep us busy today. My 'explanation' is not meant to suggest every event in the Bible can be 'scientifically rationalized.' We must remember that the literature known as the Bible was written many centuries ago by people who were not trained as scientists—keen observers—and it was not intended to convey scientific principles. The 'Bible writers' looked at the world around them with pre-scientific eyes, described it, and reacted accordingly. But we, living on the verge of the 21st century, try to keep our belief in the *reliability* of the message without having it interfere with rationalist doubts as to the authenticity of accompanying phenomena.

Let us now consider two main issues that are often the focus of apparent tension. I refer to the beginning of everything, and its end. Apart from evolution, these two points seem to yield the greatest tensions between religion and scientific thinking.

Let's look at what the opposite sides say about the beginning of everything. The Bible says 'In the beginning God created the heavens and the earth' [5]; few details are indicated. According to the latest scientific theory referred to as the 'Big Bang', the universe started with a sudden explosion of energy. Several models have been proposed to deal with the details of the Big Bang theory that are based on the current observations of the mean distance between galaxies seen as a function of time. ([6], p. 28). If the universe has a positive curvature, it is called *closed*, because two light rays that started out to be parallel, when extended, will intersect. The span of life of such a universe is finite, just like its volume (Fig. 1).

Another model suggests that the universe may have no curvature, i.e. it is *flat*. Light rays that start parallel will remain parallel. Finally, the universe may have a negative curvature. In that case it is called an *open* universe. In an open universe all apparently parallel light rays will continue to deviate. In an open universe, the span of life is supposed to be as infinite as its volume.

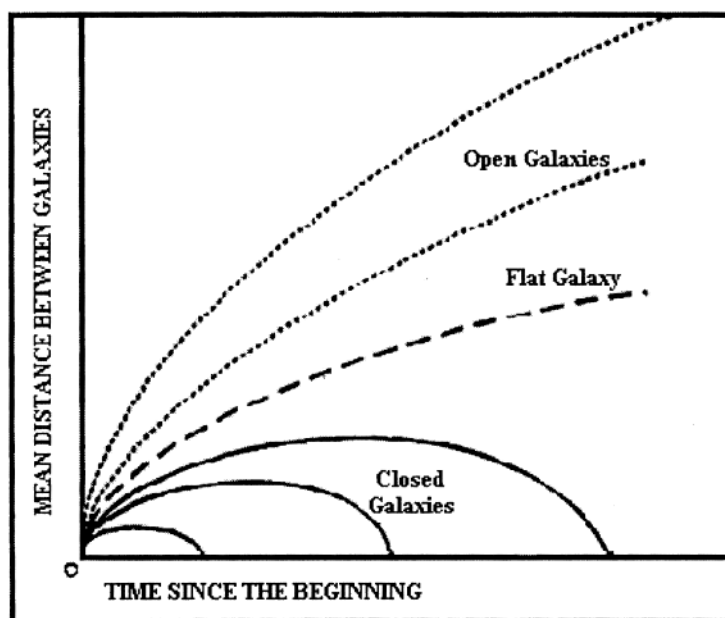


Fig. 1

All three models start at time zero (0) when all space was contracted into one point. Between one second and a few minutes after zero time, the temperature was so high that all of the nuclear fusion reactions possible in the universe occurred at a few billions of degrees centigrade. In the following few hundred thousand years, the universe cooled down as a consequence of its expansion. Now, what does theory have to say about these first three seconds? The expansion must have been super quick between 10^{-35} and 10^{-32} s, and the universe may have expanded by a factor of 10^{50} -fold. But the theory is silent about the processes occurring from zero time to 10^{-35} s. The Big Bang model can be represented by a cone (Fig. 2); The current conditions are represented by the big circle at the top ([6], p. 32). The first few seconds can be described by the weak interaction forces theory, the strong interaction forces theory, and gravitation theory. The current aim of model building is to arrive at one theory—the Grand Unified Theory. However, for the first 10^{-44} s new theory is required, which some suggest is the quantum-gravity theory. It is even unclear if the concepts space and time still apply. The current immediate question for science appears to be: what happened in the first 10^{-35} s? Thus, the scientific

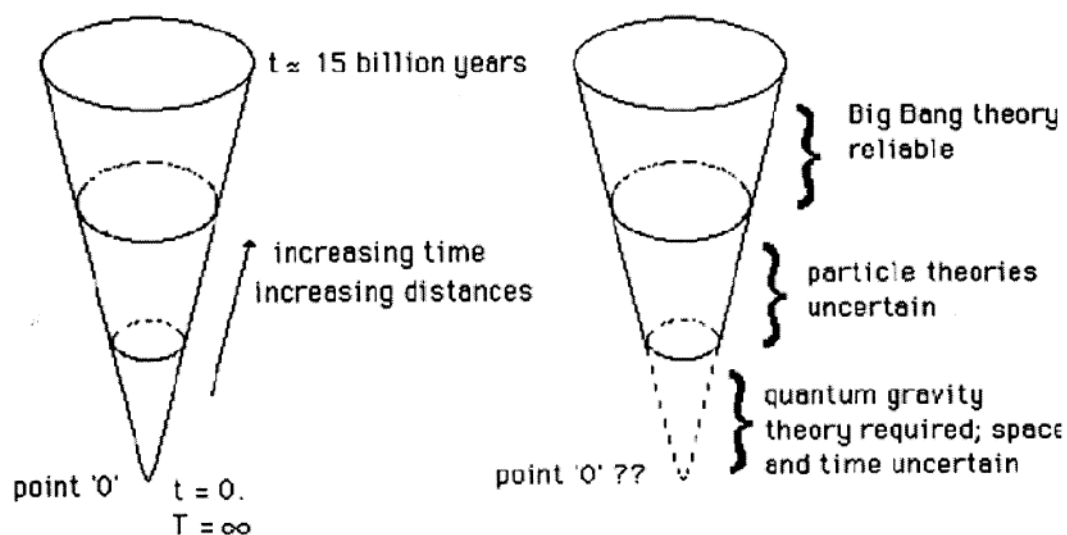


Fig. 2

answer concerning our apparent beginning lies hidden in the fog of speculation. There is no agreement yet as to the fundamental questions.

The question remains: are there relevant parallels between Genesis 1 and the Big Bang theory? There is a difference in linguistic usage between the Bible and science. There is a difference in world view. But there is no representative expression regarding the beginning in the Big Bang theory. Apart from this distinction, even if there would be superficial parallels, these would be vague generalities associated with both descriptions; for example 'Once there was a beginning', or 'This has always existed' ([6], p. 39).

So do we have to strive for an interdependence in world view, for harmony between the Big Bang theory and the religious concept of creation? Even if we might be successful at this point in time, the approach from science will not yield that what Christian people call 'God.' The seventeenth century French scientist and philosopher, Blaise Pascal, put it clearly: the God of the philosophers is not the God of Abraham, of Isaac, and of Jacob ([1], p. 342).

Humanity, its science and its maturity in thinking, has progressed since the days of Pascal and there might be an approach to accommodate the differences. In dealing with this issue, I rely on the beautiful book by Karen Armstrong [1] entitled, 'A History of God.' Armstrong relates how both in the Jewish and in the Islamic traditions of the tenth century, some thinkers following a lead from Greek thought created the ideal of *falsafiah*. To Islamic adherents, the *faɣlasuffs* [you hear the word 'philosopher' in it] tried to look behind history, which is considered a mere illusion, and to catch a glimpse of the timeless, the real god-like image. But they tried to find their way through the path of reason. The Islamic *faɣlasuffs* influenced Jewish philosophers. For example Saadia ibn Joseph, a Talmud scholar in the tenth century, saw the attainment of a rational concept of God as a *mitzvah*—as a commandment. The focus of their questions was to answer the riddle of how a material world could have come into being. The argument is that, if a material world 'came into being', then the world can not be eternal—contrary to the Platonic school of philosophy—but there must have been some beginning in the time. Other thinkers regard this world as a divine emanation, a radiation originating in the 'godly being.' Still is it remarkable that these philosophers also arrived at the Pascal viewpoint. They acknowledge that only personal experience will give you the faith that there is a living God ([1], p. 198ff). So, have we arrived at last at a point where we can establish a tension between science and religion? I think yes, in a certain sense. It is not the natural phenomena which calls up the tension, but it is the interpretation which the scientists themselves apply to their theory. Just as with evolution where one can see how science is transformed into dogma. Read Stephen Weinberg, the man who wrote this fascinating book about *The first three minutes*. At the end he exclaims: 'It looks like this: the more we are coming to understand about the universe, the more senseless it appears to us' ([7], p. 157). Here again you see how a scientist tries to arrive at some sense, at a dogma, or more appropriately said, at metaphysics. But this time it is based on scientific reasoning and not on revelation. About a century ago an Egyptian Islamic scholar, Mohammed Abduh, said when speculating about the *hadith*: 'Reflect upon God's creation but not about his nature, or else you will perish.' ([1], p. 418). According to Abduh, reason cannot grasp the essential being of God which remains shrouded in mystery, a point of view that is very close to Pascals's. All the other questions that exercise theologians are simply frivolous. The Quraan dismisses them as *zanna*. Perhaps a similar point of view is possible with 'scientific explanations.'

Now we come to the point associated with the future of the universe. Science tells us that in about five billion years, the nuclear fuel which has caused the sun to glow during the last five billions of years will be exhausted. The sun will swell up and become a red giant which will evaporate the earth. After one more hundred million years it will become a white dwarf—a small, hot, and very massive remnant—eventually cooling down to a brown dwarf or a black one without emission of any visible light.

What does science tell us about the universe as a whole? It will keep expanding and it will become progressively colder. There must come a point in time at which all stars will be exhausted. Then, any life as we know it will become impossible: everything will be extinguished in the infinite long future in a cold universe. On the other hand, there are also theories which maintain that gravity will, in the long run, take the lead over expansion, which implies that everything will begin to contract. In that case, everything will come together. Perhaps there will be a reversal, back to point zero, infinitely dense and infinitely hot. Or,

still harder to imagine, a pulsating universe which, like a pounding heart, will regularly contract and expand ([6], pp. 70–71).

None of these images projected by science is a beckoning perspective; it is a choice between being burnt up or freezing to death. This leads to Stephen Weinberg's conclusion that 'all is senseless.' The only thing which makes sense is our attempt to understand ([7], p. 157). Many cosmologists have similar pessimistic views about the ultimate future.

There are, however, also more optimistic views. According to Freeman Dyson, for example, life in a cooling universe can go on infinitely long, provided it finds a sufficient enough way to handle the energy stores. I mention this view, just like Frank Tipler's speculation regarding the possibility that the future in a closed universe may be 'infinity.' Now what is 'eternity?' Tipler thinks that in all religions eternity deals ultimately with the eternal propagation of intelligent personality—shall we call it 'God?' As a religious person, I would like to state that the hope for life eternal comes from within—one's 'heart.' Drees' opinion is that religious belief has to deal with the value of things here and now, to enable an orientation leading to decisions which must be taken immediately. This is a position that allows religion to eliminate the choice between optimism and pessimism for humans. But Drees is not optimistic regarding our ultimate future. We have now arrived at the boundary between science and religion. At this boundary that relates to our ultimate future, one concludes an optimism or pessimism. I do not believe that is the model of a practising scientist. At this boundary, science starts speculating and pronouncing about things which are for science as sure or as uncertain as for theology, but a huge difference exists between science and theology regarding pronouncements about the future. Theology has learned to be very careful over time. Science, on the other hand, is still the sacred cow of our times and dares to say things which cannot be proved scientifically. For example, how does Stephen Hawking arrive at the conclusion that there will be a moment when we will know the mind of God? What a pretension! I feel myself enough a scientist not to condemn scientific achievements but, on the contrary, to admire them. But I am vehemently opposed to physics applying itself to metaphysics and pretending it is *provable* physics. The best condition that we can achieve, as Van den Beukel says, is to compare both science and theology with two dogs which will have everlasting peace as long as either remains in its own kennel.

The real problem in my view is that there exists essentially no tension between religion and science irrespective of what people may try to make you believe. Both science and religion have their own realm of thought for which they claim validity. In the seventeenth century the church was allowed to pretend to have authority in scientific matters. We should not allow twentieth century science to presume to speak about matters which clearly are not capable of solution through science. Hawking's words: 'Then we know the mind of God' were swept away by these three words of Van den Beukel: *the immense arrogance* ([2], p. 102).

I would like to add a point to attempt to alleviate the apparent tension. The message of religion is a constant one, although it may have evolved during the centuries. Religion's mission is to render sense to the human condition and to provide an outlook beyond its boundaries. Science's mission is not a view of life or an ideology, but a coherent image of the world we live in, a model to explain the phenomena we experience. But how many times has the model of one thought process be replaced by another? Imagine religion to have changed 'models' as often as science!

All problems between science and religion in our times are the result of scientists yielding to the temptation to come out of its 'kennel' and to intrude on the terrain of religion by striving for the equivalent of religious pretensions and to invest the results with a kind of religious authority. Colleagues, there is no tension between science and religion, as long as each sticks to its own tasks.

I conclude this lecture, by quoting the most famous scientist of our times, Albert Einstein. He once was questioned by the archbishop of Canterbury about the implications that the theory of relativity might have on religion. Einstein said: 'None. Relativity is a purely scientific matter and has nothing to do with religion.' ([1], p. 453).

Discussions between science and religion are found only occasionally in religious circles. I believe that such discussions occur most often in Protestantism, and especially in Northern countries. Millions of religious persons in the past, and probably in the future, do not 'look to God' to provide them with an explanation of the universe. Science has been a threat to those Western Christians who read the scriptures

literally and interpret doctrines as though they were matters of objective fact. The notion of God as the first cause was eventually abandoned by Jews, Muslims and Orthodox believers in the Middle ages. The more subjective 'God' that they sought for could not be attained as an objective fact on which everyone agreed ([1], p. 435). I end with the observation that the apparent tension between science and religion can be eased somewhat if we recognize what religion should be and what science strives for. The tension between science and religion is nonexistent! If you are a teacher, please keep in mind that the truths of science can be transmitted to your students without giving up your religious beliefs.

NOTE ADDED IN PROOF

In Drees' inauguration lecture [8] he makes a remark on the discussion about evolution theory and the secondary school. 'Educating evolution theory *besides* other visions as a compromise may bring us from evil to worse. In the first time it must be realized that the word 'theory' in these discussions is used in multiple meanings. Evolution theory is not 'just a theory', an idea, it is manifold anchored in discoveries. Treating evolution theory as a notion besides other notions brings us from evil to worse regarding education, because this misleads pupils in respect of (their appreciation of) science. Not all notions can be regarded as knowledge to the same extent. There is reason to speak of true, and in many more cases with greater certainty, of false.'

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