

Articles

PROBLEMS BETWEEN SCIENCE AND THEOLOGY IN THE COURSE OF THEIR MODERN HISTORY

by Wolfhart Pannenberg

Abstract. It is misleading to speak of warfare between science and Christian theology, as Andrew White did in 1896. White also was mistaken in exaggerating the conflict between the church and Galileo and Copernicus. The more important issue between science and theology has to do with the mechanistic interpretation of nature. When he introduced the principle of inertia in his natural philosophy, René Descartes insisted that God's immutability renders it impossible for God to intervene in the creation. He reduced the idea of God to a deistic notion by speaking of motion exclusively as a property of bodies. Even though Isaac Newton offered a different view, the Cartesian view dominated subsequent thinking. This made dialogue with theology difficult. Michael Faraday, followed by Albert Einstein, introduced the idea of field; bodily phenomena were subordinated as manifestations of fields. The precursor of the idea of field is the Stoic idea of spirit, which is close to the biblical concept of spirit. Thomas Torrance and I have taken this concept of field as an occasion to reopen dialogue. Mechanistic thinking accounts for the tension between Darwinian thought and theology. In principle the tension can be resolved, because the Bible itself asserts that all living things were brought from the earth—that is, organic life emerged from inorganic matter. Thus, emergence, contingency, and novelty are consistent with Darwinian evolutionary thinking. Contingency can be related conceptually to the activity of God in creation.

Keywords: contingency; Charles Darwin; René Descartes; Albert Einstein; evolution; Michael Faraday; field; inertia.

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There was a time, around the turn of the nineteenth century, when many talked about a “warfare” of science with Christian theology, the title of a book by Andrew White, first published in 1896. It was a time when under the lead of classical physics modern natural science felt victorious. The warfare was said to have started with Copernicus and Galileo. But while there certainly had been tension between the heliocentric worldview and the authority of the Bible, the term warfare is much too strong. Neither Copernicus nor Galileo intended such a conflict. The proceedings against Galileo at Rome and their unfortunate results did a lot of damage but did not undermine the positive attitude of scientists toward the Christian faith. Besides, they were due more to the issue of church authority than to the scientific position of Galileo.

On the Protestant side, Martin Luther, in one of his table talks, said in 1539 that he would rather believe Holy Scripture, which reports in the Book of Joshua (10:12–13) that Joshua ordered the sun to stand still and not the earth, which presupposed that according to the order of nature the sun would go around the earth rather than the reverse. Biblical literalism continued for a long time to prevent Protestant theologians from adopting the Copernican view, although John Kepler as early as 1596 suggested that in the story of Joshua the point might simply have been that he prayed for daylight to last long enough to finish the battle against the Amorites. There was no real conflict, then, between the book of nature and the book of Holy Scripture.

The more serious problems between science and Christian theology emerged somewhat later, with the introduction of the principle of *inertia* in the natural philosophy of Descartes. The key importance of that principle is to be perceived in the context of Descartes’ concept of motion, which was closely related to his conception of bodily reality. He considered movements (like rest) a property of the bodies that are in movement (Princ. II, 31f.). God in the beginning created matter together with movement and endowed every creature with its movement. Because of God’s immutability, God preserves the amount of movement and rest as it was created in the beginning (II, 36) without further interfering in the interactions of his creatures. Extrapolating ideas of Galileo before him, Descartes disregarded the concept of God as *final* cause of the universe and relegated God’s relationship to the world “to the position of first cause of motion, the happenings of the universe then continuing in aeternum as incidents in the regular revolutions of a great mathematical machine.” Thus Edwin A. Burttt described Descartes’ natural philosophy in 1924. His judgment is correct that the resulting picture is “fundamentally different from the Platonic–Aristotelian–Christian view” of the world that had been “centrally a teleological . . . conception of the processes of nature” (Burttt 1932, A41, 113). But the decisive point in this opposition was not the abolition of final causes and the corresponding emphasis on God as only efficient

cause of the universe. The decisive change was that Descartes denied any further interference of the creator with creation under the pretext that such was required by divine immutability. Descartes did not deny that the creation is in continuous need of conservation by its creator, but because of his immutability God preserves the creation precisely in the state it was in the beginning. Therefore, God is not the cause of changes in the created world; all changes result from the mechanical interactions of the creatures among themselves, when they transfer their movements upon one another.

The first principle of this mechanistic view of the processes of nature and of its development was the principle of inertia, the first law of nature, as Descartes said (II, 37). It affirms that everything tends to persevere in its state, be it a state of rest or of movement. This principle fundamentally changed the Aristotelian-scholastic theory of movement, which affirmed that all movement tends to rest. This traditional view required an extrinsic cause for any movement: *Omne quod movetur, ab alio movetur*, said Thomas Aquinas (S. th. I,2,3 resp.). In Descartes' view, such an extrinsic cause of movement was no longer necessary in general, since movement now was conceived as a "state" of the body, like rest was. The concept of *state* came to function as the general term to which movement and rest were subordinated. Accordingly, God's activity of conserving his creatures was understood to preserve them in the state of movement they had received in the beginning, in the act of creation. The consequence was, I repeat, that because of God's immutability all changes in the world of nature were perceived to result from the mutual interactions of the creatures and not from any divine intervention. Thus, the principle of inertia made the world of nature independent from all further divine activity. The consequence was deism, with a God who acted as creator only in the beginning, while the further course of nature was left to its own mechanisms.

It was this view of the world that caused Isaac Newton's suspicion of atheistic consequences of the Cartesian worldview (Koyré 1965, 93f., 109). As a remedy, he introduced his concept of force as cause of movement. In his *Mathematic Principles of Natural Philosophy* (1687) Newton reformulated the principle of inertia in terms of a force that is intrinsic in bodies, *vis insita*, and he distinguished this from forces that act upon bodies from the outside, *vis impressa*, and among these he admitted other than mechanical forces. From the preface of his *Principles* one could get the impression that his ideal was a completely mechanical description of nature. But in his *Opticks* (1706) he emphasized that the first cause is not mechanical and that there are other nonmaterial forces such as gravity (Koyré 1965, 109). Thus, Burt wondered how it was "that Newton historically came to pose as the champion of the more rigid mechanical view of the physical realm" (1932, 243). Contrary to Descartes, Newton affirmed in his famous General Scholium, which was added to the second edition of

the *Principia* in 1713 (II, 311f.), that God not only created but also “governs all things” and that in him all things are “moved.” In his *Opticks*, Newton affirmed that God moves everything like we move “the parts of our bodies” by our will. Burttt summarized Newton’s position in the statement that God “is the ultimate originator of motion and is able at any time now to add motion to bodies” (Burttt 1932, 261).

The development of physics in the eighteenth century did not follow in the line of Newton’s combination of his natural philosophy with religious ideas. When Kant published his ideas on a purely mechanical origin of the solar system, he did not intend to but in fact contributed to a tendency that rendered the assumption of a creator God as efficient cause of the universe superfluous, as became evident in the completion of Kant’s theory by Pierre Simon Laplace with his famous dictum that he no longer needed the hypothesis of a God as creator of the universe. When as a matter of principle the concept of force was attributed to bodies that exercise forces upon one another (see Jammer 1957, 188ff., 200ff.), a return to the mechanistic worldview of Descartes took place, which Newton had intended to correct because of its implicit potential of atheism. In the eighteenth century this tendency became victorious. The principle of inertia no longer needed a basis in the assumption of divine immutability. Newton himself made it independent from such an assumption when he defined the tendency of bodies to continue in their “state” of either movement or rest in terms of a *vis insita*. Soon the concept of force in this description was replaced by characterizing inertia as simply a property of bodies. The tendency of this principle to emancipate the description of nature from any need for divine intervention or succor was now complemented by the attribution of forces to bodies exclusively. This excluded by definition any divine intervention in the course of nature, because, whatever God may be conceived to be, he is certainly not a body.

The mechanistic interpretation of the course of nature, then, contributed decisively to the alienation between theology and the natural sciences. As a corollary it may be mentioned that David Hume’s famous rejection of miracles in his *Inquiry Concerning Human Understanding* (1748, chap. 10) presupposed a view of nature in which divine interventions were excluded in principle such as was the case in the mechanistic natural philosophy of his time. Hume was correct to criticize a conception of miracle in terms of a “violation of the laws of nature,” but, rather than replacing this misleading idea of miracle by the Augustinian notion of miracle as an extremely unusual event, he rejected the notion altogether as “most contrary to custom and experience,” which was a far cry from John Locke’s attitude concerning this issue as well as from Newton’s.

Considering the importance of the attribution of forces to bodies in this conflict with theology, one might expect that the introduction of a field concept of force by Michael Faraday could have reversed the picture.

Faraday's tendency to envisage bodily phenomena as subordinate manifestations of fields (see Hesse 1961, 201ff.) could bring about a change in the relationship of science to theology. Although God could not be imagined as body to influence the course of natural events, the divine spirit could very well have been conceived as field, especially in view of the fact that the ancient Stoic ideas about *pneuma* as a cosmic principle, which, according to Max Jammer (1972, 923–26), were the “immediate” conceptual precursor of the field concept of modern physics, were remarkably close to the root meaning of the biblical concept of spirit as “air in movement” like breath or wind. But in the field theory of James C. Maxwell, fields were conceived as correlate to bodies or masses, and when Albert Einstein renewed Faraday's idea of a priority of fields with regard to bodily phenomena, he did so by way of a geometrical description of the cosmic field of spacetime and not in the sense of Faraday's conception of a field of force (see Berkson 1974, 50ff., 148ff., 317f.). Thus the potential of the field concept for the dialogue between science and theology has not been used until very recently— by theologians such as Thomas Torrance and myself.

In the heyday of a mechanistic description of the universe of nature, the full weight of rational argument for the existence of God fell upon the teleological argument. Indications of design or teleonomic order, especially in the world of organisms, could be taken as hints and evidence of the existence of a designing mind who created them. This is the background of the otherwise astounding passion in the debate about Charles Darwin and his theory of evolution, when he “showed that adaptation can be explained by random variation and natural selection” (Barbour 2000, 28f.). This seemed to do away with the argument from design in the world of organisms. Nevertheless, there were positive responses to Darwin's theory by theologians very early, such as the volume *Lux Mundi*, edited in 1889 by Charles Gore. But in some circles the hostile reactions of some theologians to the idea of a natural evolution of organisms continues to the present day, although the biblical creation story itself said that God created vegetation and even the animals by commanding *the earth* to bring forth such creatures (Gen 1:11, 24). God does not need to create all by himself and alone but recruits the assistance of his creatures. In affirming that the earth brought forth not only primitive forms of life but even the higher animals, the Bible is more audacious than Darwin was. It is hard to see, then, what biblical reasons theologians can have to object to an origin of organic life from inorganic matter, not to speak of the further evolution of higher species from lower ones. Certainly, the biblical record did not yet employ an idea of evolution but rather affirmed the constancy of species as a consequence of the conception that the order of creation was intended to remain as it was founded in the beginning. Nevertheless, the use of the earth as agency in God's work of creation is significant enough,

especially when connected with the idea of a continuing divine activity of creation, as suggested by other biblical passages.

To critics of the Darwinian theory of natural selection that doctrine could appear at first as another triumph of the mechanistic description of natural processes. This explains the enthusiastic response to the Darwinian theory among materialist scientists such as Ernest Haeckel in Germany. The further development of the concept of evolution in terms of emergent evolution and organic evolution clarified, however, that the theory did not advocate a biological determinism but allowed openness to the emergence of novelty in the course of evolution. Yet, as late as 1970, Jacques Monod in his book *Chance and Necessity* did not appreciate the positive value of chance and contingency for a theological interpretation of the process of evolution. Chance was called upon only in the service of destroying the argument from design. But in a theological interpretation of nature the element of chance or contingency is even more important than design, because contingency and the emergence of novelty correspond to the biblical view of God's continuously creative activity in the course of history and in the world of nature.

Contingency and novelty in natural processes can be interpreted theologically as evidence of God's continuing creative activity. Just as the first act of creation expresses the freedom of the creator, so does his continuous creative activity, which is manifested by the element of contingency in natural processes. For this reason I emphasized the issue of contingency in a study on contingency and natural law (Pannenberg 1970) as did Torrance in his book *Contingent and Divine Order* (1981). The irreversibility of time with its consequence that every new event is uniquely new and the indeterminacy of individual events according to quantum theory seemed to support the view that natural processes are basically sequences of contingent events—an assumption that is not opposed to the operation of laws in their course, because precisely in the unique sequence of contingent events regularities may occur that can be expressed in formulas of natural law. The element of necessity in the concept of natural law is not in opposition, then, to the basic contingency in all natural events, though there is also unpredictable contingency and novelty. My argument received a critical response by Robert J. Russell in *Zygon* (1988). At that time, Russell doubted whether contingency in the occurrence of actual events ("local" or "global" contingency) can reasonably be affirmed. However, quantum physicist Hans-Peter Dürr, long-time assistant of Werner Heisenberg, looked at the world of quantum physics as early as 1986 in terms of an open system and said: "in a certain sense this world originates anew at every moment" (Dürr 1986, 17). And the thermodynamic investigations of fluctuations in dissipative systems pioneered by Ilya Prigogine (1980) and others showed that unpredictability and contingency occur even in macrophysical processes. The observation of chaotic processes gave

rise to a discussion on its deterministic and indeterministic aspects and even to a “chaos theology” (Bonting 2002; Ganoczy 1995; Russell 1995). I agree with the judgment of Sjoerd Bonting that, notwithstanding the deterministic character of theoretical description, “the natural system becomes indeterministic at a bifurcation point” (Bonting 2002, 33). I also agree with his theological defense of talking about divine “intervention” in such a situation (2002, 51). I appreciate Arthur Peacocke’s hesitation concerning such language in view of the danger of falling prey to another form of “God of the gaps.” However, if contingency is not an exception in natural processes but rather a basic character of all events whatsoever, notwithstanding the regularities occurring in their course and described in terms of natural law, then it is a matter not of gaps but of a different view of nature at large. The interaction of God with creation is certainly concerned with creation as a whole, since the eternal God looks upon creation from the point of its completion, and therefore there is an influence of the whole on the parts (top-down causality). But God also relates creatively to every single creature, as Bonting emphasizes: “If we deny God’s ‘intervention’ in his creation, we are back to the deistic God of Newtonian thinking” (Bonting 2002, 51).

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