Geology and religion: a historical perspective on current problems

M. KÖLBL-EBERT

Jura-Museum Eichstätt, Willibaldsburg, D-85072 Eichstätt, Germany

Corresponding author (e-mail: Koelbl-Ebert@jura-museum.de)

Today, when referring to the relationship between geology and religion, people usually think immediately of Christian (and other) fundamentalists and their chronic palaeontological illiteracy leading to creationism, to intelligent design, and to a distrust of science in general and especially geology, palaeontology and evolutionary biology. Thus the relationship of geology and religion is usually considered to be under strain. However, outside this very specific field of conflict, there does not seem to be a relationship at all. Among geologists, as well as among other scientists, it is not customary to talk about one’s faith, and so it is hard to tell whether a colleague is practising a religious faith or at least adhering to it in private, or whether he or she wishes to be counted among atheists or agnostics. Such knowledge does not seem to be relevant to our joint scientific efforts. Geology as well as other sciences operates from a methodological naturalism, regardless of whether one is an atheist, theist, or something else. Centuries of observation, collection and experiment have taught us to trust these methods. We no longer expect disruptive miracles to upset the chain of natural causes and consequences. This is not because of any system of belief or disbelief, it is simply from experience, and we certainly have come a long way on this basis.

From mythological approaches to independent geological expertise

In former times, things used to be very different, and for most of human history the observation of geological phenomena and the acquisition of geological expertise was intimately connected with religious ideas. Earthquakes and volcanoes, towering mountains and conspicuous rock formations, fossils and ore veins were regarded either as due to direct divine action and intervention or as manifestations of the divine itself (Mazadiego et al.; Barbaro). It was God (or Gods), who had created the Earth as ‘home’ for humans, providing the necessary resources (animals and plants, but also water, rocks and metals), or who might be suspected to exert punishment on sinners by means of natural disasters (Kölbl-Ebert 2005; Udiás on earthquakes). Although accepting flint and pyrite in prehistoric time, or later copper and other ores, to be gifts of divine providence (Norris) is some sort of explanation for their existence, that assumption was clearly not sufficient to enable adequate strategies for the search for new deposits to be devised. Observational skills and arrangement of observations according to rules and guidelines (involving the formulation of theories) were required, and eventually such knowledge was accumulated and became part of the craft knowledge of miners.

Also, from an intellectual point of view, invoking divine action as a general and all-fitting explanation of phenomena was unsatisfying for an intellectual, and even for the devout theist who would like to know how God ‘did it’. After all, curiosity is a decidedly human trait. For this more theoretical part of ‘geological expertise’, the late Medieval and Renaissance intellectual world turned to the remnants of much older knowledge, that of the antiquity, which apparently had been a golden, better and much more knowledgeable age, judging from the ruins that were still around. Why not trust the explanatory power and authority of ancient texts (including the Bible) that had been produced by these obviously advanced civilizations?

This intimate link between early geo-theory and Christian philosophy proved to be very fruitful for some time, because the Christian tradition of visualizing the history of humans on Earth from the creation, via global revolutions such as the biblical Flood up to historical times (Rudwick 1992; Magruder) and the Judaeo-Christian sense of a finite Earth history (Rudwick; see also Rudwick 2005) prepared the ground for accepting the Earth’s different strata as testimony to the development of our globe through time. It was this religious, theological framework from which the early geology started to evolve, and that provided the tools used in popularization of the new science of the seventeenth century. It is understandable why, for example, geological phenomena such as erratic blocks and other debris covering much of Europe were initially seen as a consequence of events mentioned in the Bible and other ancient texts. However, with increasing observations there was a growing mismatch between what was expected according to ancient
In discussing questions of this kind two rules are to be observed, as Augustine teaches. The first is, to hold to the truth of Scripture without waverer. The second is that since Holy Scripture can be explained in a multiplicity of senses, one should adhere to a particular explanation only in such measure as to be ready to abandon it if it be proved with certainty to be false, lest Holy Scripture be exposed to the ridicule of unbelievers, and obstacles be placed to their believing (Aquinas 1273, 1st part, question 68).

Subsequently, attempts to reconcile the growing timescale of geology with biblical chronology became widespread in the eighteenth and nineteenth centuries. The most popular, apart from more metaphorical interpretations of the biblical creation stories, were possibly the ‘gap theory’ (or ‘chaos/restitution theory’), claiming an indefinitely long time span between Genesis 1: 1–2 or 2–3 and the ‘day–age theory’ (or concordance theory), which interpreted the days of biblical creation as seven long eras, which might be equated with different geological formations (see Roberts, on Sedgwick).

Geology and religion drifting apart

The release of geology from religious connotations or associations was a development closely connected with the Enlightenment, when geology and religion started to drift apart not with a violent rupture but in a subtle and sometimes circuitous manner. The Enlightenment was not about science versus religion, nor just about reason against superstition, as some of us may have learned at school. Enlightenment was much more about emancipation from the unquestioned, antique authorities, trusting your senses and your own reasoning, and regarding problems (including social, political, and psychological) as being solvable by natural means and the application of reason. Not only did science, medicine and technology prosper through the Enlightenment but philosophy and theology also developed new methods (Sheehan 2005; Ostermann), employing other academic disciplines such as linguistic studies, philology, history, archaeology, and even science. The scholarly skills and methods that theology acquired in turn inspired geology through the numerous geological clerics who shaped early geology around the beginning of the nineteenth century (Rudwick; Roberts on Sedgwick), especially where the age of the Earth and the nature of the supposed relics of the geological ‘deluge’ were discussed.

From case studies such as those by Luzzini, Pinto & Amador, Schweizer, Lewis and Taquet, it can be seen how the geological features (which were later reinterpreted as traces of an Ice Age) were eventually recognized as having been far earlier in Earth history than any event recorded by literate human societies. Among geologists, although not always among the wider public, this gradual dissociation between biblical Flood and geological deluge was generally amicable, not acrimonious. It was facilitated by the concurrent development of biblical scholarship, which showed that earlier literalistic interpretations were no longer tenable (and were also destructive of religious meaning). What was transposed into geology in the course of these debates was the strong Judeo-Christian sense that the world has had a directional and contingent history, which might have been punctuated by occasional catastrophic events (Rudwick).

However, outside the group of people with geological expertise, not all was smooth and peaceful, and some conservative clergymen as well as laypersons were shocked by the new ideas that came with geology: the immensity of the timescale, a dynamic Earth, not just a ruin shaped by the Deluge, and a dynamic biology along with the Darwinian theory of evolution, which was founded in part on palaeontological evidence and the assumption of a long geological timescale.

Two such skirmishes make an especially good story, and therefore are often retold. Dean Cockburn of York (1774–1858) took the opportunity of the 1844 meeting of the British Association for the Advancement of Science (BAAS) in York to attack William Buckland (1784–1856) and Adam Sedgwick (1785–1873) (see Roberts), two influential clerical geologists, who were not orthodox enough for his taste. However, they were not the only people Cockburn publicly abused. The science writer and mathematician Mary Somerville (1780–1872), for example, wrote in her autobiography:

Geologists had excited public attention, and had shocked the clergy and the more scrupulous of the laity by proving beyond a doubt that the formation of the globe extended through enormous periods of time. The contest was even more keen then than it is at the present time about the various races of pre-historic men. It lasted very long, too; for after I had published my work on Physical Geography [in 1848], I was preached against by name in York Cathedral. Our friend, Dr. Buckland, committed himself by taking the clerical view in his "Bridgewater Treatise"; [Buckland 1836] but facts are such stubborn things, that he was obliged to join the geologists at last (Somerville 1873, p. 129).

Even more notorious was the debate between the Bishop of Oxford, Samuel Wilberforce (1805–1873) and Thomas Henry Huxley (1825–1895) on evolution and Charles Darwin’s (1809–1882) new book On the Origin of Species (Darwin 1859) at the BAAS meeting in Oxford in 1860. Closer inspection of the case, however, makes clear that this piece of history was not about simple ‘war’ between science and religion, as such, but that
clerics were present on both sides (James 2005), and that the dissociation involved just as much an ‘internal’ theological debate about how to interpret the Bible as a battle between science and religion. Although the wealthy and independent British gentlemen geologists of that time had little to fear from such skirmishes, things were much more difficult for those early professional geologists who happened to be dependent on religious authorities. For example, the botanist and geologist James Buckman (1814–1884) lost his job, a professorship at the Royal Agricultural College in Cirencester, because he provided evidence for the variability of plants and was cited favourably by Darwin. His boss, a theologian, obviously was not pleased with the promulgation of such ideas at his college (Torrens).

Such are the dangers wherever science is not independent but is conducted under the ‘umbrella’ of an institution that sets other priorities. Then conflicting loyalties may lead either to corruption of science or to censorship, as in the Buckman case, although this is not inevitable. Some hundred years of seismological research by Jesuits, for example, have yielded considerable scientific fruit, acknowledged widely by the scientific community, without any obvious problems between the scientific and spiritual life of the people involved (Udiás).

Many religious centres of learning used to teach not only theology and philosophy to their students but also science. For example, the (Roman Catholic) Bishop’s Seminary in Eichstätt (Germany), which hosted the 2007 INHIGEO meeting, was re-established in 1843 after the turmoil of secularization. In 1844, among the first things done by the seminary was the purchase of a scientific collection to be used as a teaching aid, as the theology students were required to study not only the relevant theological subjects but also philosophy, history of philosophy, psychology, history, physics, chemistry, natural history (including biology, anthropology, geology and mineralogy) and pedagogy. The lectures were given by men who were priests as well as scientists (see, e.g., Viohl). The motivation for this was basically a continuation of the older idea of natural theology (see, e.g., Bork): studying God not only in the Bible but also in the ‘book of nature’; and also to simply stay ‘up to date’.

Although teaching of natural history at Eichstätt was discontinued in the late 1960s, the Seminary still hosts a splendid palaeontological collection of fossils from the Solnhofen Limestone (accessible to and frequently visited by various fossil specialists), and it co-fines the Jura-Museum Eichstätt, which has among its holdings the famous Eichstätt specimen of Archaeopteryx on display in an exhibition on bird evolution, a specimen that belongs to the Seminary and thus to the Church.

From such basic openness towards science, and especially geology, we may gather that historical conflicts have often originated not necessarily from theological or scientific reasons alone, but have at times been enhanced by personal antipathies or peculiarities. So it is valuable for a historian of science to investigate the biographies of geologists in all their depth, highlighting not only scientific achievements but considering also the spiritual life of the protagonists (Roberts on Sedgwick, Branagan, Mayer, Viohl, Seibold & Seibold and Turner).

Creationism
Considering the somewhat strained relationship between geology and a certain variety of religion that currently exists, we might ask why and when such conflicts originated, because the creationism we face today is a fairly recent phenomenon (see Roberts, both papers). Historically, conflict between geology (or science in general) and religion has often developed from questions about power and (church) politics. It was in times of crisis that religious authorities tended to react with suspicion to any kind of science that seemed to undermine their influence and to collide with traditional teachings. This is particularly apparent when reviewing the relationship between the Roman Catholic Church and geology (or science in general), be it the often-cited Galileo case in the aftermath of the Reformation (Ostermann) or the minor skirmishes that took place after the secularization of the early nineteenth century (Klemun) or during the Kulturkampf (culture struggle) around the start of the twentieth century (Vaccari).

At present, there is a certain lingering sympathy (for example, on the part of Cardinal Schönborn of Vienna) for intelligent design (e.g. Horn & Wiedenhofer 2007), much to the distress of many academic theologians (see www.forum-grenzfrage.de; compare also Ostermann), which airs a deep distrust of the secular world with its apparent loss of moral values (and concomitant neglect of moral authorities) and spiritual meaning. Although Cardinal Schönborn has publicly dismissed creationism as nonsense, he does not seem to be aware of the historical roots of intelligent design, which began in the late 1980s as a case of camouflage of the religious nature of creationism to gain access to the US educational system (see www.talkorigins.org/; www.talk.design.org/; see also Roberts (an Anglican priest’s perspective)). It seems that intelligent design is regarded by Schönborn as a suitable way to give (alleged) scientific blessing to faith, and thus rationalize it by means of scientific or philosophical argument. For this purpose, intelligent design, whose scientific sounding rhetoric is not
easily exposed by the average theologian, seems to be a more suitable ally than mainstream science. Readers may want to contemplate the similarities of this modern case of apologetics and the promotion of Neptunism in late eighteenth-century Italy (Candela).

The more traditional creationism was, until recently, a mostly Protestant feature (Young and Mosher et al.). However, it is no longer a problem of minor free churches but also occurs increasingly in mainstream Protestant churches to a worrying extent (see Hemminger 2007; Roberts).

People become (or remain) creationists for many reasons. Peters explores one reason which seems to be especially relevant to the US situation:

[W]hat unites the radical creationists is a need to declare God innocent of the charge of creating an already fallen world, a world full of suffering and death and futility from the beginning. Large numbers of Westerners profess belief in God; I will argue that what separates radical creationists from the rest is their conviction that contemporary scientific orthodoxy renders belief in a conviction that contemporary scientific orthodoxy renders belief in a loving, personal Creator deeply implausible, and a burning desire to make it less so.

The immense diversity of opinions among creationists regarding geology, palaeontology and evolution ‘can be accounted for by the fact that radical creationism is organized around and motivated by a quest to show God [to be] innocent of natural evils’ (Peters). The natural evil is blamed on the sinfulness of humans instead. However, there are other factors, apart from problems with theodicy, which should not be neglected. The motto of the Enlightenment, sapere aude or ‘dare to know’, causes fear in some people: fear of taking up the responsibility that comes with freedom and that is then delegated elsewhere, either to religious authorities or, these days, to secular (scientific or esoteric) experts. Simple answers are what such people crave, and creationists, and the ever-increasing business of ‘esotericism’, provide ostensibly simple recipes for life as well as a feeling of (false) security in a world that is difficult to understand and to manage.

It is the fear of the secular world, with all its complicated decisions to be made for oneself, the fear of getting lost in the maze of theological and spiritual possibilities, where no one tells you what to do or what to believe, the fear of losing sight of moral values and spiritual meaning in an economic system where value is attached only to money and productivity, that encourages the expectation of the apocalypse around the end of the second millennium after Christ, with its strange and dark mixture of dread and satisfaction in those who hope to be caught in ‘the rapture’. Of course, there are also those who make money and gain political influence by exploiting the spiritual needs, troubles and sometimes despair of unsophisticated people (Hedges 2006). This has also been noticed by the Council of Europe, which on 4 October 2007 passed a resolution (Number 1580) on the dangers of creationism in education, pointing out that:

The total rejection of science is definitely one of the most serious threats to human and civic rights. . . . The war on the theory of evolution and on its proponents most often originates in forms of religious extremism closely linked to extreme right-wing political movements. The creationist movements possess real political power. The fact of the matter, and this has been exposed on several occasions, is that some advocates of strict creationism are out to replace democracy by theocracy (Council of Europe 2007).

Uneeducated people are easy prey for the political wing of the creationist movement. Their desire for security or theodicy is satisfied neither by science nor by modern scholarly theology (Peters), and they are usually unaware of the achievements of both science and post-Enlightenment theology (Ostermann and Roberts).

From my personal involvement with young theological students at the Catholic University of Eichstätt-Ingolstadt (Germany), I often get the impression that many of them do not really have an idea of what science means and how it works, and why should they? In school, their teachers knew everything and they simply had to believe them. Their textbooks told them what to learn by heart for use in the examinations. They studied physics, chemistry and biology but never conducted an experiment without knowing how it would turn out, and never asked a question or researched it themselves by observations or other means. How should they understand the difference between a physical or biological problem and the opinions offered in a newspaper or some dogma of the Church? It is not only the deeply religious who are affected by this ignorance. In Germany, and as far as I understand, in other countries too, we also have a huge surge in ‘esotericism’.

It is important to question not only the way we teach science (Pigliucci 2007) but also how we teach and reflect about religion and faith, as there may be another reason contributing to the problem of creationism. Science is not atheistic as such, but it may be damaging to the simple faith of our childhood. Embarking on the adventure of science will necessarily shake this belief, but by perseverance on our personal path in science, casting away easy answers and unreasonable superstitions, we might gain more than we lose and our faith may grow stronger and more mature. In the words of the former director of the Vatican Observatory, George Coyne:

I would essentially like to share with you two convictions . . .: (1) that the Intelligent Design (ID) movement [or other forms of creationism], while evoking a God of power and might, a designer
God, actually belittles God, makes her/him too small and paltry; (2) that our scientific understanding of the universe, untainted by religious considerations, provides for those who believe in God a marvellous opportunity to reflect upon their beliefs. So why does there seem to be a persistent retreat in the Church about 12 billion and in which life, beginning in its most primitive forms at about 12 × 1 billion years from the Big Bang, evolved through a process of random genetic mutations and natural selection, escapes God’s dominion. That fear is groundless. Science is completely neutral with respect to philosophical or theological implications that may be drawn from its conclusions. Those conclusions are always subject to improvement. That is why science is such an interesting adventure and scientists curiously interesting creatures. But for someone to deny the best of today’s science on religious grounds is to live in that groundless fear just mentioned (Coyne 2005).

Conclusion

From such thoughts, and of course the papers assembled in this volume, the reader may gather that the relationship between geology and religion is much more complex than might be supposed at first glance. Both geology and religion have evolved through time, often intensely entwined, and mutually influencing one another. For much of the time needed for the development of geological methods and expertise, geology and religion cannot be considered separately by historians of science, as the historical protagonists were often both geologists and theologians; and in other cases the theological laymen among early geologists considered their geological discoveries in the light of their faith.

With these historical considerations in mind, we may better understand the current situation and offer a dialogue between geology and modern theology, bearing in mind that the current debate, if there has to be one, should not be about geology versus theology but about enlightenment versus fundamentalism. It is important that geologists should be aware that many theologians are just as appalled by the recent rise of Christian fundamentalism as they are.

The papers assembled in this book were presented at the annual conference of the International Commission on the History of Geological Sciences (INHIGEO), which took place in Eichstätt (Germany) from 28 July to 5 August 2007. I wish to thank my staff at the Jura-Museum in Eichstätt, who helped organizing the event, and the Bishop’s Seminary in Eichstätt, and especially the Rector Dr J. Gehr, who cordially and amiably welcomed us all, geologists, geohistorians and theologians, Christians, Muslims, Buddhists, Shinto, atheists, agnostics and who knows what else, in the Seminary’s splendid rooms. My thanks go also to all the contributing authors; it has been most pleasant to work with you all. Finally, I am much indebted to those who provided valuable reviews of the papers or, in the case of Anglophones, also helped to correct not only my English but also that of the contributors whose first languages are not English: P. Barbaro, K. Bork, B. Cooper, B. Fritscher, M. Klemun, S. Knell, L. Laporte, S. Newcomb, K. Magruder, S. Moshier, R. O’Connor, D. Oldroyd, M. Ostermann, M. Roberts, M. Rudwick, P. Taquet, K. Taylor, E. Vaccari, P. Wyse-Jackson, M. Yajima, D. Young and four anonymous reviewers.

Notes

1Outside the USA, this is a new phenomenon. In Germany, for example, the debate reached the media only about 5 or 6 years ago. There has always been a small group of creationists among Jehovah’s Witnesses, Seventh-day Adventist or certain evangelicals, but they have been an almost silent minority. Now there is a vocal minority striving for publicity.

2This is the idea of ‘falsifiable theology’, a notion that possibly every scientist should be able to live with.

3So called, because after the initial act of creation (‘In the beginning God created the heaven and the earth’; Genesis 1:1), the ‘Earth was without form’ (Genesis 1:2, i.e. it was chaotic), and only later, starting with day 1 and the creation of light, was the Earth moulded into the planet we know today, implying a time gap either between the initial creation (of a perfect Earth) and rendering it chaotic (with later restoration of a habitable Earth) or between an initially chaotic Earth and the ordering process of days 1 to 6. Other creationists prefer to locate the time gap within Chapter 2 of Genesis after the seventh day and before the account of the fall of Adam and Eve.

4Historians of science must be aware of their own subjective religious worldview, which may sometimes influence their interpretation of such pre- or proto-scientific ideas. For a case study see Oldroyd.

5This need not necessarily be a traditional religious institution (see, e.g. Zhang & Oldroyd).

6It is disturbing that Russell et al. (1998), documenting a highly professional and inspiring interdisciplinary conference on evolutionary and molecular biology, which had been organized and hosted by the Vatican Observatory, was not quoted in this book, pointing to a serious neglect of the previously intense interdisciplinary and ecumenical dialogue between science and religion that existed under Pope John Paul II.

7A phrase from Horace, used by Immanuel Kant (1724–1804) in his essay ‘What is Enlightenment?’ (Kant 1784).

8On the other hand, the media expose students to scientists who argue for philosophical atheism (e.g. Dawkins 2006), depicting it as a logical consequence of scientific method, an opinion that obviously has much to answer from a philosophical or theological point of view. This kind of atheism immediately proves to be counter-productive. The students are only strengthened in their
prejudice that ‘science is just as dogmatic as those scientists claim religion to be’, and they cannot fail to note that the scientists have at best a shaky grasp of modern theology and ignore its manifold attempts at a fruitful dialogue between science and religion (see Russell et al. 1998; Peters & Hewlett 2003; Schärtl 2008).

References


