

From apocalypse to entropy: Understanding the decline of religion

Victor Gijbers

July 13, 2003

Contents

1 The decline of religion: a conceptual scheme	1
2 The importance of cultural influence	2
3 Visions of the end: physical eschatology	5
3.1 Optimists, pessimists, eternalists	5
3.2 ‘Not with a bang but a whimper’	6
3.3 ‘Ewigen Bestätigung und Besiegelung’	7
4 The heat death of religion	8

1 The decline of religion: a conceptual scheme

If there has been a battle between science and religion, there can be no doubt to whom the victory belongs. Looking back through the mists of time at medieval Europe, we are immediately struck by the astonishing degree in which religious thought penetrated every aspect of society. This has by and large ceased to be the case in our own age, and at least part of the emptiness left behind by the withdrawal of Christianity has been filled by a spectacular inrush of science. For the historian trying to grasp the complex relation between science and religion, understanding this development is a central task. Such understanding, however, can never come from mere knowledge of the unordered historical facts – facts do not by themselves explain anything. What one requires is a conceptual scheme of the decline of religion and the accompanying rise of science in which one can try to fit the facts; one needs to create a way of analysis, and let history decide whether it is or is not useful.

A notorious attempt to do just this is the late nineteenth century historiography of Andrew White and John Draper, whom interpreted the complex interactions between science and religion in terms of warfare.¹ The two cultural forces were combatants, fighting for control over the minds of men – and the majority of the battles were won by science. This conceptual scheme in which to place the historical facts has been criticised very thoroughly, and has had the dubious and somewhat undeserved honour of become a paradigmatic example of bad historiography. Draper and White’s theory has been decisively refuted, but that does not mean that it was a bad theory, merely that it was a false one. Simply abandoning it is not an option – we need a new theoretical model in order to continue our investigations.

¹Actually, Andrew White conceived of it as a war between science and *theology*, not science and religion – for my present purpose, however, the distinction is unimportant.

The ‘warfare’ metaphor, then, should be replaced by another way of interpreting the interactions between science and religion which led to the rise of the former and the decline of the latter. Yet one may already cast doubt on the thesis implicit in this statement, namely that religion is no longer important in our society, by pointing out that the great majority of the people alive today are still religious. Perhaps the nature of religious experience has changed, from a social to a purely personal phenomenon, but religion is as alive today as it was five hundred years ago. Another possible counter-argument might be that religion has not retreated at all: all truly religious claims are consistent with contemporary science, and in fact science and religion are concerned with strictly separated realms of enquiry. On this view, the very idea of a conflict between science and religion is incoherent. In order to escape these two objections, I have to make clear what I mean by the ‘rise of science’ and the ‘decline of religion’. This explanation will be seen to suggest a conceptual scheme within which to place the historical facts.

I wish to look at religion and science neither as personal beliefs nor as logical systems of propositions, but as social and cultural forces. A culture has many aspects: science, philosophy, religion, politics, economy, literature, music, architecture, theatre, etcetera. My claim is that the importance of any of these aspects is not so much shown by the amount of time or money spent on it, as it is by its power to influence the other cultural forces with thoughts and images from its own sphere, thus strengthening both itself and the culture as a whole. For example, in medieval society religion was in many respects the fundamental phenomenon: philosophy revolved around theological questions and concepts, all forms of art used religious symbols and stories, religion had a large influence on politics, and even on the basic emotions of humanity. (As examples of this last statement, think of piety, reverence and sin – emotional attitudes which are now largely forgotten or reinterpreted.) Religion was a major cultural force not because everyone was religious, but because it had a profound influence on almost every aspect of the culture. People thought in religious terms, used religious symbols and experienced religious feelings.

The claim that this influence has completely disappeared today is obviously false, but it is clearly true that it has greatly diminished. On the other hand, scientific thought has become more and more important, and has a considerable influence on the way we think and speak, on all forms of art and on both theology and philosophy.² The initial question can thus be reformulated: how did it happen that religion lost and science gained so much strength as a cultural force? The conceptual scheme which naturally suggests itself is this: instead of conflicts, the true interaction between science and religion has been a series of episodes in which religion lost its role as a source of inspiration for some facets of culture to science. To test the fruitfulness of this scheme, the third part of this paper will look at an example, namely the influence of thermodynamics on visualisations of the end of the world, traditionally a highly religious subject. Before I turn to this, I need to make some general remarks on the application of the scheme outlined above. A twofold task lays before me: to justify my contention that the importance of an aspect of a culture is strongly correlated to its ability to influence other parts of the culture, and to show by means of a simple example how one could analyse the replacement of one cultural force by another.

2 The importance of cultural influence

Cultural movements come and go. Some last for a few years before evaporating like water on hot metal, hardly ever noticed. Others remain on the scene for decades,

²I do not dare to claim that science has replaced religion as the most important cultural force, however. That honour might well be reserved for economy, sad as this may seem to some of us.

centuries, even millennia, and diffuse their central ideas and symbols through all aspects of a culture. The variety, scope, duration and influence of such cultural movements can vary greatly – and any attempt to find a clear causal explanation for their respective fates seems rather hopeless. Still, it does not seem too far-fetched to make an analogy with Imre Lakatos' theory of 'scientific research programmes', and claim that there is a distinction between fruitful, dynamic cultural forces on the one hand, and barren, degenerating ones on the other. A movement is fruitful if new ideas often emerge in it, if it can successfully confront problems, if it has the ability to innovate and to inspire people. A barren movement is one in which very few new ideas emerge, which is plagued by problems that seem unsolvable, which is rigid and codified and lacks the ability to inspire creative minds. Thus, early Marxism was a very fruitful and dynamic cultural force, which inspired brilliant minds of all kinds in many different countries; it led to new ideas in literature and other arts; it had an innovative influence on psychology, biology, many parts of philosophy, economic and political theory, and so on. Around 1950, however, Marxism no longer had the power to exert this kind of influence: it did not develop any spectacular new ideas, it could not solve the problems which plagued its sociological and historical theories, it retarded rather than advanced the sciences, it stifled creative artists and its political systems had become rigid bureaucracies incapable of innovation. This later Marxism was a *degenerating* cultural force; slowly but inexorably it was losing its power, until it collapsed under the weight of the political structures built upon it. Nowadays, Marxism seems to have reached a state of inactive equilibrium.

This example clearly illustrates that a powerful, dynamic cultural force has the ability to influence many other aspects of culture. Any such force will shape the way people think, will furnish them with symbols and figures of speech, with allegories and modes of thought. Thus a religion which preaches about 'sin' and 'redemption' will, if it is influential, accustom people to think in those terms – and they will then reappear in poetry and literature, in music and philosophy. It seems almost a necessary truth that any cultural force which is powerful captures the minds of men; that whatever captures the minds of men will reappear in many of their actions; and thus that any powerful, non-degenerating cultural force will have a profound influence on many other aspects of culture. But a *degenerating* cultural force can still be 'influential' in the sense that many people consider themselves part of it; presumably, right until the collapse of Russian communism, the great majority of the Russians considered themselves Marxists – but Marxism had already been degenerating for decades. And, oppositely, a cultural force can be strong and fruitful even though very few people adhere to it – for instance Nietzscheanism, which between 1880 and 1890 had exactly one proponent, Friedrich Nietzsche, but was to have a major influence on western culture. Neither is it logical problems which ensure that a cultural movement degenerates. Philosophers of science have shown over and over again that most abandoned research programmes were not logically refuted, and it seems we can safely assume that the same goes for systems of religious thought. The single most important symptom of degeneration then seems to be the inability of a cultural force to influence other aspects of culture, in which case it will slowly become more and more sterile, until its cultural significance reaches absolute zero.

I now turn to my second task: showing how we can analyse the replacement of one cultural force by another in a certain facet of culture. As an instructive example, I will consider the sciences in the scientific revolution. The content of the sciences is, of course, by definition scientific. But the source of inspiration for this content changed from 'religious' to 'scientific' – religion thus lost its ability to influence and inspire one very important aspect of culture.

At the dawn of the 17th century, Johannes Kepler thought up his famous laws of planetary motion. 'After his skill in astronomy, religious devotion is probably [his]

best-known characteristic,' Richard S. Westfall claims.³ Kepler's scientific treatise *Harmonies of the World* is full of religious incantations, hymns and prayers. We find that his cosmos is still an organic, ordered whole, where the laws of nature are not yet impersonal abstractions. He was furthermore able to calculate the density of the sun, the sphere of the fixed stars and the intermediate ether by assuming that the universe resembled the Trinity, which entailed an equal division of matter between its three principal parts.⁴ Obviously, for Kepler religious thought still inspired science. And by this I do not merely mean that his religious persuasions inspired him to do science – a characteristic shared by many later scientists – but more importantly that his language, symbols and concepts were thoroughly religious. There was no strict division between religious writing and scientific writing; the religious mode of thought still pervaded scientific thought; and Christian concepts such as 'Trinity' were fruitfully used as metaphors in science. Kepler's Christianity was not merely a personal psychological influence; it proscribed the way in which science was to be written and conceptualised, and it proposed research questions and ways to solve them.

Nearly a hundred years later, Newton proved Kepler's laws from his own theories of mechanics and gravitation. I wish to maintain that his works show that the influence of religion on scientific thought had greatly diminished. Many possible criticisms of this thesis immediately arise: Is it not true that Newton was a deeply religious person, who spent more time on theology than on physics? Is it not the case that he was inspired to spend time on science because of his religious convictions? Do the *Principia* not contain statements about God as surely as, if less frequently than, the works of Kepler did? And didn't Newton hold the opinion that the laws of nature are constantly upheld by God? I immediately concede all of these points, but still retain my thesis. That Newton was a profound believer and that his attention to physics was based on his religious convictions are psychological facts which do not themselves demonstrate that religion had a powerful influence on science. This influence, if it still existed, has to be found in the language, the mode of presentation and the fruitful use of concepts and symbols from religious thought; in all of these respects, the change since Kepler is both large and obvious. With Newton, religious imagery no longer provides the conceptual basis for physical science: the world has been mechanised and materialised, with strict laws governing the behaviour of the particles. Whether or not these particles have been created by God, and whether or not the laws are upheld by Him, is relatively unimportant: the basic concepts 'particle', 'matter' and 'law of nature' are *not* religious. The religious way of thinking is no longer the scientific way of thinking, and as a consequence religious ideas are no longer allowed to function as premisses of arguments in science.

This movement away from religion is nowhere more obvious than in Newton's passage on God in the *Principia*. He writes: 'All that diversity of natural things which we find suited to different times and places could arise from nothing but the ideas and will of a Being necessarily existing.'⁵ Here, religious concepts are no longer used to think about science; instead the very opposite takes place, a scientific image in conjured up in order to strengthen and direct religious thought. Nature is not conceived of as basically religious, but God is portrayed as the Creator of the natural order observed and described by the sciences. The ideas and symbols of science, which were developed relatively independent of religion, are now used to influence religious thought. This proves, if I am correct, that religion was slowly losing strength, whereas science was gaining it. On this view, the venerable 18th century tradition of physicotheology, where science was used to illustrate and propagate religious thought, was not a sign of the strength of religion, but rather a clear

³Westfall [8], p. 219.

⁴Westfall [8], p. 222.

⁵Newton, *Principia*; taken from Westfall [8], p. 229.

symptom of its *degeneration*.

The appropriate mode of analysis, then, is not to look at the thoughts and beliefs of individual scientists; the strength of cultural forces cannot be learned in this way. What we ought to look at is the way in which the language and symbols of one aspect of culture pervade others, and the way in which thoughts and concepts of one aspect enter other aspects as similar thoughts or metaphors. With this in mind, I will now turn to thermodynamics in the 19th century and its application in apocalyptic and related writings.

3 Visions of the end: physical eschatology

3.1 Optimists, pessimists, eternalists

Any system of eschatological thought – the doctrine of last things – must fall within one of three broad categories: optimistic, pessimistic or eternalistic. Either the end of the world will be a state of bliss and perfection; or it will be dreadful and terrifying; or there will be no end at all, and the universe will just go on and on. In the history of the world, we find all of these three possible choices cast into coherent and influential philosophies. Thus, Marxism claimed that by necessity the world was evolving through constant struggle towards a state of final political and economic justice; the Greek epics depict history as the slow but inexorable weakening of mankind; and in Hindu thought, the world forever moves in a cyclic history.

It is, however, very hard to assign a place to Christianity in this partition. I would like to argue that this is one of its great strengths – no matter what the mood of a cultural movement is, it can always find thoughts and symbols within Christian thought to express its feelings. For optimists, there is the idea of salvation, of Heaven, of the Second Coming of Christ and eternal bliss for all who deserve it. All wrongs will be set aright, we will be reunited with our lost loved ones, and God's creation at last attains perfection. Pessimists, on the other hand, have the Apocalypse – the Revelations of Saint John alone are enough to populate a host of nightmares! God acts as a strict judge, and all mortals shall tremble in fear while the world collapses around them in death and fire. Only a few shall be saved, whereas the great majority of men will forever burn in the horrible abyss of Hell. Finally, we have God as eternal and immutable being; the afterlife as everlasting continuation of this life. There is enough in Christendom to please him who seeks eternity.

Why should we call this seemingly eclectic attitude a great strength? As I remarked above, different cultural movements – and, for that matter, different individuals – have different moods; some are light and happy, others sad and dismal, some emotionally neutral. The later part of the 19th century was predominantly optimistic, whereas pessimism ruled the years following the first world war. Such moods have always existed, and differed from time to time and from place to place – they can be created by a nation's success or failure in war, by artistic movements, and so on. What is important, however, is the acknowledgement that such movements are bound to occur in any society, and that a cultural force which is able to supply many different kinds of movement with symbols and thoughts is in a very strong position. And this is exactly what Christianity could do for thought on the fate of the world: optimistic, pessimistic and eternalist movement alike could borrow imagery and theories from Christian thought. This meant that an important aspect of culture – for one's view of the fate of the world most surely influences one's general outlook – was under the firm influence of religion.

But in the second half of the 19th century, this dominance was challenged by

two new and quickly expanding fields of scientific research: Darwin's theory of evolution, and the theory of thermodynamics. The former was to provide material for the optimists, whereas the latter would prove to have a profound influence of pessimistic and eternalist eschatology. I will pay most attention to the influence of thermodynamics, but a few words of the optimistic implications of Darwin's theory are in order.

Thus, from the war of nature, from famine and death, the most exalted object which we are capable of conceiving, namely, the production of the higher animals, directly follows.⁶

'From evil, good,' is Darwin's message at the end of his famous *Origin of Species*. The theory of evolution told a tale of progress from simple to more advanced forms; and it was not long before people assumed that the tale told was one of evolution towards greater and greater perfection, and used it in a wide variety of situations. Already in 1862 the influential British philosopher Herbert Spencer wrote in his *First Principles*:

[We have the belief] that Evolution can end only in the establishment of the greatest perfection and the most complete happiness.⁷

The idea of evolution was more powerful than the ancient Christian belief of a joyful resurrection in Heaven, and replaced it as the main source for optimistic eschatological inspiration. For those who could not share the joys of its adherents, however, a justification for their pessimistic or eternalistic beliefs came from the new science of thermodynamics. This science paradoxically seemed to prove both the slow death of the universe and its immortality; this worried scientists, but allowed pessimists and eternalists to choose what was most useful to them. We first turn to the notorious 'Second Law'.

3.2 'Not with a bang but a whimper'

In 1852, William Thomson, the later Lord Kelvin, wrote a short article called 'On a universal tendency in nature to the dissipation of energy'. His thermodynamical studies had led him to believe that in any possible process the amount of useful energy was lowered – a fact that would later be associated with the monotonic increase of entropy. In this article he explored the implications of this idea, and ended with the now famous words:

Within a finite period of time past, the earth must have been, and within a finite period to come the earth must again be, unfit for the habitation of man as at present constituted, unless operations have been, or are to be performed, which are impossible under the laws to which the known operations going on at present in the material world are subject.⁸

Thus the idea of a 'heat death' was first born, and although Kelvin's reasoning was less than unproblematic, it soon became extremely popular as both an eschatological theory and a metaphor for inevitable, slow death. Its influence on culture was threefold: first, as a concrete theory about the end of the world in physical treatises. Second, as a metaphor in social and historical writings. Third, as an image conjured up by literary writers.

⁶Darwin [4], p. 369.

⁷Spencer, *First Principles*, taken from Brush [1], p. 63.

⁸Thomson, *On a universal tendency in nature to the dissipation of energy*, taken from Coely & Vance [3], p. 77.

In popular physical writings the idea of the ‘heat death’ turned up again and again, the dubious logic of Kelvin’s argument notwithstanding. The famous and influential scientific populariser Camille Flammarion enthusiastically seized the idea, and published a book in 1893 called ‘La Fin du Monde’, which contained tragic images of mankind dying in the final coldness that thermodynamics seemed to predict. Forty years later, Sir Arthur Eddington was making similar claims to the lay public:

At present we can see no way in which an attack on the second law of thermodynamics could possibly succeed, and I confess that personally I have no great desire that it should succeed in averting the final running-down of the universe.⁹

These examples are indications that the idea of the ‘heat death’ was well-known, and thus had the potential to influence non-scientific aspects of culture. It did, for example in historiography and social criticism, where it derived its power from the scientific authority associated with it. Messages similar to that of the second law can be easily found in the Bible¹⁰, yet it was the thermodynamical metaphor rather than the biblical passage that was used – science was judged more reliable than religion. For example, the historian Henry Adams wrote an essay in 1910, ‘A Letter to American Teachers of History’, in which he elevates the second law of thermodynamics to the status of a historical principle – his view of history as slowly degenerating was strengthened by the physical ideas he could draw upon. Oswald Spengler’s 1918 ‘Decline of the West’ had a similar tenor:

What the myth of Götterdämmerung signified of old, the irreligious form of it, the theory of Entropy, signifies today.¹¹

The concept of entropy and its application to the end of the world also appeared frequently in literature, most notably in H. G. Wells’ famous 1895 novella ‘The Time Machine’. The time traveler who is the protagonist of this story ends on ‘Terminal Beach’, where once again the end of the world is vividly portrayed as a consequence of the laws of thermodynamics:

[M]ore than thirty million years hence, the huge red-hot dome of the sun had come to obscure nearly a tenth part of the darkling heavens. . . . There were fringes of ice along the sea margin, with drifting masses further out; but the main expanse of that salt ocean, all bloody under the eternal sunset, was still unfrozen.¹²

These few examples can come nowhere near a comprehensive analysis of the influence of the ‘heat death’ on Victorian and early 20th century culture, but they are at least an indication of its scope. The idea that the Universe would end ‘not with a bang but a whimper’, as T. S. Eliot put it into words, became more important than the apocalyptic visions of old.

3.3 ‘Ewigen Bestätigung und Besiegelung’

Meanwhile, in 1890 the French mathematician Henri Poincaré proved a theorem that seemed to be in direct conflict with the second law: all mechanical systems

⁹Eddington, *The Nature of the Physical World*, taken from Coely & Vance [3], p. 101.

¹⁰Lord Kelvin himself referred in his private notes to Isaiah 51:6, which says: ‘Lift up your eyes to the heavens, and look upon the earth beneath: for the heavens shall vanish away like smoke, and the earth shall wax old like a garment, and they that dwell therein shall die in like manner: but my salvation shall be for ever, and my righteousness shall not be abolished.’ (KJV)

¹¹Spengler, *Decline of the West*, taken from Brush [1], p. 126.

¹²Wells, *The Time Machine*, taken from Clarke [2], p. 127.

in (almost) any given state will return to almost exactly that state within a finite time. If the Universe is a mechanical system, this means that it will return again and again to its present state. A few years earlier, the German philosopher Friedrich Nietzsche had reached a similar, if less mathematical, result by contemplating the first law of thermodynamics, the conservation of energy. He had spent quite some time studying physics in order to find a proof of his theory of ‘eternal recurrence’, which he had already formulated in his 1882 ‘Die fröhliche Wissenschaft’ as the idea of an ‘ewigen Bestätigung und Besiegelung’, and finally found it:

If the world may be thought of as a certain definite quantity of force and as a certain definite number of centres of force – and every other representation remains indefinite and therefore useless – it follows that, in the great dice game of existence, it must pass through a calculable number of combinations. In infinite time, every possible combination would at some time or another be realised; more: it would be realised an infinite number of times. And since between every combination and its next recurrence all other possible combinations would have to take place, and each of these combinations conditions the entire sequence of combinations in the same series, a circular movement of absolutely identical series is thus demonstrated: the world as a circular movement that has already repeated itself infinitely often and plays its game in infinitum.¹³

Both in physics and philosophy some of the most creative minds of the age were exploring the possibilities for thermodynamics to prove the eternal cyclic nature of history. Although the cyclical view has never been very popular in the Western world, this development completed the usurpation of eschatological thought by science. All three possible ways of thinking about the end of times were covered by scientific symbols and images.¹⁴

4 The heat death of religion

Given the incompleteness of the above considerations, no strong conclusions can be drawn. Yet it seems clear that if the factual shift from religious to scientific imagery in the realm of the ‘end of time’ has not been established, it has at least been shown that this shift is conceivable. And if it is conceivable in such a bulwark of religious thought as apocalyptic prophecy, then it is surely possible in large areas of human culture. The applicability of the conceptual scheme proposed in the first two sections of this paper has not been demonstrated beyond doubt, but it has been made plausible.

It is my contention that the decline of religious influence on Western culture as a whole can be traced back to a myriad of such small-scale events where religion lost a tiny part of its cultural power to science or other contenders. When we look around at philosophy, science, television, movies, theatre, literature, sports and all other significant aspects of our modern culture, we can only come to the conclusion that religion is almost absent as a source of inspiration. Furthermore, no clear developments are taking place that could be described as a revitalisation

¹³Nietzsche, *The Will to Power*, taken from Brush [1], p. 73-74.

¹⁴The previous consideration were by necessity no more than a list of examples – a full consideration of the shift of attention from religion to physics would demand a significant amount of research. Some preliminary results have been obtained by Brush (1978) [1], Myers (1989) [5] and Clarke (2001) [2], although each of them primarily explores a theme different from the one stated here. Brush tries to write a general cultural history of thermodynamics; Myers sheds light on the rhetoric uses of thermodynamical scientific commonplaces; Clarke delves into the use of thermodynamical metaphors in literary writings.

of religious thought; there are no visible cultural movements towards a religion that can once again inspire the minds of creative men and women. This does not mean that religion has lost its power as a personal conviction, as a source of hope, safety and meaning for the individual. But it does mean that, from a cultural perspective, religion is no longer an actor of importance. Switching tastefulness for flippancy, we can paraphrase Kelvin: Within a finite time to come religion must be unable to exert any meaningful influence on western culture, unless cultural developments have been taking, or are to take place, which are impossible for us to recognise as going on at present in our society.

References

- [1] **Brush, Stephen G.**, *The Temperature of History – Phases of Science and Culture in the Nineteenth Century*, New York, 1978
- [2] **Clarke, Bruce**, *Energy Forms: Allegory and Science in the Era of Classical Thermodynamics*, Michigan, 2001
- [3] **Coely, Noel G. & Vance Hall**, *Darwin to Einstein - Primary sources on Science & Belief*, Harlow, 1980
- [4] **Darwin, Charles**, *The Origin of Species*, originally published in 1859, Ware, 1998
- [5] **Myers, Greg**, “Nineteenth-Century Popularizations of Thermodynamics and the Rhetoric of Social Prophecy”, in Brantlinger, *Energy & Entropy: Science and Culture in Victorian Britain*, Bloomington, 1989, p. 307-338
- [6] **Nietzsche, Friedrich**, *Die fröhliche Wissenschaft*, 1882
<http://www.geocities.com/thenietzschechannel/dfw.htm>
- [7] **Russell, Colin A.**, *Science and Belief: from Darwin to Einstein – Time, chance and thermodynamics*, Guildford, 1981
- [8] **Westfall, Richard S.**, “The Rise of Science and the Decline of Orthodox Christianity: A Study of Kepler, Descartes, and Newton”, in Lindberg & Numbers, *God & Nature: Historical Essays on the Encounter between Christianity and Science*, Berkeley, 1986, p. 218-237