Inspiration in Science and Religion

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Inspiration in Science and Religion

Edited by

Michael Fuller

CAMBRIDGE SCHOLARS PUBLISHING

Inspiration in Science and Religion,
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This book first published 2012

Cambridge Scholars Publishing

12 Back Chapman Street, Newcastle upon Tyne, NE6 2XX, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN (10): 1-4438-4062-9, ISBN (13): 978-1-4438-4062-0

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PREFACE

ALASTAIR NIVEN
CUMBERLAND LODGE

The conference that gave rise to this book perfectly fulfilled the mission for which Cumberland Lodge was gifted in 1947 to the foundation which has run it ever since. The charitable organisation which began life here in that year was created for the purpose of bringing people together for ethical, moral or spiritual discourse. Any conversation which might lead to the betterment of society would find an appropriate home here. It was part of the Lodge's original brief to bring people together from different disciplines and, when possible, from many countries, especially from around the Commonwealth. Our task has always been to facilitate dialogue. From the start the Lodge described itself as a Christian organisation, but it did so without doctrine, making it clear that peoples of all beliefs would be welcome, providing they expressed their views moderately and with a willingness to listen to others.

As I write this, I am looking at our first visitors' book. Long defunct bodies, such as the Christian Frontier Council, and others which still flourish, such as the World Student Christian Federation, convened here. Speakers such as the theologian Paul Tillich, the philosopher and novelist Iris Murdoch, and the theoretical chemist Christopher Longuet-Higgins rubbed shoulders with students, some of whom were themselves to become just as prominent years later in their own subject areas. It was intended from the start that the focus of Cumberland Lodge would be on young people, the 'next generation' who would have the responsibility of ensuring that the uneasy peace which Britain had only recently achieved would be lasting. People from many countries, including defeated Germany, were brought together for colloquia on international relations. 'The Nature of Man', 'The Philosophy of Science', 'Religious Drama' and 'Freedom' were the titles of some of the earliest seminars held here. As early as October 1949 we organised a conference on Science and Religion, one of many in subsequent decades which were precursors of the occasion which this book records and celebrates.

How did this all come about? In 1943 an academic historian based at the University of London called Amy Buller wrote a book called *Darkness Over Germany*. It was widely read by influential people. The author believed that the universities in Germany had failed in their duty to articulate the dangers of extreme politics. Hitler's rise to power had consequently been comparatively easy. Buller went to Germany several times in the late 1930s and was struck not only by the intellectual paralysis that had befallen this most civilised of nations, but also by the seductive glamour which it had for visiting Britons. She encountered young people especially, who were travelling round Germany on holiday, deeply admiring of what Hitler was bringing about there and envious that no such saviour had emerged in their own country. Appalled by this, she wrote about how valuable it would be to have a place where students and potential leaders could foregather to think about their responsibilities in the society that would be created once the war was won. Though her eye was on somewhere she could rent cheaply, perhaps in the east end of London or in Liverpool, from where she originally came, King George VI had other ideas. Amy Buller was summoned to Buckingham Palace and offered Cumberland Lodge as the place where she might realise her dream.

Much of what Buller wrote in *Darkness Over Germany* resonates today. She talks about young people, often faced by unemployment and drift, given 'new life and energy' from the purpose instilled in them by Nazism. 'To a generation without faith, the Nazis gave a brutal philosophy'. She recognised that, evil and misguided though it was, this philosophy had given meaning to their lives. Hitler had 'assured the youth of his country not only that there were jobs for them but they had an important part to play in the great struggle for the resurrection of the nation from defeat and despair'. Buller's hope was that the discovery of religion rather than nationalism would be an antidote to such ideas and would encourage young people to move away from the attractions of extremism. She was, however, a pragmatist as much as she was an idealist. She knew that preaching at youth would be counter-productive. Hence her determination that Cumberland Lodge would operate free from missionary zeal. Peoples of all backgrounds would find a sympathetic environment in which to exchange opinions and to seek a better understanding of each other. Intellectual rigour would be paramount, but no one was to feel awkward on account of their social background, nationality, ethnicity or beliefs.

Cumberland Lodge is the largest house in Windsor Great Park. It has an amazing history, both radical and royal. One of Oliver Cromwell's soldiers bought the land on which it stands when Crown estates were sold

off after the execution of King Charles I in 1649. When the monarchy was restored in 1660 the house, then known as either the Great Lodge or Windsor Lodge, continued to be lived in by the family that had built it until 1671. Though its subsequent provenance has been much intertwined with the Crown, we are conscious that the origins of the place lie in dissidence and reform. Every monarch since the time of Charles II has walked its corridors. Tenancies have been granted by the Sovereign to many important people in the story of this country. It was here, for example, that Sarah, Duchess of Marlborough, sometimes aided and abetted by Lord Godolphin, based her power in the early years of Queen Anne's reign. It was at Windsor Lodge that her husband, the great soldier John Churchill, Duke of Marlborough, died in 1722. After Sarah's death, William Augustus, Duke of Cumberland, was rewarded for his efforts in defeating Prince Charles Edward at Culloden by being given the entitlement to the house in 1746. Anathema to anyone of Scottish descent because of his brutality in suppressing the Jacobites, Cumberland tried to make amends for his besmirched reputation by beautifying the Great Park and establishing his own court at the Lodge, where he bred some of the best race horses in Europe. The Lodge was re-named in his honour after his demise.

We often refer to Cumberland Lodge as 'a house for ideas'. It has been so since it was built, even in the centuries when it was a home for royalty and their associates. It was here that Voltaire came, as Alexander Pope and Jonathan Swift did too, to talk with the Duchess of Marlborough and even to sell books to her. The Sandby brothers, both artists of consequence, made some of their best paintings and drawings here. John Nash, following in the footsteps of Christopher Wren, who was often here in the late seventeenth-century, was based at the Lodge whilst refurbishing the house next door, Royal Lodge. Queen Victoria brought distinguished writers to the Lodge: Hans Christian Anderson, for example, as well as the composer Richard Wagner. Benjamin Disraeli often stayed here. The mid twentieth-century visitors' book shows how many intellectuals, politicians and inventors frequented the Lodge at the invitation of its last private tenant, Lord Fitzalan of Derwent, who had retired as Viceroy of Ireland when the country was partitioned. It was during his period that the Lodge was used by the Prime Minister, Stanley Baldwin, as the venue for confidential talks about the constitutional crisis arising from Edward VIII's determination to marry Wallis Simpson.

As we have seen, the role of Cumberland lodge changed fundamentally in 1947 with the King's decision to base Amy Buller's initiative here. It has proved an inspired decision. Universities, for example, from all round

the country and internationally regularly convene here. Learned societies, national charities, all the Inns of Court, parts of the National Health Service, some corporate companies and many think tanks have made use of the place over the past sixty-five years, all engaged with social and ethical matters. We are proud of the programme that we initiate ourselves: conferences, colloquia, public conversations, exhibitions and literary evenings are part of a continuous calendar of activities exploring the issues and topics we were set up to examine. Over the years there has been much emphasis on dialogue between faiths, on examining Christian themes, and on the connections between religion and other disciplines – not just science but philosophy, sociology, the law and medicine. Many of these have led to publications. Dialogue between Christians and Muslims was under way here long before it became the imperative it is today.

Science has been important to the life of the Lodge too. Conferences have been held on topics such as *Science Education and the Needs of Society* and *Environment, Society and Risk.* Medical and health issues have been explored in partnership with the Royal Society of Medicine and the Health Protection Agency. Many science departments from the universities have convened at the Lodge, the Maxwell Society at King's College London, a grouping of physicists and astronomers, having met here annually since 1948.

This book, therefore, takes its place in an honourable tradition of religious and scientific enquiry based at Cumberland Lodge. We were delighted to work from the outset with the Science and Religion Forum on the concept and planning of the conference that lie behind this publication. The take-up for the event was excellent, every speaker was worth hearing, and there was a wide range of views expressed, with some quite challenging divergences of opinion. It could have been a nebulous occasion. What, after all, is inspiration? Lord Winston came close to denying that it exists at all. 'Sheer hard work' is what lies behind discovery and inventiveness, he asserted. Others made an equally robust defence of imagination, insight, passion and intellectual courage as evidence of the existence of inspiration, though they differed as to whether these are measurable or not.

We were particularly interested in bringing together religionists and scientists (not that the two are inevitably separate), to see whether what can be described as inspiration in scientific exploration is part of the same spectrum which informs faith and moral belief. It was always unlikely that we would achieve a consensus about this, but the range of views was expressed with mutual respect. It is now for the reader to decide whether

the discussions held at Cumberland Lodge opened up new lines of thought and led to better understanding. It is our heartfelt belief that they did so.

The mission of Cumberland Lodge is a simple one. 'Inspired by the beauty and history of its surroundings, Cumberland Lodge is dedicated to the discussion of ethical, spiritual and topical issues in contemporary society. Preparing young people for their future responsibilities is at the heart of its work, but the Lodge seeks through the enquiring nature of its programmes and the quality of its hospitality to enhance the well-being of people whatever their age or wherever they live.' *Inspiration in Science and Religion*, with a participation that included students as well as senior and experienced people both from within and outside the Science and Religion Forum, embodied this mission perfectly. We are proud to have worked in partnership with the Forum and keen that it should not be for the last time.

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INTRODUCTION

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An editor's task is generally seen as being concerned with the ordering and presentation of information. When confronted with so rich and varied a set of essays as those which resulted from the 2011 Science and Religion Forum conference at Cumberland Lodge, that task is by no means a trivial one, and calls initially for some reflection on the method by which it is to be done.

John Hedley Brooke (whose presentation offering an overview of the concept of inspiration from an historical point of view forms a natural starting-point both for the original conference and for this collection) has commented that 'The quest for an orderly world … was a characteristic of enlightenment culture, discernable for example in the classical structure of a Haydn symphony, in the symmetry of Georgian architecture, and in the fashion for formal gardens' (Brooke 1991, p. 232). One might add to this list the establishment of museums and other spaces for the public display of artefacts, arranged and ordered in such a way as to bring out information contained within them: to enable them to tell a story.

Any editor of these essays, as the 21st century inheritor of this tradition, looks immediately to find common themes in the material here presented in order to arrange it. We might note, perhaps, commonalities in the ways in which different religious traditions have thought about inspiration; or contrasting understandings of the role played by inspiration in different academic disciplines (scientific, theological and others); or accounts of the personal witnesses of individuals, historically and in the present day, who have reflected on sources of inspiration in their work. Any of these might have provided a suitable framework within which to present the material which follows.

However, this editor felt that the sheer variety of material here means that any attempt to structure it in such a way would run the risk of doing violence to it. How, for example, might one categorise the contribution of Chris Southgate? Part a reflection on 'looking', part an analysis of the

poetry of Gerard Manley Hopkins, part an exegesis of one of the author's own poems, it defies categorisation. Similarly, the essay by Pauline Rudd is part a philosophical reflection on the process of discovery, part an account of the operation of a research team in a modern scientific context, part a personal story, part a drawing on the wells of theological imagery that may be found within the Christian tradition to illuminate all these things. To say that either of these is an essay of a particular type, and to place it therefore in a context next to other essays perceived to be similar, is effectively to instruct the reader to approach these thoughtful and multi-faceted texts in a particular way, and by implication to ignore any other ways of reading them. It would thereby constitute an abject failure in the editor's task, which is surely to present material in such a way as to allow it to be appreciated in all its richness.

Contrast this 'museum-type' way of ordering material with another, earlier one: the curiosity cabinets created during the renaissance. David L. Martin has commented: 'No two cabinets were the same, nor did they need to be. For curiosity to act as a bridge to Edenic wisdom, it was the play of resemblances, sympathies, and similitudes that was in need of interpretation' (Martin 2011, p. 43). In these cabinets, the collector made connections between things by their juxtaposition and their playful re-ordering, not by fitting them into a predetermined interpretative narrative.

I hope that it is not any abrogation of editorial responsibility that leads to my claim that the essays below are better considered as items in a curiosity cabinet, rather than exhibits in a museum. Each has multitudinous resonances with the others: each is perhaps best contemplated in its own right, sparking off associations with, and reminiscences of, the others as the collection is read. The reader is therefore encouraged to read these essays in any order, to relish the associations and resonances she will find, and to find inspiration herself thereby.

The order in which these essays are presented is not, however, quite arbitrary, in that it simply follows that of the original conference. It thus stands as a tribute to the inspiration of those who organised this remarkable event in the first place.

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CHAPTER ONE

INSPIRATION IN SCIENCE AND RELIGION: HISTORICAL PERSPECTIVES

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The degradation of 'inspiration'?

As I began seeking inspiration for this essay, a flyer flew through my letterbox. On inspection I was confronted by the three words: 'What inspires you?' This seemed strangely providential, until I realised the missive came from that august institution well known to those of a certain age: Saga Holidays. They wanted to know if I was inspired by tropical islands, river cruises, or perhaps Christmas markets. Here is just one example of many suggesting that, in a modern secular consumer society, the concept of inspiration shows signs of degradation. A new block of flats in London has been advertised as an 'inspirational development of 1, 2 and 3 bedroom apartments with excellent links to Canary Wharf and the city' (*The Times*, 19 November 2010). From *The Independent* in June 2011, I learned that 'Chanel no.19, the baby sister of Chanel no.5, is being reinvented. Susannah Frankel charts the evolution of this inspirational fragrance' (*The Independent*, Magazine, 25 June 2011). Perhaps I needed to find some. But it was dispiriting to reflect that the spirit had gone out of inspiration, to be replaced by a smell.

The word 'inspiring' is ubiquitous – a cliché applied to anything that makes us feel a bit better, which might be sympathetic architecture, a good book, or a gentle river cruise. One can, of course, be too hard on the journalese. The word still has older resonances, as in the infusion of motivation to accomplish meritorious goals, often in challenging circumstances. It was salutary to hear Elizabeth Taylor's remark that, for her campaign to help AIDS sufferers, she had been inspired by the death

of Rock Hudson. Ideals and values, as well as events, do still inspire. In a debate carried by *The Observer* on the value of religion in society, one Catholic contributor made the point that religious ideals still provide 'inspiration' for many people (*The Observer*, 21 November 2010). They surely do. And since we have our eyes fixed on science as well as religion, it was delightful to read that, at 85, David Attenborough was still finding 'nature inspirational' (*The Independent*, 21 November 2010).

Television programmes have been devoted to the 'inspiration' authors have experienced from their encounters with that most powerful of nature's forces, the sea. The thesis of one presenter, in January 2011, was that such experiences may *transform* lives in a profound existential sense. Because this is what religious experiences are also said to do, might there be parallels between the transformative effects of a scientist's encounter with nature and those deriving from religious experience? There is that wonderful moment when the young Charles Darwin stood still in the Brazilian rain forest, recording in his notebook: 'Twiners entwining twiners … tresses like hair – beautiful lepidoptera – Silence – hosannah'. As Darwin's biographer James Moore observed, 'he felt his soul responding and thought of Nature's God' (Desmond and Moore 1991, p. 22). No-one, Darwin wrote, 'can stand in these solitudes unmoved, and not feel that there is more in man than the mere breath of his body' (Darwin 1910, p. 473). The language is interesting because, in the Christian tradition which he had not yet forsaken, there was indeed another breath – that of the spirit, indwelling and guiding human aspiration.

My aim in this essay is to examine more closely what inspiration might mean in both scientific and religious contexts. I was asked to provide some historical perspectives on the subject and I believe there are good reasons for doing so. Historical examples can illuminate some of the problems that arise when using the word 'inspiration'. More importantly, history has the virtue – not always welcome – of complicating matters (c.f. Brooke 1991, Numbers 2010). It may challenge the categories, the dualities and the suppositions with which we habitually structure the world. Reflecting on the historical chapters of a recent book with the title 'Science and Religion around the World', David Livingstone concludes that they 'inspire the conviction that the misplaced certainties of presumption are not to be preferred to the messy contingencies of history' (Livingstone 2011, p. 294). For a misplaced certainty of presumption one could not do much better than cite an advertisement for Robert Park's *Superstition: Belief in the Age of Science* (2010), carrying the message that 'Science is the only way of knowing – everything else is just religion' (advertisement from Princeton University Press). I guess that makes history just a religion,

which is not a little paradoxical given that it has been one of the most secular of academic disciplines.

Inspiration in science

What has history to say about inspiration in science? In anticipation of this conference, Christopher Southgate has commented on a distinction between the kind of inspiration that manifests itself in what might be called 'Eureka' moments, and the inspiration that sustains dedicated application to solving a problem over a longer period of time. He notes a possible parallel with the religious case, where Paul's experience on the road to Damascus is archetypal of the sudden conversion. Inspiration in the second sense would be reflected in a life of commitment where a sense of 'calling' to fulfil some higher purpose would obtain (Southgate 2011, pp. 9-10). Inspiration as sustenance has been expressed by many in the arts and sciences. The Jewish artist Marc Chagall said that, throughout his life, the Bible had inspired and consoled him, becoming second nature to him.[1]

There certainly have been Eureka moments in science and experiences that remind one of a religious conversion. Here is the naturalist Alfred Newton describing his mental state when absorbing Darwin's inspiring message:

> I know that I sat up late that night to read [that part of the *Journal of the Linnean Society* which contains the papers by Mr. Darwin and Mr Wallace]; and never shall I forget the impression it made upon me. Herein was contained a perfectly simple solution of all the difficulties which had been troubling me for months past. I hardly know whether I at first felt more vexed at the solution not having occurred to me, than pleased that it had been found at all. …All personal feeling apart, it came to me like the direct revelation of a higher power; and I awoke next morning with the consciousness that there was an end of all the mystery in the simple phrase, 'Natural Selection' (Cohen 1985, p. 595).

Discovery in science can take the form of a religious experience and it does not require a detailed knowledge of the history of science to appreciate that inspiration has taken many forms and has had many sources (Brooke 2008). A sense of purpose or mission has sometimes come from intense introspection in a period of solitude. In his *Discourse on Method*, Descartes famously recalled a day spent in a stove-heated

[1] For this information I am indebted to a lecture by Monica Bohm-Duchen, entitled 'Marc Chagall: Wandering Jew or Citizen of the World?', presented to the Lunesdale Decorative & Fine Arts Society, 20 September 2011.

room in Germany when he formulated the project of reforming his own thoughts (Descartes 1960, p. 44). He envisaged laying new foundations for an epistemology based not on the contingencies of one's education but on clear and distinct ideas. He had known that 'nothing so strange and so little credible can be imagined but some philosopher has been found to assert it' (ibid. pp. 46-7). Current philosophy had the inconvenience that it 'enables us to speak plausibly of everything, and to win the admiration of the least learned' (ibid. p. 39). So began a determination to reform natural philosophy that eventuated in a hugely influential mechanisation of nature (c.f. Brooke 1991, Gaukroger 1995).

Inspiration has come not only from an over-heated mind. The cool reading of books, sometimes on subjects far removed from one's primary interest, has sparked innovative trains of thought. The concept of natural selection that so inspired Alfred Newton had dawned on Darwin in the autumn of 1838 when he had read an *Essay on Population* by Thomas Malthus. In this text Darwin found a telling argument that population growth would have a recurring tendency to outstrip growth of the food supply. As Darwin put it in his *Autobiography:*

> Being well prepared to appreciate the struggle for existence … from long continued observation of the habits of animals and plants, it at once struck me that under these circumstances favourable variations would tend to be preserved, and unfavourable ones to be destroyed. The result of this would be the formation of new species. …I had at last got a theory by which to work (Darwin 1958, p. 120).

For a modern example of inspiration from an unlikely source, one might refer to Gerald Joyce, a professor at the Scripps Research Institute in San Diego. Professor Joyce is spearheading a research programme on the origin of life – but it is a programme with a difference. He has one eye on the old problem of whether there might be life on other worlds. The idea is to artificially create life as we do not know it. Echoing an inter-disciplinary quarrel with a long history, Joyce recently said that 'It drives me crazy when astronomers say, "Surely the universe is pregnant with life." If we have an Earthlike planet, what are the chances of life arising? Is it one in a million? Is it one in two? I don't see how you can say'. But, he continued, 'if you had a second example of life, even if it were synthetic, you might know better. I'm betting we're just going to make it' (Overbye 2011). The point of the story is that Joyce recalls how he initially came to his scientific vocation. It was by reading a novel: Thomas Pynchon's *Gravity's Rainbow* (1973), a story of rockets and death in World War II. The last section, called 'The Counterforce', was about

pockets of life and love carving order out of the rubble of wartime Europe. For biologists, Joyce declares, the counterforce creating order and life out of chaos is simply Darwinian evolution. 'I wanted to be a member of the counterforce'.

First-hand experience of nature is of course a vital source of inspiration in science as in art. In this respect the history of science is rich in anecdote. Think of Newton and the apple, or Darwin on the Galapagos Islands. For the philosopher Ian Ramsey, such Eureka moments were moments of disclosure analogous to revelatory moments in religious experience (Ramsey 1964). In the religious case, dreams were once seen as an instrument of communication between the divine and the human. As such they suffered under Enlightenment critiques. To paraphrase David Hume: if a man tells me that God spoke to him in a dream, I say that he did but dream it! And yet there is at least one famous example from the history of science where a dream proved inspirational. In what Arthur Koestler described as 'probably the most important dream in history since Joseph's seven fat and lean cows', August Kekulé arrived at the cyclic structure for benzene as he dreamt of a snake devouring its own tail – an ancient alchemical symbol (Wotiz 1993, p. 265).

The sheer diversity in sources of inspiration is remarkable. How much originality in the sciences has derived from the perception of analogies between otherwise disparate features of nature! How much has come from the almost playful construction of mathematical models that are suddenly found to resonate with patterns inscribed in nature. It was Galileo who famously said that the language of nature is mathematics, his science replete with examples of questions addressed to nature in that language. Looking for a decisive argument to prove the Earth's motion, he drew inspiration from an analogy with the motion of water-carrying barges as they struck the dockside in Venice. As a consequence of the jolt, the water began to oscillate in a wave-like motion. Ah! Suppose the combined motions of the Earth – revolution around the sun and rotation on its axis – induced comparable changes in the absolute motion of any point on the Earth's surface, would there not be a similar consequence for the sea? And there was – in the oscillating phenomenon of the tides. QED: the Earth moves (Sharratt 1994, pp. 168-9).

In Galileo's contemporary, Johannes Kepler, also a Copernican, we see a vision of the cosmos inspired by the projection of geometrical figures and harmonies onto the natural world. Suppose the planetary orbits were of such a magnitude that they could be inscribed within a set of the five regular Greek solids. 'Since God adapted the requisite motion to the distances of the orbs, surely he must have accommodated the distances

themselves to some requisite measure' (cited in Howell 2002, p. 130). That was Kepler's reasoning, and in the Preface to his *Mysterium Cosmographicum* (1596) he told his readers that the revelatory moment came during a lecture on 19 July 1595. It is gratifying to know that lecturing, which is not always an inspiration for one's audience, can be advantageous to the lecturer!

It would be possible to devote the entirety of this essay to the multiplication of examples. But I have said enough to show why Karl Popper considered it impossible to formalise an inductive logic of hypothesis production as a means of scientific *discovery*. There was a deductive logic to scientific explanation and corroboration once a theory was in place, but the ultimate origins of a theory often eluded rationalisation. I want to suggest now that, even if we speak of inspiration, we need to be critical. There can be a wide gap between anecdotal history and serious history of science (c.f. Numbers 2009).

Mythologies of inspiration

It has to be said that stories of sudden inspiration may belong to popular mythology rather than reliable narrative. How many 'inspiring' cruises to the Galapagos have been sold on the basis of Darwin's Eureka moment! And yet we know that it was not while he was there that he had the insight that each island might have its distinctive species of finch, mocking bird and thrush. It was on the point of departure that he had a vital clue from a governor of the islands, Nicholas Lawson, who said that he could tell, just by looking at a giant tortoise, from which island it came. Without such prior insight, Darwin had not recorded the location of many of his specimens. He also needed the expertise of the ornithologist John Gould back home in England to determine which were distinct species and which were not (Sulloway 1982).

The story of Kekulé's dream has also been challenged. A close reading of his speech at the *Benzolfest* in 1890 suggests he may have been daydreaming rather than asleep. It has been questioned whether Kekulé was imagining snakes at all. He refers to rows of atoms 'in snakelike motion'. When he then says that 'one of the snakes had seized hold of its own tail', he may have been speaking figuratively, having already referred to the snake-like motion of the carbon-carbon linkages. The judgment of one commentator is not to deny that Kekulé's visual imagination was crucial to the discovery, but he does deny that a visual analogy between the strings of atoms and snakes had anything to do with it (Weisberg 1986, pp. 32-3 and 141: Wotiz 1993, pp. 265-6). To inject a further degree of

scepticism it is only necessary to add that Kekulé's story of how he first envisioned the benzene ring was a convenient way of asserting and sealing a priority claim when there had been other contenders. In much the same way, there can be an alternative reading of Descartes' story of the stove-heated room. Was this not a device to authenticate his reformist vision by implying that he had received special illumination as he reflected on the inadequacy of his Jesuit education? Descartes also provides a telling example of a phenomenon familiar to historians of science: the mismatch between formal articulations of 'scientific method' and the actual methods used in scientific research (Schuster 1986).

There is a second problem with Eureka stories. They may give the false impression that the real work has been done once the special illumination has occurred. And yet it took Copernicus over 30 years before his big book moved the Earth. Even if a falling apple did trigger a train of thought in Newton that led to a unification of terrestrial and heavenly forces, the real work was done during the twenty years that elapsed between the apple and the *Principia* (1687). A falling apple hardly showed that an inverse square law of gravitation would explain Kepler's planetary laws. Likewise with Darwin: some twenty years separated the publication of *On the Origin of Species* (1859) from his reading of Malthus. Not until the mid-1850s did he grasp why natural selection might favour repeated divergence from a common ancestor, as the extreme variants in a population seized different ecological niches. Not for this great scientific trio any reward in a research assessment exercise! Perspiration, more than inspiration, was the secret of their success.

To complicate matters further, we must not assume that moments of inspiration have an intrinsic capacity to yield the truth. After all, Galileo was in large measure incorrect in ascribing the tides to the combined motions of the Earth. Kepler, too, despite persevering with his Platonic spacing of the planetary orbits, was destined never to clinch his beautiful model. For a balanced view, we need to recall the theological premise of his argument: 'Since God adapted the requisite motion to the distances of the orbs, surely he must have accommodated the distances themselves to some requisite measure'. There *was* a fertile, though not infallible, marriage here between a neo-Platonic philosophy of nature and Kepler's Lutheran Christianity. I say fertile because, in other contexts, belief in a mathematically harmonious creation did deliver. It delivered for Kepler when he articulated what we know as his third law of planetary motion. That is the one that correlates the time it takes for a planet to complete its orbit with its mean distance from the sun. There was something akin to ecstasy in Kepler's experience. He wrote of his 'unutterable rapture at the

divine spectacle of heavenly harmony' (Caspar 1959, p. 267). Copernicus may have been less expressive; but, writes Fernand Hallyn, 'if the Renaissance artist is often called a god, Copernicus's God creates like a Renaissance artist' (Hallyn 1993, p. 94). In both Copernicus and Kepler there is a sense of excitement at the disclosure of a hidden, mathematical beauty. Newton would later say that the beauty of the solar system could only have come from the counsel and dominion of an intelligent and powerful Being (Newton 1713: Thayer 1953, pp. 46-58). These examples alone raise a question that we now need to consider: whether we can speak of religious inspiration within science.

Religious inspiration in science

The problems we saw with the exaggeration of Eureka moments suggest that if we are looking for religious motivation in the sciences it may be best to focus on that sense of inspiration which relates to the sustenance of purpose and direction in scientific work rather than to any direct and immediate transfer of religious illumination. Once we leave the sixteenth and seventeenth centuries, this is surely the case. But there were certainly philosophies of nature during the Renaissance that were spiritual in orientation, in that one positively sought inspiration before embarking on an experiment. Hence the image of the alchemist at prayer (as, for example, in Heinrich Kuhnrath's *Amphitheatrum Sapientiae Aeternae* (1598), depicted in Brooke 1991, p. 68). A common idea was that it was necessary to tune oneself into the right spiritual state if one hoped to uncover any of nature's secrets. It is easy to smile, or to caricature what may seem to us quaint beliefs. And it is certainly true that the failure of an experiment could conveniently be ascribed to a failure to achieve the appropriate spiritual state. But in the iconoclastic, chemically based medicine of Paracelsus, for example, there was a deep frustration at the excuses made by physicians when they claimed a disease was incurable. God in his mercy, Paracelsus insisted, had provided cures for all human ills and it was the responsibility of the student of nature to uncover them, using chemical techniques for the extraction and purification of the salient ingredients (Hannaway 1975: Brooke 1991, pp. 63-72). Because of his advocacy of chemical remedies rather than rely on a Galenic re-balancing of the humours, Paracelsus has an important place in the history of chemistry and of medicine. Not all his recipes would win acclaim today. One wonders at the fate of those prescribed mercury to clarify the spleen. But in what has been called the chemical philosophy of the Renaissance, a reforming empirical spirit was combined with a Christian, albeit heterodox,

spirituality. Nor did the combination entirely disappear even among chemists seduced by what Robert Boyle called the 'excellency' of the mechanical philosophy. To the end of his days Boyle retained a deep interest in the reality of a spirit world (c.f. Principe 1998: Hunter 2009). His worldview allowed direct communication between the worlds of spirit and matter. He confided that, when working in his laboratory, he had sometimes received 'pregnant hints' from the deity that had re-directed his experimental projects and even saved him from dangerous explosions. As Larry Principe has shown, the Boyle often described as the father of modern chemistry, was the same Boyle whose aspiration extended to the transmutation of metals. He even believed that, if the philosopher's stone could be found, it might have the property of attracting spirits, hopefully angelic rather than demonic. One of the characters in a dialogue composed by Boyle suggests that 'Tis not likely that air and fluid parts of the world should be destitute of spirits' and adds that 'Tis not likely that there should be so few spirits or so few of them as is commonly presumed' (Principe 1998, p. 310). We might say that Boyle was inspired to re-spiritualise the world with chemistry as the medium. His motivation came from one of his life-long concerns: the refutation of atheism. As he once wrote, it required only one properly authenticated relation of a supernatural phenomenon to defeat the atheist (Boyle's thorough engagement with the atheism of his day can be found in MacIntosh 2005).

This driving sense of purpose outlived Boyle himself because he made provision in his will for the foundation of lectures that would prove the Christian religion and defeat its opponents. The Boyle lectures extended well into the eighteenth century and a resurrected series is prospering now at the church of St Mary le Bow in London, where Richard Bentley first marshalled Newton's science to confute the atheist by exhibiting the mathematical prowess of the Creator. Much has been written on the physico-theology of the eighteenth century that followed this precedent – how it so easily graduated into a deistic theology of nature and eventually dug its own grave by claiming to find design in the minutest details of creation (see Brooke 1991 pp. 192-225: Brooke and Cantor 1998, pp. 141-243: Buckley 1987). Its formulation in the *Natural Theology* (1802) of William Paley would prove especially vulnerable to what became a Darwinian critique (McGrath 2011). But we should not forget that the drive to combat atheism did provide inspiration for scientific research on several fronts: in the study of seemingly crafted anatomical structures, in the study of adaptation, and, by the early nineteenth century, in the reconstruction of fossil species from their fragmentary remains. Many lectures could be devoted to the catalytic role of natural theology in the

popularisation of the sciences (c.f. Topham 2010). Here is just one example of the marriage between scientific and religious inspiration. It comes from William Derham's *Physico-theology* (1713):

> Let us cast our eyes here and there. Let us ransack all the globe, let us with the greatest accuracy inspect every part thereof, search out the inmost secrets of any of the creatures; let us examine them with our gauges, ... pry into them with our microscopes, and most exquisite instruments, still we find them to bear testimony to their infinite workman; and that they exceed all human skill so far, as that the most exquisite copies and imitations of the best artists, are no other than rude bungling pieces to them (Brooke 1973, p. 36).

We have a nice reminder here that a scientific instrument – the microscope – had provided a form of religious inspiration by magnifying the contrast between the seeming perfection of natural forms, understood as the work of the Creator, and the rough surfaces of the finest human artefacts.

An enduring scientific culture in Europe, often supported by religious values, had a figurehead in Francis Bacon, whose experimental philosophy was justified on religious grounds. Bacon himself had promoted his empiricism on the ground that it represented a more humble approach to nature than was enshrined in the scholastic commentaries on Aristotle. Adopting the theological principle that God could have made the world in any number of ways, one had to study it empirically to discover which of the many possibilities had been instantiated. Such links between theology and scientific methodology re-surfaced many times on the interface between scientists and their publics. Newton undoubtedly saw in his science a means of proving that the universe was the result not of chance but the choice of a 'voluntary Agent' (c.f. Newton's 'First Letter to Bentley', in Thayer 1953, p. 47). Baconian empiricism would eventually prove inadequate as a prescription for all forms of science. By the time Darwin published in 1859 hypothetico-deductive methodologies had proved their worth in spheres such as optics and the kinetic theory of gases. But it is striking how strong the link had been between Baconianism and a humility theology. It was one of Samuel Wilberforce's resources in his attack on Darwin's hypothesis of natural selection, which the bishop denounced as too speculative (Wilberforce 1874: Livingstone 2009). In that example there is, of course, a reminder that religious inspiration could also be obstructive to innovative science.

For a balanced view, it helps to consider ways in which moral imperatives could find expression in the pursuit of scientific goals. This

had been important to Bacon, whose science-based utopia is often seen as a secular vision. His conviction that the application of science could bring relief to man's estate was, however, rooted in a Protestant ethic in which there was a special responsibility to exhibit, by the fruit of good works, the reality of one's salvation and gratitude for it. Accordingly, it was the applied sciences, such as agriculture and medicine, for which he pressed (Webster 1975, pp. 22-31).

A quite different example, to bring out the diversity, takes us from the seventeenth to the twentieth century and to the pacifism of the Quaker physicist Arthur Eddington. In the recent biography by Matthew Stanley, Eddington's attitude to the German scientific community during the First World War is sharply contrasted with that of many British scientists who, unsurprisingly, distanced themselves. Inspired by a Quaker ethic, Eddington stands out as the scientist who did most to maintain and re-establish contact, particularly with Einstein whose relativity theory of gravitation he introduced to British and American scientists before leading the expedition to test it in 1919. Stanley's point is that at a time of war, the internationality and alleged universalism of scientific knowledge was not of itself sufficient to integrate scientific communities bearing the impress of the hostilities. It required the steadfast spirit of a courageous individual to keep the channels of communication as open as possible (Stanley 2007).

Between Bacon and Eddington were many figures whose religious inspiration was visible in their evaluation and advocacy of the sciences. Another recent biography – that of John Wesley by Deborah Madden – provides compelling evidence that Wesley's altruism towards the poor found expression in his determination to offer them what he called a 'cheap, safe and natural medicine'. His book *Primitive Physic* was immensely successful, passing through 24 editions between 1747 and 1792. By 1859, the year of Darwin's *Origin*, it was in its 37th edition. This was popular science, to be sure, but during his life Wesley had kept himself up to speed on the latest medical theories and was a great believer in the therapeutic potential of electricity (Madden 2007).

In Wesley and Eddington we see contrasting examples of what Wesley's contemporary Joseph Priestley called the *joining* of natural philosophy to Christianity. Priestley illustrates yet another role for religious inspiration in promoting a culture of science and technology, in his case one that he believed would slay his theological opponents. As a Unitarian, Priestley fought a tireless campaign against Anglican orthodoxy. His philosophy was one in which scientific progress provided a model of, and a vehicle for, social progress. His particular interest in the workings of the mind was sustained by a resolve to demonstrate the

rationality of a Christianity purged of Calvinism and superstition. The radical outcome was nothing less than a denial of mind/body dualism and the expulsion of spirits from the world (Brooke 2005).

In Wesley, Priestley and Eddington we see different forms of religious dissent interacting with the sciences in different ways. Their motivation in each case had a strong moral component. High standards of morality are not, however, the preserve only of the religious. The radicalism of Priestley's Christian monism, which some would describe as materialism, raises the important issue of inspiration in the sciences that might come from even more radical, anti-religious, motivation.

Anti-religious inspiration in the sciences

It is surely the case that those who, for whatever reasons, have wished to attack the world's religions have taken delight in scientific innovations that have been grist to their mill. Two aspects of a familiar meta-narrative become relevant here. One is the claim that what may look like religious inspiration in science was, in reality, simply a justification in religious terms for scientific activity that had its real inspiration elsewhere. The second is the claim that, as the sciences have advanced, the sphere of the supernatural has shrunk, and with it the world of the spirit. In response to the first claim it has to be conceded that, in many contexts, there have been social pressures for religious conformity. It does not, however, follow that the religious remarks of many of the pioneers of modern science were insincere or merely window-dressing. Each case has to be examined in detail without recourse to crude generalisation. For example, given his intensive and dedicated application to biblical study and his deep concerns about the fulfilment of biblical prophecy, it would be preposterous to suggest that Newton's *General Scholium* to the second (1713) edition of his *Principia* was merely window dressing (Snobelen 2001). The same goes for Boyle who, from an early age, composed works of religious devotion and seized every opportunity to subvert atheistic philosophies.

In response to the second claim, it has to be conceded that the jurisdiction of a god-of-the-gaps has shrunk as the scope of naturalistic explanation has expanded. But a god-of-the-gaps is not the God of classical Christian theology in which the doctrine of creation, at least in most of its renderings, affirms the dependence of all that is on a transcendent power continually sustaining the world in being. This is not to deny that scientific breakthroughs have sometimes afforded delight to religious sceptics and atheists; but it is to deny that atheistic readings of nature are the only ones possible.

A schematic history subservient to anti-religious goals would be easy to write. In its triumphalist form it would usually include the Copernican innovation, ostensibly diminishing human significance in a greatly expanded universe. It would include the consequent revival of interest in the possibility of life on other planetary worlds, raising particular difficulties for a theology of Incarnation. It would include the mechanisation of nature because, although a clockwork universe reinforced arguments for design, a doctrine of special providence does not fit so comfortably within a mechanistic frame. It would have to include the de-spiritualising of nature and the de-soulment of human persons that we have just seen in Priestley. No Holy Spirit either in his Unitarianism, nor any direct influence of the deity on the human mind.

An expanded age for the Earth and Georges Cuvier's demonstration of extinction in the fossil record preceded Darwin's wresting of the initiative from the natural theologians (Brooke 1991, pp. 243-8: Rudwick 2005). In his *Descent of Man,* Darwin showed how easy it would have been for primitive humans to populate the world with spirits. Would it have been so different from the behaviour of his dog, which, on a summer day, barked when a canopy in the garden swayed in the breeze? Darwin concluded that the dog had reasoned that there was an invisible intruder on its territory (Darwin 1906, p. 145). The very notion of biblical inspiration, especially in its plenary form, was put under great pressure during the middle years of the nineteenth century when, with the help of Thomas Henry Huxley, the whole enterprise of harmonising Genesis with geology was embarrassed (Huxley 1904, pp. 139-200). And so one could continue: in the second half of the nineteenth century there were disturbing disclosures from thermodynamics about the Earth's eventual demise; and, in our own day, models of a multiverse have undercut apologetic arguments for a fine-tuner of the universe (Davies 2006, pp. 172-216). Each and every one of these scientific developments has found champions eager to turn them against religious beliefs and institutions. Commentators have often suggested that Richard Dawkins' deep commitment to an exclusively neo-Darwinian account of evolution is 'inspired' by his atheism.

There is a historical perspective here that cannot be ignored and it is easily amplified with reference to the secular presuppositions of the human sciences, such as anthropology and sociology. Those who reflect now on what it is to be human have to contend with the proposition that it is not I, but my brain, that thinks. I happen to think that, despite this meta-narrative of the corrosion of religious authority by the sciences, it tells only a streamlined story. At each and every one of these junctures in the history of science, the challenge has been faced by religious thinkers. Not

always promptly, and not always with a view to accommodation. But the challenge has itself been a source of inspiration to those eager to demonstrate that, as religious believers, they have nothing to fear from science. To give just one example, neither Kepler nor Galileo believed that the displacement of humanity from the centre of the cosmos amounted to a deflation of human significance. In Aristotelian cosmology the centre was actually a dump. It was that point to which all earthly matter fell. For the Earth to be placed among the planets was to move up-market. And if one was obsessed with physical centrality, one could always follow Kepler in observing that the earth occupied a central orbit around the sun, if not a central point (Danielson 2009). One way of dealing with the challenge from the Earth sciences was simply to dissociate geology and Genesis (Rudwick 2009). Christian responses to Darwin also show how much room there was for manoeuvre. Some indeed reveal how a science of evolution could itself be a source of inspiration for those unhappy with the image of an intervening, conjuring God. Charles Kingsley, Frederick Temple and Aubrey Moore spring to mind (Brooke 2009). Such examples introduce one final consideration about inspiration in both science and religion. This is the inspirational role of a mentor.

The inspiring mentor

Inspiration may come from example. In the religious domain, preachers, pastors and saints have mediated in the production of that sense of a 'calling' which may then direct and guide a human life. Among many forms of the spiritual life the 'imitation of Christ' would be one example from the Christian tradition, with Christ as the supreme mentor in the sacrifice of self. In religious contexts there is often a conjunction between inspiration and aspiration. Hopes for justice, deliverance from suffering, and for eternal life have been recurring motifs (Watts 2002, p. 72 and pp. 133-41).

The role of mentors in science would be easy to document. I would never have studied chemistry at university had it not been for an effusive Welshman at my school who filled the subject with colour, intellectual challenge and occasional explosions. Choose any *great* scientist from the past and their passion for their subject would be traceable to the example of those who inducted them. Kepler was inspired by his teacher at Tübingen, Michael Maestlin. Centuries later, Darwin was inspired by his Cambridge mentors, John Henslow and Adam Sedgwick – and later by the naturalism of the geologist Charles Lyell.

If there are mentors in religion and in science, there can also be mentors whose writings on the relations *between* science and religion set an edifying example. There is now a vast literature of this kind, much of it written in response to the scientistic triumphalism to which I have just referred. The 'Science and Religion Forum' has recently begun a series in its *Newsletter*, in which members are invited to discuss a book that had a transformative impact on their understanding and orientation. Our current Chairman, Kenneth Wilson, chose Charles Coulson's *Science and Christian Belief* (1953), saying that 'Coulson demonstrated to my satisfaction … that any religion worth its salt, is intellectually stimulating, morally demanding, and unendingly intriguing' (Wilson 2010, p. 9). I read Coulson, too, just as I was preparing for my university entrance examinations. I remember to this day how I resolved to discuss in the General Paper his demolition of a god-of-the-gaps, whichever question I chose to answer! Our former secretary Peter Colyer chose to write on Ruth Page's book *God and the Web of Creation*. Here, he writes, was 'a theologian prepared to accept the well-established findings of science, including evolution's apparently wayward course through unimaginable time, and reach theistic conclusions without use of double explanations or pious overruling' (Colyer 2011, p. 15). Having been privileged to work with Peter in Oxford, I was interested to read his account of how he came to be there. 'In a rare moment of relaxation in my busy London office, I leaned back in my chair and wondered what I would do when I could retire. The answer came to me in a flash: I would like to return to university to conduct postgraduate work in science and Christianity' (ibid., p. 13). As a cue for this conference he asked whether that flash was not a flash of inspiration.

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I have not in this essay made any reference to the neuroscience of inspiration. This is mainly because I lack the expertise to do so. But I would like to conclude by commending a book, more recent than Coulson and Page, which for some of its readers might play a comparable transformative role. This is Iain McGilchrist's *The Master and his Emissary* (2009), subtitled *The Divided Brain and the Making of the Western World*. I am indebted to Kenneth Wilson for drawing this book to my attention. It combines the disclosures of neuroscience with a penetrating historical survey that has something profound to say about the relations between scientific and religious modes of thought.

As the author insists, old suppositions about the different functions of right and left hemisphere have been superseded by the knowledge that both are involved in everything we do. Why then has nature so carefully segregated the hemispheres? McGilchrist's answer is that there is an evolutionary advantage to the division, originating in the need to pay two quite different types of attention to the world simultaneously. In human consciousness, the argument goes, these two modes of attention give rise to two different versions of the world, having different qualities as well as different sets of preoccupations and values. Critically, McGilchrist argues that the relationship between these two modes is asymmetrical, as is the brain that permits them to come into being. Both are necessary; but one – the left – sees less than the other while believing that it sees everything. Whereas the left hemisphere tends to deal more with pieces of information in isolation, the right deals with the entity as a whole. The hemispheres need to co-operate, but McGilchrist sees them involved in a sort of power struggle. This, he thinks, explains many aspects of contemporary Western culture. Over two thousand years or more 'the balance of power has shifted where it cannot afford to go – further and further towards the part-world created by the left hemisphere' (McGilchrist 2009, p. 6). The left is ultimately dependent on the right but, as he puts it, 'it seems to have no awareness of this'. From over 500 pages of technical neuroscience and accomplished cultural history there emerges the warning that we need to change course before it is too late. McGilchrist particularly laments the over-mechanisation of the body, the eradication of religion and the erasure of beauty from art.

McGilchrist has important things to say about 'inspiration'. He notes how Wordsworth, at the opening of book XII of *The Prelude*, describes how inspiration requires both the effort by which the mind 'aspires, grasps, struggles, wishes, craves' and the stillness of the mind which 'fits him to receive it, when unsought.' It is only when our intentions are fixed on something else that we can see things 'as they really are' (McGilchrist 2009, p. 377). This, according to McGilchrist, is Wordsworth in effect talking about the relationship between the two hemispheres. Narrowly focussed attention is the province of the left, yet while the left is preoccupied the right is freed to see the scene afresh, not overlaid by the familiarity that the left would normally bring to the scene. The poets have said that inspiration is something that we cannot control. McGilchrist cites a letter from Gerard Manley Hopkins to Robert Bridges in September 1885: 'I shall shortly have some sonnets to send you, five or more. Four of these came like inspirations unbidden and against my will' (McGilchrist 2009, p. 381).