Devotional Cosmology: Poetry, Thermodynamics and Popular Astronomy, 1839-1889

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Abstract

The relationship between science and religion in nineteenth century Britain has been the focus of major recent interest from historians and critics, and was a source of anxiety for Victorians. This thesis uses a modified version of the 'two-way traffic' model used in literature and science studies, to consider a three-way exchange of ideas between science, literature and religion in the mid- and later nineteenth century. I use popular scientific treatises and religious poetry published between 1839 and 1889 to consider some of the ways in which some Victorian writers attempted to unite religious and scientific cosmologies to create an inclusive, coherent scheme in which God co-exists with scientific laws without contradiction.

I argue that poetry, and particularly epic, played an important part in enabling some Victorians who were concerned about a potential incompatibility between science and religion, to explore and propose solutions to perceived conflicts. In addition to this intermediary role, poetry acts in its own right to exchange ideas, in the form of images, tropes and figurative devices, with both science and religion. I examine the poetry of Gerard Manley Hopkins and James Clerk Maxwell in relation to their attitudes to thermodynamics. In terms of epic poetry, I focus upon Philip James Bailey's *Festus* and Edward Henry Bickersteth's *Yesterday, Today and Forever*. I also consider the popular scientific treatise and use literary analytical methods, such as close reading, to trace instances of poetic and religious allusion, and I note affinities between epic poetry and popular scientific treatises. I make case studies of *The Unseen Universe* by Balfour Stewart and Peter Guthrie Tait, and the very public debate between William Whewell and David Brewster on the possibility of extraterrestrial life.

Nearly all of the poems and treatises on which I focus in this thesis have been understudied, especially in the field of literature and science. I aim to reposition these texts as important routes for further study in this field. In order to investigate patterns of exchange between science, religion and poetry, I focus in my thesis upon three chief cosmological questions: the future of the universe in light of Victorian understandings of the laws of thermodynamics; the presence, or not, of a divide

between the spiritual and earthly realms; and the existence or otherwise of extraterrestrial life. The project considers each of these questions as they are dealt with in poetry and in scientific treatises, and examines how answers to each question are developed, with each genre contributing to the development of ideas in the other.

Contents

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Introduction

Overview

My thesis is chiefly concerned with the ways in which poetry and science dealt with certain theological problems raised by particular developments in astronomy and energy physics. While one of the fields in which my thesis works is science and religion, it does not engage with the nebulous question of whether a conflict existed between science and religion in the nineteenth century. Each chapter examines different moments where astronomy or thermodynamics and Christianity interacted, and how poetry intervened between religion and the sciences. Often these encounters are acts of reconciliation by the author, or an explicit attempt to deny the existence of a conflict between science and religion, thereby acknowledging the possibility of such a dissonance even as they seek to dismiss it.

My thesis examines the exchange of language, tropes and ideas between religious poetry and popular scientific treatises. I argue that religious poetry, and particularly epic poetry, provided a space for people perturbed by questions of science and religion to explore and come to terms with their implications. The eschatological epic could provide for the Victorians a useful place to consider the theological repercussions of new scientific discoveries. Allusion and technical vocabulary are two of the most frequent devices for including astronomy in poetic imaginings of the afterlife, and allowed poets to explore how a religious afterlife and a scientifically understood universe might interact in a cohesive fashion.

In turn, poetry performed several roles in popular scientific treatises. Poetry, in the form of quotations and epigrams and allusion, as well as figurative language and other traditionally poetic devices, allowed science writers to achieve a number of rhetorical and argumentative goals. The inclusion of poetry, and especially religious poetry, provided a straightforward way for science writers to align themselves with a particular outlook, that of the poet, without writing it in so many words. Poetry often acts as an intermediary between science and religion.

Each of the texts I have selected are notable for their popularity or influence in the nineteenth century, and for being understudied in contemporary criticism. Each chapter is to some extent an act of recovery, as I aim to demonstrate that these epic poems and scientific treatises contribute significantly to modern understandings of nineteenth century science, literature and religion.

Chronology

My thesis covers a span of fifty years, from 1839-1889. This period represents the first fifty years of the lifespan of Philip James Bailey's poem *Festus*, from its initial publication to its much-expanded fiftieth-anniversary edition. 1839-1889 saw several moments of peaking anxieties about the potential incompatibility of science and religion, including the publication of *Origin of Species* in 1859, the rising popularity of materialism and scientific naturalism, and the development of classical thermodynamics, which challenged the possibility of an eternal afterlife. Thermodynamics in particular triggered concerns about how God and an afterlife could be reconciled with an increasingly scientifically understood universe. Other developments, such as those in astronomy around the nature of different types of celestial body, raised questions about how humanity related to God, and to the universe as a whole. Thus, over my period of interest there were many attempts, scientific, poetic, philosophical, and otherwise, to create a single cosmology in which contemporary scientific thought and traditional theological ideas existed together cohesively. I study in my thesis texts that tried in various ways to quell anxieties about a perceived conflict between science and religion, particularly astronomy, thermodynamics and, largely, Protestantism.

These anxieties about the relationship between God and humanity in a scientifically understood world coincided with the development of a genre of science writing aimed at a general audience. The work of Bernard Lightman as well as James Secord and Aileen Fyfe among others, on the role and impact of popular science as a genre, has demonstrated that contemporary scientific discoveries could have a profound impact upon the general public. They have also located the start of the rise

of this movement towards popularisation near the beginning of my period of interest. Secord notes the impulse towards 'useful knowledge in the 1830s' and identifies the 'relative stability in print' from the mid-1840s as one factor contributing to the 'industrial revolution in communication' which led to the success and growth of popular science.[1] Bernard Lightman cites the 1851 Great Exhibition as evidence of the 'remarkable change in attitude towards science' and Fyfe identifies the mid-1840s as the point at which a 'mass audience' was recognised.[2] While 1839 is slightly earlier than the dates indicated for the rise of popular science as a genre, that is due to the poems rather than the treatises I have selected, and the period of study I have indicated does encapsulate the 'remarkable change' which Lightman notes.

The fourth chapter of my thesis focuses on the eighteenth-century poem *Night Thoughts* (1742), which was written and published well before the date range I have defined. However, I argue that its afterlife reaches well into the nineteenth century, and that the poem has influence and significance particular to popular science writing in the middle and latter half of the century. I aim to trace in each of my chapters influence and conversation between genres on the questions raised by thermodynamics and astronomy about the compatibility of God and science in a cohesive cosmology. While *Night Thoughts* cannot directly intervene in any mid-late nineteenth century scientific-theological debates, it is used as a tool by writers who do participate in these discussions, and it is the use of the poem which is of interest here.

Approach

My thesis uses a combination of historicist and close readings. Gillian Beer and George Levine, who both use a historicist approach in their work in the field of

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[1] James Secord, *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of* Vestiges of the Natural History of Creation (London: University of Chicago Press, 2001), p. 523.
[2] Bernard Lightman, *Victorian Popularizers of Science: Designing Nature for New Audiences* (Chicago: University of Chicago Press, 2007), p. 1; Aileen Fyfe, *Science and Salvation: Evangelical Popular Science Writing in Victorian Britain* (Chicago: University of Chicago Press, 2004), p. 6.

literature and science, have comprehensively established the value of reading texts in light of their historical and cultural context, particularly in the field of literature and science. A historicist approach is vital for one of the primary concerns of this thesis, tracing lines of influence across texts and genres, often in reaction to specific events.

As well as historicism, my argument is also based on close reading. I take this approach in the tradition of Beer and Levine, whose historicism is combined with close reading so that large-scale developments can be traced in details of textual production. More specifically, I will demonstrate that the relationship which exists between Victorian poetry, science and religion is based on allusion and exchange of language, forms and specific poetic devices such as metaphor. Tracing these lines of influence requires close analysis of the texts in my thesis. Finally, the treatises I examine here have rarely been considered as literary texts. Close analysis of the kind I perform here provides important new perspectives on these treatises beyond the readings of the texts offered by other fields, such as the history of science.

The key model I use is a combination and adaptation of Barri J. Gold's 'mutually productive conversation' model, and Gillian Beer's 'two-way traffic' model.[3] The two models have similarities, as each describes communication between literature and science as a continuous and, importantly, reciprocal process. Both models position literature and science as sharing language and ideas with each other in an equal relationship, rather than information only moving from science to literature and vice versa. My own conversation model uses many of the same indicators of 'conversation' as Gold's: the interchange of specific and 'bigger' metaphors, the use of poetic figures, such as 'analogy, metaphor and personification', and reference or allusion.[4] The important change I make to these existing models is to add a third direction, religion, to the two-way traffic, or a third participant in the mutually productive conversation. I suggest that poetry can help to mediate between

[3] Barri J. Gold, *ThermoPoetics: Energy in Victorian Literature and Science* (London and Cambridge, Mass.: The MIT Press, 2010), p. 16; Gillian Beer, *Darwin's Plots,* p. 7.
[4] Gold, pp. 17-18.

science and religion at moments of potential tension, as well as each engaging in conversation together.

Each of my chapters considers ideas of 'conversation' in a different way. Chapters One and Two showcase several different types of response to the laws of thermodynamics, from the anxious formulation and re-formulation of the relationship between energy, humanity and the divine in Hopkins' poetry, to the rather more sanguine poetic reaction of James Clerk Maxwell and the ether-enabled 'grand unified theory' of *The Unseen Universe* (1874).[5] I consider these three contributions to a wide-ranging debate that arose from the potentially apocalyptic implications of the second law, each using the 'bigger metaphors' of thermodynamic anxiety to propound their own world views.[6] Chapter Three considers a more literal kind of conversation: a debate played out in successive editions of two scientific treatises, *Of the Plurality of Worlds* (1853) and *More Worlds than One* (1854). I analyse the role of shared common ground, which is to say, biblical, scientific, literary and theological influences, to escalate and inform the exchange of opposing ideas. In Chapter Four, I turn my attention to *Night Thoughts*, a devotional poem which, despite its position a century outside of my defined chronology, found an afterlife as an important tool in conversations concerning scientific and religious cosmologies. Finally, Chapter Five considers the eschatological epic as a site for conversation in itself. In one of the poems, *Yesterday, Today and Forever* (1870), the author's engagement with geological and astronomical treatises, and his use of imagery and ideas from within it, informs the creation story and biblical history he related. Meanwhile, the extended publication history of the other poem, *Festus* (1839), provides an opportunity to see a text in conversation with itself and its audience; the author constantly adjusts the views, particularly theological views, presented in the poem based upon prevailing opinion and reader feedback.

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[5] Ibid., p. 71.
[6] Ibid., p. 17.

Genre

The two genres I focus on in this thesis are scientific treatises and poetry. In particular, I will examine popular scientific treatises that consider the cosmological implications of the development of the laws of thermodynamics and advances in astronomy, and poetry including epic poetry. I consider the long poetry of three writers, Edward Young, Edward Henry Bickersteth and Philip James Bailey, and two poets who work in much shorter forms, James Clerk Maxwell and Gerard Manley Hopkins. While I argue generally that poetry provides a space for religious-scientific discussion, the exact nature and connotations of this space differ quite strongly between forms. I argue that poetry acted as a third party in conversations between science and religion, and it follows that different forms would best suit different types of conversation. I contend that the flexibility and expressive possibilities of form particular to poetry are part of what makes it a useful interlocutor between science and religion.

The majority of the poetry I consider falls into a category I term eschatological epic, which is to say, epic poetry that considers issues of death, judgement and the future life. I draw upon Herbert Tucker's work on epic, which goes a long way towards rehabilitating the epic as a fruitful area of study for modern Victorianist scholarship. I extend his defence of the relevance of the genre to nineteenth century culture to argue that epic poetry provided an important, and understudied, discursive space for specifically considering issues of science and religion. Epic poetry's long form which captures, in Tucker's words, a 'cultural moment', permits in-depth explorations of issues with pressing cultural significance.[7] I argue that poetry, and especially the eschatological epic, provided an important discursive space to consider the challenges presented to Christian views of the universe by scientific discoveries. This space was usually used by Christians without a strong scientific background, but who were abreast of contemporary scientific developments. The eschatological epic

[7] Herbert Tucker, *Epic: Britain's Heroic Muse 1790-1910* (Oxford: Oxford University Press, 2008), p. 25.

tended to offer the opportunity to consider potential concerns about the theological implications of specific scientific discoveries. The epic poetry I consider tends to propose a view or, in the case of Philip James Bailey's *Festus*, several views, of the cosmos which resolve the quandaries raised by issues such as the laws of thermodynamics and the existence of life on other planets in a manner which allows for both scientific and religious truths as far as possible.

I focus upon epic in two of the three chapters directly concerned with poetry for several reasons. The epics I consider here share a number of characteristics which serve to unite them as a form. They are all long narrative poems – at least 10, 000 lines – written primarily in blank verse. Each poem follows, in different styles, the spiritual journey of a male main character, and they all consider eschatological issues, or concerns about death, judgement and the afterlife. The poems are all divided into named sections, nine or twelve books for *Night Thoughts* and *Yesterday, Today and Forever* respectively, and scenes differentiated by their location in *Festus*. The types of engagement or intervention found in epic tend to be more sustained than in shorter poetry, which offers a breadth of material in a single poem which is not available in shorter work. The reasons for this sustained engagement are partially practical; an epic tends to take longer to write than a single poem, allowing for early reactions to a debate or discovery to be tempered by time to reflect or new developments in the debate. Similarly, the length of an epic provides the literal space for a different type of in-depth exploration of a topic than that afforded by a sonnet, lyric or other, shorter form. In the case of integrating scientific discoveries into religious understandings of the universe, epic can provide the space to propose a wider-ranging system, or wider variety of experimental systems, of synthesis than can easily be achieved in a single shorter-form poem.

In addition to possibilities provided by the length of the eschatological epic, the segmented nature of the form, with each book or scene presenting a new leg of the main character's journey, allows one poem to address the same theme or idea multiple times in different ways. In *Festus*, this multiplicity manifests as layering, with several, often contradicting, attempts at addressing a theological or scientific question offered and then discarded with minimal comment, while *Yesterday, Today*

and Forever relates a history of the universe from creation to judgement day with the addition at each stage of Victorian scientific theory and allusion. In the case of *Night Thoughts*, the length of the poem and the wide-ranging nature of its spiritual and emotional journey are part of what gave it its longevity; regardless of their emotional state or personal relationship with God, each reader is able to find a line or two with some resonance. These resonances change with the time in which the poem is read, allowing new interpretations and resulting in the extremely widespread use in the nineteenth century of specific lines which help to reflect contemporary anxieties and values.

While epic poetry provides ample page-space for a nuanced discussion of pressing contemporary debates, the shorter poetry I have selected for examination in Chapter One intervenes in these debates in a perhaps more immediate way. Gerard Manley Hopkins and James Clerk Maxwell present contrasting approaches to dealing with theological concerns raised by contemporary thermodynamic discoveries. I will argue that while Hopkins' inclusion in this thesis is in some ways unexpected, his poems represent a significant type of intervention in nineteenth-century discussions between science and religion. Gerard Manley Hopkins' experimental sonnets consider the challenges presented by the newly-discovered laws of thermodynamics to the eternal nature of God and the afterlife from a Catholic perspective, rather than the Protestant theologies adopted by the majority of the other writers. Hopkins' poetry is also unusual in that his formal choices often confound typical expectations of religious poetry.[8] I argue that use of unconventional form is a vital part of Hopkins' varied explorations of thermodynamic eventualities. Further, I suggest that despite the clear theological differences between Catholicism and Protestantism, and the distinctive Catholic tenor to Hopkins' poetry, most of the various strategies for dealing with thermodynamics that he suggests in sonnets are similar to those found in Protestant responses to the same issue. For example, I will argue that Hopkins suggests a split-energy model in 'That Nature is a Heraclitean Fire and of the

[8] An extended study of the conventional forms for religious poetry can be found in Kirstie Blair, *Form and Faith in Victorian Poetry and Religion* (Oxford: Oxford University Press) 2012.

Comfort of the Resurrection' that bears strong similarities to the system proposed by Balfour Stewart and Peter Guthrie Tait in *The Unseen Universe.* Stewart and Tait suggest a divide between the 'visible' and 'invisible' universes, in which the former hosts the scientifically observable universe and the latter is home to an eternal God and future life. Meanwhile, the relative calm and confidence of 'God's Grandeur' is similar in conclusion, though very different in methodology, to James Clerk Maxwell's sanguine attitude to tensions between science and religion expressed through his poetry.

Each of the sonnets I consider presents a single point of view regarding the possibility of an eternal God and afterlife, a possibility newly jeopardised in the nineteenth century by the discovery that the amount of useful energy in the universe is gradually diminishing and will eventually dissipate altogether. Unlike in eschatological epic, which offers a degree of space and freedom to consider a variety of perspectives in a single poem, in the sonnets studied here, each of the three positions Hopkins takes on the issue of eternal energy is presented as the only possibility in that poem. The degree of optimism or resignation expressed in each poem regarding the eventual fate of humanity corresponds with the how closely each poem conforms to the traditional traits of a sonnet. For Hopkins, poetic form was a tool for conveying affect, and I argue that the form of the experimental or exploded sonnet which he favoured for expressing thermodynamic concerns is a key component of the poems' emotional impact.

Meanwhile, the playful verse of James Clerk Maxwell engages with science in one of the most direct ways of all the poets discussed here: Maxwell's poetry is about physics, written by a physicist, usually quite quickly in response to something he had just read or heard about, and disseminated mostly privately among his physicist friends. The significance of form in the case of Maxwell's poetry is mostly that the poems' generally short length meant that they could be produced quickly enough to remain current to specific events in scientific circles, rather than responding to broader debates as the other poets examined here do. Thus, Maxwell's poetry does not offer strategies for integrating science and religion, as Bickersteth and Bailey's eschatological epics do to differing extents and in varying ways, nor does it offer the

intensely emotional reflections on the religious repercussions of scientific discovery afforded by Hopkins' unusual sonnets. Maxwell's poems do not necessarily participate in conversations about energy physics or the cosmos in order to provide or experiment with strategies for combining religious and scientific worldviews, like the other poems studied here. Rather, his poetry tends to consider and comment upon the developments and personalities in the professional circles in which Maxwell moved. Despite these differences, Maxwell's poetry does engage with the concerns shared by the other poets in this thesis, albeit with different motivations, and demonstrates one of the many types of conversation I trace in my thesis.

The second genre on which I focus is the popular scientific treatise. My thesis focuses on cosmologies as they are considered in the fields of astronomy and thermodynamics. These physical sciences both raised important questions for the Victorians about how humanity relates to God. The date range of my thesis includes the 1859 publication of *Origin of Species*, which of course raised major questions regarding the relationship between God and humanity, and humanity's beginnings. Literary responses to *Origin* and the controversy raised by it and other contemporaneous works of biology and evolutionary theory have been discussed at length in twentieth and twenty-first century literature and science studies.[9] While biology and evolutionary theory have become somewhat ubiquitous in studies of literature and science as they connect with religious concerns, I aim to show that physical sciences were also a major source of Victorian religious anxieties and theological questions. There is a growing body of modern criticism on literature and the physical sciences, some of which engages with theological issues, and it is to this

[9] Important examples of critical work on literature and Victorian evolutionary science include Gillian Beer, *Darwin's Plots: Evolutionary Narrative in Darwin, George Eliot and Nineteenth-Century Fiction* (London: Routledge & Kegan Paul, 1983); George Levine, *Darwin and the Novelists: Patterns of Science in Victorian Fiction* (Chicago: Chicago University Press, 1988); Joseph Carroll, *Literary Darwinism: Evolution, Human Nature, and Literature*. (New York: Routledge, 2004) and Bernard Lightman, *Evolutionary Naturalism in Victorian Britain: The 'Darwinians' and Their Critics* (Farnham: Ashgate, 2009); James Secord, *Victorian Sensation: The Extraordinary Publication, Reception and Secret Authorship of* Vestiges of the Natural History of Creation (London: University of Chicago Press, 2001).

subsection of the field to which I intend to contribute.[10] I will demonstrate the importance of religious thought to thinking in physics and vice versa, and emphasise the affective components of physics, and particularly astronomy and thermodynamics.

I address thermodynamics and astronomy as two physical sciences which, despite their differences, share similarities in terms of their affect and the kinds of questions which were raised as a result of discoveries in each field. While cosmology, that is, the study of the beginnings, development and large-scale nature of the universe, as it relates to astronomy had been a source of religious anxiety for centuries before the Victorian period, thermodynamics was a much smaller and newer branch of science, and the angst it elicited among the Victorians was perhaps more difficult to predict.[11] However, the specific developments in thermodynamics and astronomy which I consider in this thesis arose at a similar time, both attracting public attention in the mid-late nineteenth century. The cultural moment shared by astronomy and thermodynamics is captured in particular by the epic poetry examined in this thesis. Both sciences raise similar major questions about God's relationships with humanity and their relative positions in the universe. For example, *The Unseen Universe* takes pains to place God in a separate yet connected section of the universe, where He is safely away from the vexing matter of entropy, while the cosmic plurality debate as expressed through *Of the Plurality of Worlds* and *More Worlds than One* is concerned with humanity's position in the cosmos and in God's affections. While there is little cross-disciplinary exchange between the thermodynamic and astronomical treatises I examine, ideas from both are used

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[10] Significant recent work on the physical sciences and literature include Barri J. Gold's *ThermoPoetics*; Alice Jenkins, *Space and the 'March of Mind': Literature and the Physical Sciences in Britain, 1815–1850* (Oxford: Oxford University Press, 2007) and Daniel Brown, *The Poetry of Victorian Scientists: Style, Science and Nonsense* (Cambridge: Cambridge University Press, 2013)

[11] Work which demonstrates pre-Victorian astronomical anxiety includes Merton Robert K., *Science, Technology and Society in Seventeenth Century England* (United States of America: Howard Fertig Inc., 1970); Michael Crowe, *The Extraterrestrial Life Debate, 1750-1900: The idea of a plurality of worlds from Kant to Lowell,* (Cambridge: Cambridge University Press, 1986) and Gabrielle Sugar, 'To The Moon: Discovering the Comic in the Cosmic on the Early Modern English Stage', in *Literature in the Age of Celestial Discovery: From Copernicus to Flamsteed*, ed. by Judy A. Hayden (Basingstoke: Palgrave Macmillan, 2016).

liberally throughout the eschatological epics discussed in Chapter Five. Thus I use poetic responses to the smaller and newer field of thermodynamics and the anxieties it elicited as a localised case study, establishing the terms of debate and types of questions which were responded to through poetry. In astronomy, meanwhile, the terms of debate and the kinds of questions asked of astronomers and cosmologists were more established. Accordingly, the culture of answers to these questions is similarly more developed and more complicated. In later chapters, I move into an examination of the more complex questions and answers – which are addressed in correspondingly longer poems – raised by astronomy.

The scientific treatises I discuss here are slightly unusual in that they are not necessarily works which reveal or explicate scientific discoveries. *The Plurality of Worlds* (1853), *More Worlds than One* (1854) and *The Unseen Universe* (1874) are all treatises written by experts in each branch of science, and the texts are all engaging with specific, current scientific debates and questions. However, while the treatises are all concerned with a contemporary scientific issue, they are perhaps not works of science in the usual sense. This type of scientific writing does not require the reader to have any specialist knowledge, such as a deep understanding of mathematics, to engage with the author's conclusions. Although the reader is not expected to be an expert in the relevant science, they are nonetheless expected to be somewhat scientifically engaged, as the texts respond to and call upon contemporary developments, such as advances in nebular astronomy or energy physics, as part of their arguments.

The selection of these types of scientific treatise has in turn informed the type of astronomy and astronomical imagery I analyse. I examine astronomy as it informs ideas or images of space rather than as a scientific practice.[12] To illustrate, a great

[12] Examples of other critics who use a similar approach to ideas of space include Anna Henchman's *The Starry Sky Within: Astronomy and the Reach of the Mind in Victorian Literature* (Oxford: Oxford University Press, 2014) and Pamela Gossin, *Thomas Hardy's Novel Universe: Astronomy, Cosmology, and Gender in the post-Darwinian world* (Aldershot: Ashgate, 2007) though unlike me, both critics do include some discussion of astronomical practice.

many of the texts I have selected feature imaginative explorations of the solar system or wider cosmos, drawing on current theories about the nature of particular planets or other celestial bodies. However, none of these texts, be they scientific or poetic, involves depictions of astronomical equipment or methods. Similarly, my examination of writing on thermodynamics does not cover the prose nonfiction of physicists who directly contributed to the formulation of its laws, such as William Thomson or Rudolph Clausius' work. Instead, I focus upon popular scientific and poetic reactions to the laws of thermodynamics. My approach, based in cross-genre conversations, means that it is more rewarding to focus on wider reactions to particular scientific developments, or the reception of the developments in new forms after they have been repackaged for a particular ideological, usually theological, purpose.

My thesis focuses on Christianity, particularly Protestantism and mostly the Church of England. The specific denominations of the writers in this thesis vary, but all except two fall under the general category of Protestant. The exceptions are Gerard Manley Hopkins and Philip James Bailey, a Catholic and a Universalist respectively. However, Hopkins and Bailey's writings are still relevant to this thesis despite their faiths. In Bailey's case, the popularity of *Festus*, its longevity, and its author's reactivity to feedback from readers means that although the text itself is not especially Protestant, many of its influences, and much of its audience, were. Bailey was thus engaged in the same conversations as poets of Protestant denominations, including those from the Church of England. Similarly, although Hopkins was a Catholic, the nature of his engagement with nineteenth century energy science warrants its inclusion in Chapter One.

Critical Context

In this survey of the key critical texts and debates that have informed my thesis and the fields in which it engages, I will first address those works whose contributions to the field of literature and science, Victorian poetry, or religion and literature, have directly influenced the models and arguments I utilise. Within this group, I will first look at those works that have been significant in returning to

critical attention the two main genres that this thesis covers, scientific treatise and epic poetry. I will then consider the key models upon which I draw in my construction of the relationship between literature and science in my texts, particularly the 'mutually productive conversation model' and the 'two-way traffic model'. Finally, I will examine the most significant recent contributions to my specific areas of interest. Having addressed relevant recent criticism and work with very direct impact on my thesis and its argument, I will go on to survey those works which were important in shaping their respective fields to make possible the types of argument and analysis which this thesis undertakes. My evaluation of the relevant fields will include an assessment of how these works influence this thesis, and how I draw upon them to intervene in the field.

This thesis focuses primarily on two genres, the popular scientific treatise and the epic poem, and I argue that these genres fill roughly equivalent roles in their respective fields. Herbert Tucker's *Epic: Britain's Heroic Muse 1790-1910* (2008) is one of the most sustained and comprehensive examinations of the epic poem's place in the long nineteenth century. Tucker justifies his focus on the genre by repositioning it alongside the romance and the novel as what he arrestingly terms one of the 'major predators at the top of the literary food chain'[13] in the nineteenth century, despite it having largely fallen out of creative and critical fashion in twenty-first century scholarship. Tucker creates a space for critical examination of the epic by demonstrating its omnipresence and its important place in Victorian literary and social culture.

Tucker argues that the 'constant aim' of the epic poem is 'to embrace the cultural moment of the inner story, remote in time or place as it might be, as located on a continuum that led to the cultural moment of the metropolitan nineteenth century' [14]. He suggests that the 'inner story', the plot, of the epic is connected intimately and uniquely to the 'cultural moment' in which the poem is written.

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[13] Herbert Tucker, *Epic*, p. 18.
[14] Ibid., p. 25.

Tucker's book has been very influential in encouraging critical interest in the epic, and while a limited number of scholars have since approached the epic from the point of view of literature and science, no one has offered an extended examination of astronomy in Victorian epic poetry.[15] Tucker's survey mentions some sciences, particularly geology and biology, but astronomy is given no attention at all. The discussion of geology and biology is brief and general, and no science or scientific concern has a 'cultural moment' of its own, but rather Tucker attributes them supporting or contributing roles to non-scientific moments. My examination of the epic reflects in part Tucker's characterisation of the aim of the genre, but the 'moments' upon which we concentrate differ and our approaches diverge accordingly. His chronological structure breaks down the long nineteenth century according to its 'received social and political history',[16] with each decade representing a 'cultural moment'.

The period on which my thesis mainly focuses, 1840-1880, is selected to reflect contemporary scientific discoveries and prevailing attitudes to science and religion as well as the publication dates of key texts. Although this chronology intersects at points with Tucker's 'received social and cultural history', Tucker's cultural moments are more diverse than my own, and rely on broader social and cultural histories rather than the history of science. The moments selected by Tucker encompass the reaction to specific events, including the French Revolution, the death of Lord Byron and the Napoleonic wars, as well as the general character of a particular part of the long nineteenth century such as the jingoistic exuberance at the height of the British Empire and the post-war relief of the Regency era. My own 'cultural moments' include the development of the laws of thermodynamics and the advent of the cosmic plurality debate. As such Tucker and I have differing chronologies. Tucker's chapter 'To the Ending Doom: Epic Apocalypse 1820-1830'

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[15] A very limited examination of astronomy in epic poetry can be found in Anna Henchman's *The Starry Sky Within: Astronomy and the Reach of the Mind in Victorian Literature* (Oxford: Oxford University Press, 2014); the book focuses mostly on astronomy in the Victorian novel and to a lesser extent poetry generally.
[16] Tucker, *Epic*, p. 9.

places the 'cultural moment' for what I term eschatological epics in the 1820s, a decade earlier than when I locate the heyday of this kind of epic. Tucker uses Byron's death in 1824 and its aftermath in literary circles as the starting point for his discussion of epic apocalypse, but I find my period of interest later in the century.

The sheer length of an epic poem can present an analytical challenge, as it can be difficult to retain a sense of the whole while focusing on key parts within a poem without becoming reductive. My analysis of the poetic epics I discuss in this thesis draws, like Tucker's, on close readings and historicist interpretation. This methodology fits those used in literature and science since Beer and Levine, and allows me to trace the mutual influence of the genres I study, on multiple levels.

My other genre of interest, the popular scientific treatise, has found two of its most significant examinations in Bernard Lightman's *Victorian Popularizers of Science: Designing Nature for New Audiences* (2007) and James Secord's *Victorian Sensation: The Extraordinary Publication, Reception, and Secret Authorship of* Vestiges of the Natural History of Creation (2000). Like *Epic*, much of the importance of *Victorian Popularizers* is to be found in its work bringing a relatively little-studied genre to the fore. In this book, Lightman, like other twenty-first century historians such as Crosbie Smith, and Aileen Fyfe, moves away from the focus upon gentleman scientists that dominated the late twentieth century model of the history of Victorian science, and instead examines citizen science and popular science.[17] Much of Lightman's very varied work outside *Victorian Popularizers* focuses on scientific naturalism and its Victorian proponents, such as John Tyndall and Thomas Huxley.[18] Lightman usually demonstrates that 'scientific naturalism has been vitally important

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[17] Two key examples of the gentlemen of science model can be found in Frank Turner, *Contesting Cultural Authority: Essays in Victorian Intellectual Life* (Cambridge: Cambridge University Press, 1993) and J.B. Morrell and A.W. Thackray, *Gentlemen of Science: Early Years of the British Association for the Advancement of Science* (Oxford: Clarendon Press, 1981).

[18] Some examples include: Bernard Lightman, "'Fighting Even With Death': Balfour, Scientific Naturalism, and Thomas Henry Huxley's Final Battle" In *T.H. Huxley's Place in Science and Letters: Centenary Essays*, ed. by Alan Barr (Athens and London: University of Georgia Press, 1997), 323-350; *Evolutionary Naturalism in Victorian Britain: The 'Darwinians' and Their Critics* (Farnham: Ashgate, 2009); *The Age of Scientific Naturalism: Tyndall and His Contemporaries*, Co-edited with Michael S. Reidy (London: Pickering and Chatto, 2014).

for the understanding of science in the Victorian period and even into the present day'.[19] In *Victorian Popularizers*, however, Lightman's attention moves away from scientific naturalism and science as performed by scientists, and instead he examines popular science and its audience, whose interests may have lain in other methodologies, such as natural theology. Here too my work draws on this aspect from Lightman in *Victorian Popularizers* as well as Smith's and Fyfe's major work, as I do not really engage with the current interest in Victorian scientific naturalists. Instead, I give my attention to two of the many alternative groups that Lightman proposes as key popularizers of science: the 'clergyman-academic',[20] and the North British Physicists. William Whewell, David Brewster, Edward Young, Edward Henry Bickersteth and, in a sense, Gerard Manley Hopkins could all to varying degrees be characterised as clergyman-academics, while the North British Physicists are represented in my thesis by Balfour Stewart and Peter Guthrie Tait. Indeed, Philip James Bailey is the only figure in my thesis who is not accounted for by one of these groups.

Lightman suggests five approaches to 'undertaking a study of the development of science for the general reading audience in the nineteenth century'.[21] The first is the 'positivist diffusion model',[22] which suggests that 'official' scientific knowledge was gained by the scientific elite and then disseminated downwards by 'popularizers', and it has largely been superseded in scholarly circles. Lightman uses a mixture of the remaining four approaches: examining marginal sciences, such as phrenology, and its practitioners; examining marginal groups of scholars, such as women; examining science publishing and print culture; and finally studying the 'varying sites in which science for general audiences can be found',[23] meaning libraries, lectures, zoos, and other potential locations of scientific encounter outside

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[19] Gowan Dawson and Bernard Lightman, 'Introduction' in *Victorian Scientific Naturalism: Community, Identity and Continuity* ed. by Gowan Dawson and Bernard Lightman (Chicago: Chicago University Press, 2014), pp.1-21 (p. 2).
[20] Lightman, *Victorian Popularizers*, p.40.
[21] Ibid., p. 13.
[22] Ibid., p. 14.
[23] Ibid., p. 17.

of the book. Each of these approaches offers a wealth of potential information, but the primary value of such information may be of relevance particularly to historians rather than to literary critics, while my own methodology is influenced by the field of literature and science, including the works of Gillian Beer and Barri J. Gold. Giving attention to the publishing history of the texts at hand, with an awareness of the print culture around them, helps to facilitate the studies of the conversations that all of my texts are having with themselves and their audience throughout their printed lives. I also adopt a variation on Lightman's final suggested approach, studying the less commonly-examined sites of popularizing science, by centring poetry and particularly epic poetry as a location of scientific discussion and popularisation.

James Secord's *Victorian Sensation* uses a case study of the 'evolutionary epic' *Vestiges of the Natural History of Creation* to explore 'the introduction of an evolutionary account of nature into public debate in order to see what happens when a major historical episode is approached from the perspective of reading'.[24] While both Lightman and Secord discuss popular science, their approaches are very different. Where Lightman's focus on popular science is framed as an historiographical shift, moving away from other modern theories of Victorian science communication, and uses this approach to inform his argument about the development of science for general audiences. Secord considers popular science as an episode in the history of *Vestiges*, examining it as an emerging genre that affected the reception of *Vestiges* rather than as a topic of study per se. Secord does not engage particularly closely with the content of *Vestiges*, especially not on a literary level; instead, he focuses on its contemporary cultural impact. *Victorian Sensation* explores the text's reception and interpretation by its readers, as individuals and as representatives of various groups, including political, religious and scientific organisations; its publication history, the implications of its anonymity, and issues of 'popular' science; and its relationship with the other evolutionary sensation of the nineteenth century, *Origin of Species* (1859). Unlike Secord, examining the literary

[24] Secord, p. 518.

aspects of specific popular scientific treatises is a core part of my approach, but his extended examination of the cultural-historical repercussions of a single text provides a framework from which I draw in my study of the afterlives and interconnections between the texts in this thesis.

Barri J. Gold's *ThermoPoetics: Energy in Victorian Literature and Science* proposes a model of 'mutually productive conversation' between Victorian energy literature and science, and identifies devices such as metaphor and analogy in the work of Alfred Tennyson, James Clerk Maxwell, Herbert Spencer, Charles Dickens and others as key facilitators of this conversation. My own work draws substantially on this conversation model, but adds religion in particular as a topic of conversation. As well as reading poetry and science writing for moments of simple exchange, science for poetry and vice versa, I look for moments where science and poetry encounter each other. I discuss the same religious debates to expand the 'mutually productive conversation', of literature and science, expanding it to a three-way conversation between literature, science and religion. Gold's focus in *ThermoPoetics* is on energy physics, and though this branch of science forms the starting point of my thesis, in later chapters I apply the conversation model on a wider basis, to discussions of cosmologies and astronomy. As well as the model, I also use many of the overlaps and types of interaction that Gold identifies between literature and science, particularly metaphor and allusion, to inform my own examination of religiously-concerned scientific and poetic texts. Gold argues that 'specific metaphors' can show instances of direct influence between each field, and '[b]igger metaphors […] shape a variety of narratives circulating through a culture serve both the development and the dissemination of scientific ideas'.[25] Most of the types of moments of communication between the poetry and science in Gold's model are most easily found through close reading, an approach which I use throughout my chapters.

[25] Barri J. Gold, *ThermoPoetics,* pp. 16-17.

Like Gold, I identify figurative devices such as metaphor, analogy and allegory as a key point of exchange between scientific treatises and religious poetry. I argue that religious poetry and particularly the eschatological epic provided Victorian writers and readers with a very useful forum to discuss, combine and intervene in both religious and scientific debates and concerns. The mutual exchange of images and ideas between religious poetry and scientific treatises was a key method of reconciling perceived dissonances between the fields of literature and science, and, through poetic mediation, science and religion. Bruce Clarke's *Energy Forms: Allegory and Science in the Era of Classical Thermodynamics* (2010) focuses his attention mainly on one of the figurative devices I consider, allegory. Like me, he considers the connections between scientific treatises and a literary genre, in his case treatises dealing specifically with thermodynamics, and science fiction. Although Clarke's focus is in some ways narrower than mine, his assertion that 'the specific formal characteristics of allegorical construction allow for a mobile synthesis of otherwise dispersed and interconnected elements'[26] can be applied much more broadly to other devices. Metaphor, allusion and analogy permit 'mobile synthesis of otherwise dispersed and interconnected elements' as freely as analogy. While I apply the 'mobile synthesis' portion of Clarke's argument to a wider range of devices, I bring it to bear more specifically upon points where the literary and scientific exchange intersects with ideas of religious significance.

Clarke's approach is largely historical, and although my own approach is historicist, it also has a strong element of literary as well as historical readings of the texts. While my focus is upon exchange and conversation between the two genres I study, Clarke examines both literary and scientific sources, but does not use much from the two-way traffic model. He analyses allegory and other figurative/literary devices generally in thermodynamic treatises, and examines thermodynamic allegories particularly in science fiction. Clarke only traces specific influences along the lines from nineteenth century science to nineteenth century literature, and pays

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[26] Bruce Clarke, *Energy Forms: Allegory and Science in the Era of Classical Thermodynamics* (Michigan: University of Michigan Press, 2001), pp. 5-6.

less attention to the other direction in a contemporary sense, though he acknowledges the literary roots of much of the scientific vocabulary he examines. I take much from his approach regarding the examination of figurative language, and add attention not just to the use of literary devices but also literary allusion and specific influence.

The conversation model I utilise, is influenced by both Gold's 'mutually productive conversation' and Gillian Beer's historicist 'two-way traffic' model, which I use in a modified way with the addition of religion as a third direction of traffic. Similar to the conversation model, the two-way traffic model is based on an idea of *mutual* exchange of ideas and vocabulary between literature and science. Beer introduced the model in *Darwin's Plots*, and in *Open Fields: Science in Cultural Encounter*, she broadens its scope to include more sciences. One of the key types of interaction between science and poetry that I examine is allusion, and in this I draw on Beer's comment that it is important to 'look as much at movements across from sentence to sentence as at what is contained within any single sentence, and to watch how substantive theories become metaphors in another field'.[27] Beer concludes that literary allusion demonstrates that scientific discourse had an uneasy (and productive) relationship with the established authoritative narratives of the Bible and literature; that the process of professionalization among Victorian scientists knit in class and gender assumptions; that Victorian scientists were caught between the goals of objectivity and affect, and that they found ways, through literary reference, to poise necessary contradictions in their work.[28]

While I do not directly address or explicitly draw upon all of these conclusions in this thesis, I use and adapt the final one, that Victorian scientists used allusion and literary reference to reconcile contradictions. I argue that allusion and literary reference helped to provide a space for religion in some science writing. I also argue that literary allusion and reference were a key part of popularizing scientific texts. Beer suggests that 'parable and allusion not only worked as tactic and resource in

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[27] Gillian Beer, *Open Fields: Science in Cultural Encounter* (Oxford: Oxford University Press, 1996), p. 228.
[28] Ibid., p. 196.

Victorian scientific writing. They could also harbour anxieties and insights that tapped the further implications of current scientific theories beyond the range for which experiment could vouch'.[29] I trace the 'anxieties and insights' that allusion uncovers that pertain specifically to religion.

I treat literature and science, represented in my thesis by scientific treatises and epic poetry, as two parts of a whole, each field separate but communicating with and informing the other, despite being what George Levine terms disparate 'modes of discourse'[30]. The view on literature and science that I take, that the two fields were in some ways separate but ultimately connected, is reflected in nearly all of the more recent work on science and poetry, including Beer, Gold and Clarke. This general consensus represents a shift from C.P. Snow's influential argument in *The Two Cultures* (1959) that literature and science are two separate, non-communicating 'cultures'.[31] George Levine's edited collection *One Culture: Essays in Science and Literature* goes to explicit lengths to complicate Snow's assertion. Levine's introduction to the essays makes use in particular of Beer's two- way traffic model and highlights the twentieth-century critical idea that looking at 'science and literature' is often taken to mean the study of the impact of science upon literature, rather than vice versa.[32] This is a trap that my use of the two-way traffic and mutually constructive conversation models allows me to avoid.

I focus in my thesis on cosmologies as influenced by religious faith, and particularly on ideas of an afterlife as they relate to space sciences. I examine astronomy and astronomical imagery in key eschatological epics and scientific treatises, paying attention to the subject of astronomy – stars, nebulae, theories of ether, the idea and nature of space – rather than the science's equipment technologies

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[29] Ibid., p. 215.
[30] George Levine, 'One Culture: Science and Literature' in *One Culture: Essays in Science and Literature* ed. by George Levine with Alan Rauch (Madison: University of Wisconsin Press, 1987), 1–32 (p. 3).
[31] C.P Snow, *The Two Cultures, e*d. by Stefan Collini (Cambridge: Cambridge University Press, 2008), p. 2.
[32] Levine, p. 6.

and methodologies. In this way I draw on Anna Henchman's study of the use and impact of astronomical imagery in Victorian literature, *The Starry Sky Within: Astronomy and the Reach of the Mind in Victorian Literature*, which approaches space in the nineteenth century as a deeply subjective idea. Her view of nineteenth-century ideas of space is useful to me, and is strongly influenced by Alice Jenkins' *Space and the March of the Mind*.[33] I use Henchman's discussion of space to inform my own and show that, interior (mental, imagined) and exterior (astronomical) space overlap, creating tensions and contradictions; the space that one imagines informs the space that one sees on looking at the stars. The cosmos is defined and interpreted by the viewer and, for Henchman, potentially transformed by changes of perspective: 'both astronomers and literary writers were preoccupied with problems of where we see things *from*'.[34] Henchman and I both examine how two genres contend with the same issues and the solutions each genre may offer the other – Henchman studies quandaries of perspective in astronomical treatises and, usually novels, while I consider how popular astronomical treatises and eschatological epics deal with cosmological dilemmas.

Like Clarke, Henchman's approach is largely one-way, focusing on literature's borrowings from and adaptations of astronomy to literature, where I seek to demonstrate a mutual and ongoing influence. Although both Henchman and I examine problems shared between literary and scientific spheres, the particulars are different. Further, my approach examines the mutual impact of science and religion, while Henchman's discussion of religion is quite brief. Her most extended discussion of religious issues is found in her analysis of how Thomas Hardy deals with 'the problem of where to locate God', which she treats as one of many challenges of perspective presented by an increasingly scientifically understood, and an increasingly large, universe.[35] Thus our conclusions are very different. Henchman argues that Victorian novelists 'enlis[t] astronomy to expose radically unlike views of objects, characters of locations that are commonly assumed to have some kind of

[33] Alice Jenkins, *Space and the 'March of Mind'*, p.37.
[34] Henchman, *The Starry Sky Within*, p. 1.
[35] Ibid., p. 201.

inner coherence',[36] and that 'astronomy helps writers to perceive and articulate problems at the heart of the literary point of view'. I argue instead that literature, specifically religious poetry, is used to consider, reconcile and, rather than 'expose', sometimes elide differences between scientific and religious cosmologies. Eschatological epics represented an important opportunity for writers to process and synthesize perceived contradictions between science and religion.

I argue that poetry provides an important space for equal discussion of science and religion for the Victorians, as well as being an important genre in discussing both scientific and religious concerns individually. Kirstie Blair demonstrates a similar relationship between poetry and religion that I describe and build upon in this thesis, in *Form and Faith in Victorian Poetry and Religion.* She argues that religious poetry was 'part of a context of popular religious poetics, and indeed a context including not only poetry but also tracts, sermons, pamphlets, journal articles, and religious works of all descriptions'.[37] Blair positions poetry as an important forum for discussing and disseminating religious concerns. I extend this assertion to demonstrate its importance in scientific fields as well as religious ones, though the precise mechanics of the relationship between poetry and science and poetry and religion are not identical.

Blair's argument is based on an examination of form which extends beyond simply poetic form to architectural, religious and social forms, and her approach relies mostly upon close reading, with some carefully scrutinised influences from New Formalism. My thesis pays similarly close attention to poetic form in particular. I seek to join the relationship that Blair describes between religion and poetry, with that which Daniel Brown, Barri J. Gold and others create between poetry and science. I will demonstrate that as well as being engaged in conversations between science and religion individually, Victorian poetry acts as a mediator and common mode of communication between science and religion, providing a forum for each to

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[36] Ibid., p. 231.
[37] Kirstie Blair, *Form and Faith in Victorian Poetry and Religion* (Oxford: Oxford University Press, 2012), p. 5.

be discussed in generally equal terms. Poetry, and particularly eschatological epic, provided a space to deal with concerns that had both scientific and religious elements, and allowed these concerns, debates and perceived conflicts to be discussed and processed, often with a conciliatory solution proposed to resolve the problem.

Having considered the key critical work which has directly informed my thesis, I will now turn my attention to the influential scholarship which provides the broader foundations upon which my thesis is built. My thesis engages in multiple acts of recovery, bringing back to critical attention nineteenth-century poems and treatises which are understudied in modern scholarship. I argue that, despite their comparative obscurity in twenty-first century criticism, the treatises and poems I examine here played vital roles in nineteenth-century cosmological conversations. They intervened in, influenced, or indeed in the case of *Of the Plurality of Worlds*, started, important discussions about the role of God in a scientifically understood world. I aim to re-centre these texts in the fields of science, literature and religion. An increasing awareness of the merit and usefulness of examining nineteenth century poetry, as well as ever-more nuanced assessments of the Victorian relationship between science and religion over the last forty years has madeF it possible to reassess the value of these now little-studied works.

Most of the fields this thesis works in, and accordingly most of the influential works that have laid the foundations for this type of study, are cross-disciplinary. Scholars relevant to my thesis come mostly from the fields of literature and science, science and religion, history of science, and literature and religion. However, my starting point for this survey is based only in Victorian poetry, as this is the topic which forms the essential basis of my thesis. Isobel Armstrong's *Victorian Poetry: Poetry, Politics and Poetics* (1993) is an act of recovery, similar to mine but with a much broader scope, that deals with Victorian poetry as a whole, rather than my very specific focus of mid-Victorian epic. Armstrong aims to break the 'heavy silence'[38]

[38] Isobel Armstrong, *Victorian Poetry: Poetry, Politics and Poetics* (London: Routledge, 1993), p.2.

that she argues surrounded Victorian poetry as a genre in twentieth-century criticism. Her recovery or rehabilitation of Victorian poetry stresses that it has value as a topic of interest in itself, and not just the transitory moment between the different kinds of 'excitement' found in Romantic and modernist poetry which she argues dominated assessments of the subject for most of the twentieth century.[39] Armstrong's act of recovery has been very influential in shaping the field of Victorian studies. She characterises Victorian poetry as reflecting and processing the anxieties of the period, and reads it through the lens of the broader political, philosophical and, to a lesser extent, scientific texts the poets read. I use the same combination of close reading and historicist interpretation to focus on one particular anxiety, that of a perceived or potential incompatibility between science and religion, and to recover particular texts pertaining to this anxiety. This now twenty-year-old work has been a major influence on how subsequent scholars read Victorian poetry.

As well as drawing upon Isobel Armstrong's idea of the Victorian poetic concern with anxieties, my thesis works across several fields in addition to poetry. I aim to show that poetry had a unique role in some sorts of mediation between science and religion, and explore the ways in which it was an important rhetorical device in popular scientific treatises. In their introduction to the special edition of *Victorian Poetry* on science and Victorian poetry (2003), Gowan Dawson and Sally Shuttleworth concur with Armstrong's identification ten years earlier of a 'heavy silence' around Victorian poetry, and add that 'nowhere has this critical reticence been more conspicuous than in scholarship on the relations between science and literary culture'.[40] While this 'reticence' has lifted somewhat in the thirteen years since the special issue, much work remains to be done to 'deepen our understanding of the range and variety of the creative interpenetrations of poetry and science across the Victorian period'.[41] I aim to show through my examination of the exchange of

[39] Ibid., p.1.
[40] Gowan Dawson and Sally Shuttleworth, 'Introduction: Science and Victorian Poetry', *Victorian Poetry*, 40.1 (2003), 1-11 (p. 1).
[41] Ibid., p.2.

astronomical terminology and allusion between poetry and science writing that useful cross-genre conversation was taking place.

While a limited amount of work has been done which analyses treatises as literature to some extent, such as Gold's *ThermoPoetics* and Bruce Clarke's examination of allegory in scientific treatises in *Energy Forms,* most work which exists on them, including *Energy Forms,* considers them chiefly from a history of science perspective. My thesis will demonstrate what Dawson and Shuttleworth term 'interpenetration' between scientific treatises and epic poetry, arguing that the two genres are in some ways equivalent in their respective fields. Sally Shuttleworth and Geoffrey Cantor's work on periodicals performed a similar task of reading scientific and literary works on the same terms and demonstrating the connections between them.

My thesis focuses on nineteenth century attempts to create a system where science and religion exist without contradiction, analysing poetry and treatises which, by their very insistence that there is no conflict, admit that such a conflict is at least a possibility. While I am not necessarily concerned with determining the existence or not of a conflict per se, there was certainly a contemporary anxiety that there might be one, and it is the strategies used to quell this anxiety that are of interest here. Whether or not a Victorian conflict existed between science and religion, and its nature should there be one, was discussed fairly extensively over the twentieth century by many historians. The roots of the twentieth-century notion of a Victorian conflict between science and religion can be exemplified in John William Draper's *History of the Conflict between Religion and Science* (1874) and Andrew Dickson White's *The Warfare of Science* (1876). Although Draper and White were American, both texts had British editions and were reviewed in British magazines. The British edition of *Warfare* was prefaced by a note from John Tyndall, and was reviewed broadly favourably in *Westminster Review* and *The Athenaeum*, while

History garnered a mixed review from *The Athenaeum*.[42] Thus while both texts were American, both were available to and read by British audiences, and both are referenced by historians studying the Victorian relationship between science and religion in Britain such as Frank Turner.[43]

White and Draper suggest, and are used by later readers to demonstrate, a Victorian conflict between science and religion. Draper argues that Christianity's influence on politics and public behaviour has waned over the centuries, and science is rightfully coming to power in its place:

> The history of science is not a mere record of isolated discoveries; it is a narrative of the conflict of two contending powers, the expansive force of the human intellect on one side, and the compression arising from traditionary faith and human interests on the other.[44]

This idea of religion, specifically but not limited to Catholicism in Draper's case, acting as a restriction upon scientific and thus human intellectual growth, contrasts with White's construction of the 'warfare' between science and religion in 1876. Although both Draper and White seem to argue for a conflict, and both feel that science will eventually win through, Draper characterises the conflict as a zero sum game, where science's triumph is a loss for religion, while White's approach is more nuanced. He suggests that while 'interference with science in the supposed interests of religion […] has resulted in the direst evils both to religion and to science', science that does not attempt to 'interfere' with religion, 'no matter how dangerous

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[42] Unsigned review, 'Art. II – The Warfare of Science', *Westminster Review*, 51.1 (1877), 19-36; Unsigned review, 'The Warfare of Science', *The Athenaeum*, 2549 (1876), 310-311; Unsigned review, 'History of the Conflict Between Religion and Science', *The Athenaeum* 2462 (1875), 21-22.
[43] Frank Turner, 'The Victorian Conflict Between Science and Religion: A Professional Dimension' in *Religion in Victorian Britain IV: Interpretations,* edited by Gerald Parsons (Manchester: Manchester University Press, 1988), 170-197 (p. 171).
[44] John William Draper, *History of the Conflict Between Religion and Science* (New York: D. Appleton and Company, 1874), p. vi.

some of its stages have seemed for the time to be, has invariably resulted in the highest good of both religion and science'.[45]

Other significant Victorians whose opinions of the relationship between science and religion were influential to twentieth-century scholarship include Thomas Huxley and John Tyndall. Biologist Huxley's debate with Bishop Samuel Wilberforce at a meeting of the British Association for the Advancement of Science in 1860 offers a neat symbol for a potential wider conflict, in which religion, represented by Wilberforce, loses an early strong position to eventually be roundly defeated by Huxley and science.[46] In light of these types of polemic, Robert Ensor tactfully suggests that a conflict certainly appeared 'real enough at the time', though other views in the first half of the twentieth century were more dismissive, with Charles Raven suggesting it was simply a 'storm in a Victorian teacup'.[47] Our understanding of the Victorian relationship between science and religion has been hugely refined since then, but Ensor's view remains key to me, as he suggests that since a conflict or the threat of conflict between science and religion was evidently perceived, 'real enough at the time', there is worth in examining the responses to this anxiety around a potential conflict. My thesis draws upon the more recent work on science and religion that examines not simply the existence or not of a conflict, but the more complex and specific relationships between individual sciences and religions.

While there has been a sense of doubt over the existence of a conflict since at least the middle of the last century, the topic has become more nuanced since the late 1980s with the development of several different 'complexity' models developed by James Moore, Frank Turner and others. Robert K Merton suggested in his influential monograph *Science, Technology & Society in Seventeenth Century England* (1970),

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[45] Andrew Dickson White, *The Warfare of Science* (New York: D. Appleton and Company, 1876), p. 8.
[46] Jonathan Smith, "The Huxley-Wilberforce 'Debate' on Evolution, 30 June 1860." *BRANCH: Britain, Representation and Nineteenth-Century History*. Ed. Dino Franco Felluga. Extension of *Romanticism and Victorianism on the Net*. Web. [last accessed 5/4/16].
[47] Robert Ensor, *England 1870-1914* (Oxford: Clarendon Press, 1936), p.162; Charles Raven, *Science, Religion and the Future* (Cambridge: Cambridge University Press, 1943, reprinted 1968), p.33.

that, rather than antagonism, there was 'interchange' between all aspects of society, including religion, and science.[48] He extends this idea of interchange to suggest that the move towards experimental science in the seventeenth century was the result of the 'Protestant ethic', which supplied 'a motive force for the new science'.[49] While his thesis relates only to the seventeenth century, his construction of a relationship between science and religion in which religion could promote rather than constrict science opened the door for similar relationships to be explored in the context of the nineteenth century. The twenty-first century has seen the introduction of yet more subtlety and an increased awareness of the multiplicity of types of relationship that can exist between different sciences and religions, usually more specifically Christian denominations. Aileen Fyfe in *Science and Salvation* (2004), and Dixon, Cantor and Pumfrey's edited collection of essays, *Science and Religion: New Historical Perspectives* (2010) offer two such newer perspectives which show not simply a co-existence but an active attempt at integration between certain sciences and religions, at least from some individuals. This approach takes something from Owen Chadwick's distinction 'between science when it was against religion and the scientists when they were against religion', but adds more fine distinctions, and examines the two on equal ground, rather than science as an attacker of religion as Chadwick's phrasing suggests.[50]

Matthew Arnold is an influential example of a Victorian figure who considered the interactions, not just between religion and science, like White and Draper, but the relation of literature to each of the other two topics.[51] Arnold provides a perspective

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[48] Robert K. Merton, *Science, Technology and Society in Seventeenth Century England* (United States of America: Howard Fertig, Inc., 1970), p. xi.
[49] Ibid., p.81.
[50] Owen Chadwick, *The Victorian Church* (vol 2, New York: Oxford University Press, 1970), p. 3.
[51] Significant recent work on Arnold includes Kevin McLaughlin, *In Poetic Force: Poetry After Kant* (Stanford: Stanford University Press, 2014); Matthew Sussman, 'Stylistic Virtue in Nineteenth-Century Criticism, *Victorian Studies* 56.2 (2014), 225-249; Rhian Williams, "Divine Liquidness of Diction … Divine Fluidity of Movement': Reading Poetry After Matthew Arnold and the Higher Biblical Criticism', *Literature & Theology* 27.3 (2013), 313–329. Clinton Machann writes an annual bibliographical survey of the year's work on Matthew Arnold, most recently 'Matthew Arnold', *Victorian Poetry* 54.3 (2016), 331-335. Little recent work exists on the texts I consider here; two notable exceptions are Sussman's article, above, and Paul White, 'Ministers of Culture: Arnold, Huxley and Liberal Anglican Reform of Learning, *History of Science* 43 (2005), 115-138.

on the 'work' of literature, and specifically poetry, which offers some insight into what makes poetry a particularly useful form for processing issues which straddle the fields of science and literature. In 'The Study of Poetry' (1880), Arnold states that in poetry, unlike in other fields, 'the idea is everything […] poetry attaches emotion to the idea, the idea is fact'.[52] As well as being a vehicle for the pure idea, for Arnold poetry is uniquely sensitive to 'charlatanism', that is, any attempt to compromise 'truth', soundness and 'excellence'; any attempt to be untruthful, unsound or 'inferior' in a poem will destroy it.[53] These characteristics of poetry – that good poetry is absolutely truthful, and acts as a way to convey and attach emotion to idea, fact in its truest form – gives it advantages above both scientific and religious writing, and privileges it to convey ideas attached to both. Despite the advantages of literature, in his 1883 book *Literature and Dogma*, Arnold expresses a consternation that, far from religion and science being in conflict, interpretations of the Bible which permit a close relationship between the two were being prioritised at the expense of earlier, literary methods of engaging with religious texts. He notes that 'it is curious how the feeling of the chief people in the religious world, too, seems to be just now against letters, […] and in favour of dogma, of a scientific and exact presentment of religious things, instead of a literary presentment of them'.[54]

Arnold's views on the limitations of allowing science to be the primary mode of education, rather than the more traditional 'classical' education focusing on literature and the works of the Ancient Greeks and Romans led him to challenge Thomas Huxley in his 1882 address 'Literature and Science'. Huxley made an address in 1880, 'Science and Culture', which suggests that culture as a whole will be 'unable to really advance, if their common outfit draws nothing from the stores of science', and berates classical scholars for their reluctance to include science in their

[52] Matthew Arnold, 'The Study of Poetry', in *Essays in Criticism: Second Series* by Matthew Arnold (London: Macmillan and Co., 1913), 1-55, p. 1.
[53] Arnold, 'The Study of Poetry', p. 2.
[54] Arnold, *Literature and Dogma*, (London: Smith, Elder and Co, 1883).

educational system.[55] Arnold's rebuttal in 'Literature and Science' contends that much of the work of culture is in its influence on 'conduct', which is to say, its moral and emotional imperatives, and science fails to have influence on those terms.

I have looked here at significant works in the fields of Victorian poetry, literature and science, and science and religion. The final field of interest to my thesis is religion and literature. Michael Wheeler's *Death and the Future Life in Victorian Literature and Theology* (1990), and its revised and abridged version, *Heaven, Hell and the Victorians* (1994), offer one of the first and most detailed studies of the literary implications of nineteenth-century theological concerns. Wheeler's approach is historicist, as mine is, but he does not use close reading as a core part of his approach. Wheeler considers 'the ambiguities of Victorian religious terms as features of a shared language of consolation' and argues that 'this consolation was grounded in a specifically Christian hope, and was not merely a symptom of evasion, repression or wish-fulfilment in the face of death and bereavement'.[56] I use the incidence of the 'language of consolation' as identified by Wheeler, in the texts studied here, as another indicator of conversation. I make use of the extensive theological context provided by Wheeler, but add close readings as a supplementary approach.

My thesis contributes to the fields of science and religion, science and literature and religion and literature by extending the two-way relationship between literature and science proposed by Beer, Gold, Levine and others to a three-way one which includes religion. I concur with and add to the body of recent work, such as the writing of Aileen Fyfe and Geoffrey Cantor, which endeavours to add nuance to understandings of Victorian attitudes to the relationship between science and religion. As my thesis draws from several fields, I shall apply techniques and approaches in a cross-disciplinary manner. For example, I utilise the kind of close

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[55] Thomas Huxley, 'Science and Culture', in *Science and Education: Essays* by Thomas Huxley (New York: D. Appleton and Company, 1896), 131-160, p. 144.
[56] Michael Wheeler, *Heaven, Hell and the Victorians* (Cambridge: Cambridge University Press, 1994), p.3.

reading used by Isobel Armstrong in *Victorian Poetry* and the formalist close reading techniques found in Kirstie Blair's *Form and Faith* in my assessment of scientific treatises as well as poetry. I argue that examining scientific treatises as a type of literary text offers a fresh perspective on the genre which can add to our understanding of how science and literature can interact.

Chapter Overview

This thesis consists of five chapters. Chapters One and Two deal with responses to entropic anxieties in the wake of the development of the laws of thermodynamics. Chapter One examines the poetic reactions to the theological issues raised by the idea of a finite and potentially dying universe. I consider the solutions to the problems of thermodynamics suggested by the Catholic poet Gerard Manley Hopkins and physicist James Clerk Maxwell. I argue that tropes of energy, such as imagery of fire, heat or light, play an important role in connecting ideas of God, who is frequently depicted in these terms, with those of science, where energy images are connected with the problem of entropy. In the following chapter, I consider responses to the same thermodynamic anxieties from a scientific perspective, through an analysis of the widely read 1876 treatise *The Unseen Universe* by Balfour Stewart and Peter Guthrie Tait. I examine *The Unseen Universe* as a response to perceived threats to the role of God in science from scientific materialism. I analyse its use of poetry and poetic allusion, as well as literary metaphor, and argue that poetry is used in the text as one way to bridge any perceived divide between science and religion.

In Chapters Three, Four and Five, I turn my attention to space. Chapter Three looks at another type of conversation, in this case a specific debate. I examine the controversy over the possibility of life on other planets, initially raised by William Whewell in *Of The Plurality of Worlds* (1853) and fiercely rebutted by David Brewster in reviews and his counter-treatise *More Worlds Than One* (1854). I consider the theological stakes of the debate for its Victorian participants and readership, and argue that ideas of appropriate language – explicitly scientific versus poetic language – forms a key part of the battlefield on which the controversy is set.

Chapter Four reaches back to the eighteenth century, with an analysis of the Victorian afterlife of Edward Young's eschatological epic *Night Thoughts.* I consider the poem in terms of its role as a symbol of scientific and religious reconciliation in nineteenth-century astronomical treatises, including the cosmic plurality debate I address in Chapter Three. This chapter uses *Night Thoughts* as a case study of religious poetry influencing and informing science writing, and demonstrates a less direct but nonetheless important type of literary-scientific conversation.

My final chapter, on the nineteenth century eschatological epic, considers depictions of the afterlife in poetry as they are informed by scientific ideas, and particularly astronomy. The chapter uses as its case studies *Festus*, a retelling of the Faust myth by Philip James Bailey, and *Yesterday, Today and Forever* by Edward Henry Bickersteth. *Festus*' extended publication history, as well as its extremely inclusive, flexible cosmology and eschatology, which changed slightly in every edition as Bailey expanded it to make space for contemporary trends, provides a useful longitudinal study of changing cosmological concerns over the nineteenth century. Bickersteth's poem is far more orthodox in terms of its theology, but much of its interest lies in it explicit engagement with specific astronomical and geological treatises, including *Of the Plurality of Worlds*. The chapter considers the engagement of *Festus* with astronomy in particular, and *Yesterday* with broader cosmological questions.

Thermodynamic Poetry

Introduction

The first two laws of thermodynamics were stated thus by Rudolph Clausius in 1865:

1. The energy of the universe is constant
2. The entropy of the universe tends towards maximum[1]

At the time of their development these laws were a source of consternation to many, and threatened to jeopardise key beliefs about the nature of God and the future of humanity. These laws gave rise to many attempts to reconcile thermodynamic fact with religious faith, in scientific and religious circles as one might expect, but also in literary ones. This chapter will consider poetic reactions to the laws of thermodynamics from Gerard Manley Hopkins, a devout Roman Catholic poet with limited education in energy physics, and James Clerk Maxwell, an influential physicist and 'genuinely religious' conservative evangelical who wrote poetry as a source of amusement and self-expression.[2]

I begin by considering existing critical work on poetry and energy. I then examine the theological and emotional stakes of the laws of thermodynamics for the Victorians, to try to understand why it elicited such intense reactions from a wide range of people, including many with no substantial scientific training. I then go on to examine three poems by Hopkins and Maxwell which encapsulate each of their strategies for reconciling the eternal existence of God with the laws of thermodynamics. This chapter works in partnership with Chapter Two, as both of them consider reactions and solutions to the theological repercussions of the laws of thermodynamics, and together they demonstrate a conversation between and across

[1] Rudolph Clausius, Quoted in Gold, p. 6.
[2] Matthew Stanley, *Huxley's Church and Maxwell's Demon: From Theistic Science to Naturalistic Science* (Chicago: University of Chicago Press, 2015), p. 5.

Victorian disciplines. This chapter focuses on the solutions to entropy proposed by scientifically-informed poetry. In Chapter Two I consider a solution to the same problem suggested in *The Unseen Universe*, a scientific treatise in which poetry, metaphor and literary allusion are used to supplement its argument. There are direct personal connections linking Maxwell to *The Unseen Universe*: his friendship with one of its authors, Peter Guthrie Tait, and Maxwell's poem, 'To Hermann Stoffkraft, PhD: A Paradoxical Ode', which I examine here and which is a direct response to, and refutation of, the sequel to *The Unseen Universe*, *Paradoxical Philosophy.* Hopkins' connections with *The Unseen Universe* are more tenuous, but they certainly exist. While there is no evidence that he read the treatise, he was certainly aware of Tait, having read and enjoyed his book on optics, *Light* (1884).[3] Further, one of Hopkins' means of processing and resolving the problem of entropy involved a divide between the divine and the earthly which bears similarities to that suggested by *The Unseen Universe.* I address the poetry of Hopkins and Maxwell before discussing *The Unseen Universe* for two reasons. First, in this chapter I argue that energy and affect are intimately connected in Victorian poetry, and that poetry was a key form in which anxieties around thermodynamics were processed. Thus, examining the emotional aspects of thermodynamic anxieties first permits a fuller understanding of the rationale for, and success of, *The Unseen Universe*. Second, Victorian thermodynamic solutions have been addressed several times in the substantial body of critical work on Hopkins, and I use this critical context to inform my later analysis of Maxwell's poetry and, in Chapter Two, of *The Unseen Universe*.

Important work on Victorian thermodynamics and poetry has been done by critics including Gillian Beer, Barri Gold, Jude V. Nixon and Jason Rudy. Taken together, this work has comprehensively demonstrated that the laws of thermodynamics elicited a profound reaction from literary and theological circles, sparking a conversation that continued far beyond the field of energy physics. As

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[3] Gerard Manley Hopkins, letter to Richard Watson Dixon, 7-9 August 1886, in Gerard Manley Hopkins, *The Collected Work of Gerard Manley Hopkins, Volume II: Correspondence 1882-1889, Letters on the Death of Gerard Manley Hopkins*, ed. by RK.R. Thornton and Catherine Phillips (Oxford: Oxford University Press, 2013), 798-801 (p.799).

well as Gerard Manley Hopkins, the other key poet who has received attention for his engagement with themes of energy is Alfred Tennyson.[4] Other poets who are less thoroughly studied for their engagement with themes of energy, but whose work nonetheless could produce illuminating readings, are Thomas Hardy and Matthew Arnold.[5] Gillian Beer considers in *Open Fields* Victorian feelings around the death of the sun, and suggests that 'conversation among articulate Victorians about solar physics […] worked, as half-formulated anxieties will, to generate much imaginative thought and production'.[6] Most of the examples of 'imaginative thought' suggested by Beer are novels, such as *Middlemarch* and *Tess of the D'Urbevilles*. My argument, however, focuses solely upon poetry and treatises. Gold traces the cultural journey of the term 'energy' through various poets and authors, as well as through science writing, suggesting that the former influenced the latter just as much as vice versa; the process was a dialogue rather than just an absorption of scientific knowledge into literature. She draws many parallels between Victorian and contemporary concerns about energy, particularly anxiety about its scarcity and its diminishment. A key point of interest in *Thermopoetics* for the topic of my thesis is Gold's explanation of the affective repercussions of physics, which she helpfully defines as the 'emotional weight attached' to the science as it begins to 'permeate the popular conversation'.[7] While Gold briefly addresses Maxwell's poetry, she does not consider Hopkins. Within Hopkins studies, Jude V. Nixon's work is a very influential reading of

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[4] Examples include Barri Gold, 'The Consolation of Physics: Tennyson's Thermodynamic Solution', *PMLA* 117.3 (2002), 449-464; John Holmes, "The Poet of Science': How Scientists Read their Tennyson', *Victorian Studies* 54.4 (2012), 655-678; Susan Gliserman, 'Early Victorian Science Writers and Tennyson's 'In Memoriam': A Study in Cultural Exchange: Part II', *Victorian Studies*, 18.4 (1975), 437-459.

[5] Studies pertaining to energy in Hardy include: Edward Neill, 'Back to the Future: Hardy, Poetry, Theory, Aporia', *Victorian Poetry*, 36.1 (1998), 75-95 and Anne DeWitt, "The Actual Sky a Horror': Thomas Hardy and the Arnoldian Conception of Science', *Nineteenth-Century Literature*, 73.2 (2006), 549-580. Energy in Arnold: Anne DeWitt, cited above, and John R. Reed, 'Matthew Arnold and the Soul's Horizons', *Victorian* Poetry, 8.1 (2005), 15-24. Both writers are cited often for their engagement in science more broadly, for example in Daniel Brown, 'Victorian Poetry and Science', in *The Cambridge Companion to Victorian Poetry*, ed. by Joseph Bristow (Cambridge: Cambridge University Press, 2000), 137-158; J.O. Bailey, 'Evolutionary Meliorism in the Poetry of Thomas Hardy', *Studies in Philology*, 60.3 (1963), 569-587; Anna Henchman, *The Starry Sky Within*; Morris Sweetkind, 'Poetry in a Scientific World', *The English Journal*, 59.3 (1970), 359-366.

[6] Gillian Beer, *Open Fields: Science in Cultural Encounter* (Oxford: Oxford University Press, 1996), p. 225.

[7] Barri J. Gold, *ThermoPoetics: Energy in Victorian Literature and Science* (London: MIT Press, 2010), p. 41

scientific themes; his analysis of 'tropes of energy in the form of heat, fire and light' in Hopkins' poetry argues that the poet's use of these tropes presents a distinctive interpretation of thermodynamics. In this chapter I extend examination of these 'tropes' to Maxwell as well as Hopkins, and later in my thesis I apply them to the other poets I discuss at length.[8]

Both Beer and Gold deal with 'energy' mostly as it pertains to solar physics and energy physics respectively. Jason Rudy's *Electric Meters*, meanwhile, applies ideas of energy, specifically electricity, to physiology. Rudy draws explicit links between electricity, emotion, and a physical state to argue that Victorian poets 'look to electricity to make sense of poetry's effects on the human body, distinguishing themselves […] in their overriding concern with physicality, with the material human body through which we experience poetry'.[9] I argue that the chief feature which unites the multiple meanings and uses of 'energy', both in Victorian poetry and its modern scholarship, is emotion. Whether 'energy' is being used in its most technical sense or purely figuratively, it is the emotional associations – what energy stands for – rather than technicality – what energy is – that create interest in the term. Energy is not affectively charged only by virtue of being discussed in emotional poetry. Rudy, Beer, Gold, Nixon and others all show that some Victorian poets who made use of the term 'energy', energetic language or energetic tropes within poetry, used these terms and images as a tool of affect with repercussions and connections beyond the scientific. For example, the discussion of the huge matter of entropic apocalypse and its profound theological implications, can be used as a way to work through and consider smaller matters, such as private loss, as in *In Memoriam A.H.H.* (1849), personal difficulties, which can be seen in Hopkins' poetry, or interpersonal differences as in Maxwell's poetry.

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[8] Jude V. Nixon, "Death Blots Black Out": Thermodynamics and the Poetry of Gerard Manley Hopkins', *Victorian Poetry*, 40.2 (2002), 131-155 (p. 131).
[9] Jason Rudy, *Electric Meters: Victorian Physiological Poetics* (Athens: Ohio University Press, 2009), p. 5.

Since thermodynamics in Victorian poetry has been discussed in modern scholarship more than the other topics I consider in my thesis, considering the poetic reactions to thermodynamic anxiety in this first chapter will enable me to demonstrate the broader stakes of these types of discussion before moving on to less thoroughly-examined debates. Chapter One and Chapter Two each present one type of religiously-motivated response to the laws of thermodynamics, and taken together help to demonstrate an important conversation in Victorian culture. I include Hopkins for two reasons. First, he has been relatively well-studied in the field of literature and science, but the complexity of his oeuvre means that interpretations of his work have been by no means exhausted. Secondly, I argue that an important strategy for Hopkins' thermodynamic solution is the division of the energy of the world into eternal, divine and finite, earthly energies. This divided-energy model is in some ways a variant of the same thermodynamic solution which Stewart and Tait propose in *The Unseen Universe,* which I discuss in my next chapter. Hopkins has never before been read alongside James Clerk-Maxwell, though Gillian Beer notes in passing an affinity between the poetic styles of the two, observing that Maxwell's 'Paradoxical Ode', 'though metrically more conservative, has a semantic vigour and precision not unlike Hopkins' own'.[10] I argue that their mutual engagement with the divided-energy model, Hopkins more convinced than Maxwell, enables productive joint readings and demonstrates that Maxwell's poetry, which is much less thoroughly studied than Hopkins, intervenes in significant debates.

This chapter contrasts in many ways with the rest of my thesis. The other four chapters each consider understudied works from Protestant poets, physicists and natural theologians which received very high readerships. Neither of the writers in this chapter achieved much fame as a poet during his own lifetime. Maxwell, of course, made his name as a physicist, not a poet, and the very few poems he did publish generally appeared in scientific journals, while Hopkins' poetry was shared only with his friends until after his death, and was not published in a single volume

[10] Beer, *Open Fields*, p. 256.

until 1918.[11] While Maxwell was a Protestant, and an elder in the Church of Scotland, Hopkins was a Roman Catholic priest.[12] Despite these differences, the poetry of Hopkins and Maxwell still bears relevance to my thesis, and there are possible, interesting comparisons to be drawn between their poems.

Theological implications of thermodynamics

By the time the laws of thermodynamics were formulated in 1865, the term 'thermodynamics' had been in use for about a decade, having been coined by William Thomson, and 'energy' as a term was experiencing a return to the scientific world, from which it had earlier been banished to literary circles as 'a word predominantly for poets'.[13] Essentially, the first law means that the universe will never run out of energy – or gain new energy – but the second law qualifies this rather heartening thought. Because the entropy of the universe tends towards maximum, energy will always convert to less useful, more disorderly forms. Therefore, all of the energy within any closed system is gradually being transferred into a type of energy that cannot be recovered.

A simple example of the effects of entropy can be seen in spinning a bicycle wheel; after the wheel has been pushed, it will rotate a few times before eventually slowing to a halt once more. There is the same amount of energy in the universe after the wheel has spun as before, as the first law states, but the energy has been redistributed in accordance with the second law. Friction and air resistance work against the wheel moving, and the kinetic energy that is sending the wheel around is

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[11] Stella Pratt-Smith, 'Boundaries of Perception: James Clerk Maxwell's Poetry of Self, Senses and Science', in *James Clerk Maxwell: Perspectives on his Life and Work*, ed. by Raymond Flood, Mark McCartney and Andrew Whitaker (Oxford: Oxford University Press, 2014), 233-257 (p. 249); W.H. Gardner, 'Introduction to the Third Edition', in Gerard Manley Hopkins, *Poems of Gerard Manley Hopkins*, ed. by Robert Bridges and W.H Gardner (3rd Edition, London: Oxford University Press, 1948), xiii-xvi (p. xiii).

[12] Philip Marston, 'Maxwell, Faith and Physics', in *James Clerk Maxwell: Perspectives on his Life and Work*, ed. by Raymond Flood, Mark McCartney and Andrew Whitaker (Oxford: Oxford University Press, 2014), 258-292 (p. 279).

[13] On Thomson coining 'thermodynamics': Crosbie Smith, *The Science of Energy: A Cultural History of Energy Physics in Victorian Britain* (London: Athlone Press, 1998), p.150; on energy being a term for poets: Gold, p. 4.

gradually converted into heat energy and sound energy. This waste energy cannot be easily recovered or turned into a form which would allow the wheel to keep spinning, so eventually it slows to a stop. These same laws apply to the universe, but the model is slightly different. A bike wheel is a closed system, which despite its name means that energy can be put in and go out – when the wheel stops turning, someone can put more energy into it by spinning it around again. A bike wheel is called a closed system because it can freely exchange energy with its surroundings, but it cannot exchange matter, unlike an open system, which is able to exchange both matter and energy. Meanwhile, the universe is an isolated system, and the first law says the amount of energy in it is constant: no new energy or matter can come in, and none can go out.

Ultimately, mid-Victorian scientists concluded that the laws of thermodynamics meant that the stars would eventually burn themselves out, and the processes which keep everything moving would sooner or later succumb to the second law. The universe would run down into motionlessness and uniformity. Thus the laws of thermodynamics raise theological questions. For Christians, God is eternal, and so is the afterlife. But since to exist is presumably to use energy, eternal existence violates the second law of thermodynamics. For this reason, developments in the science of energy introduced a number of new problems to Victorian ideas about God and the afterlife. Victorians were quite familiar with the worry that the sun might eventually burn itself out.[14] However, the possibility that the sun, and the universe as a whole, would cool and die was given new urgency with these laws. The time scale involved was unknown, and the likelihood of such an event was now backed with alarming scientific authority. Further, many Victorians were comforted by the prospect of an eternal heaven that awaited them after death, regardless of whether the physical universe might eventually die. But now, they were now forced to consider the possibility that an eternal afterlife ran counter to the laws of thermodynamics, and thus not just this world, but the next, was threatened by the

[14] Beer discusses Victorian mythology around the death of the sun at length in *Open Fields: Science in Cultural Encounter* (Oxford: Oxford University Press, 1996).

spectre of entropy. Therefore, developments in the science of energy introduced a number of new problems – and a renewed vocabulary with which to understand them – to Victorian society.[15] As I argue in the rest of this chapter, poetry was one important form in which these problems were discussed and processed.

Hopkins' Thermodynamic Solutions

As discussed in my introduction, one of the key factors connecting thermodynamics and astronomy is that they raise similar questions and anxieties about the role of humanity in the universe, and humankind's eventual place in the afterlife. This anxiety, as it relates to thermodynamics, is perhaps most acutely expressed among the texts examined in this thesis by Gerard Manley Hopkins' sonnets. I will consider in depth three poems from across the last quarter of Hopkins' life, paying particular attention to what Nixon terms 'tropes' of energy in each work; imagery of fire, light, kinaesthetic energy, and, conversely, their absence. These poems represent a spectrum of feeling on the question of God and energy over an extended period of time. The earliest, 'God's Grandeur' (1877), expresses a simple, joyous faith that God will ultimately provide, regardless of human activity or mundane concerns. Energy suffuses the poem, but it is unaccompanied by any anxiety. The second poem, 'Spelt from Sibyl's Leaves' (1886) was composed during Hopkins' emotional nadir, around the time that he composed the group of poems on religious doubt later termed the 'terrible sonnets'.[16] As might be expected from the poetry at this point in his life, 'Sibyl's Leaves' is a poem which confronts a thermodynamic worst-case scenario, and deals with the possibility of an energetic apocalypse without God. The third and final poem I will examine is 'That Nature is a Heraclitean Fire, and of the Comfort of the Resurrection' (1888). Written the year before Hopkins' death, 'That Nature' comes to a compromise between faith in the

[15] In addition to Smith's *The Science of Energy,* other important work on the Victorian history of thermodynamics include Helge S. Kragh, *Entropic Creation: Religious Contexts of Thermodynamics and Cosmology* (Aldershot: Ashgate, 2008) and Bruce Clarke, *Energy Forms: Allegory and Science in the Era of Classical Thermodynamics* (Ann Arbor: University of Michigan Press, 2009).
[16] Richard J. Walker, *Labyrinths of Deceit: Culture, Modernity and Identity in the Nineteenth Century* (Liverpool; Liverpool University Press, 2007), p. 176.

face of science, and apocalyptic despair. It suggests a divide between divine and earthly energies which allows for an eternal God regardless of the fate of the physical universe.

Hopkins' role as a poet with scientific leanings has been persuasively argued for by Gillian Beer and Daniel Brown in particular. While he lacked a formal scientific education, he did study some mathematics and trigonometry during his time at Oxford and kept careful notes, although he does not seem to have enjoyed the subject much.[17] He did, however, read and engage with scientific writing; Beer notes that he wrote several letters to *Nature* and read the work of Helmholtz and Tyndall, among others.[18] In one letter, to poet Coventry Patmore, Hopkins chides Patmore for his arch assertion in *Love and Poetry* that 'the greatest and perhaps the only real use of natural science is to supply similes and parables for poets and theologians'.[19] Hopkins protests that this is 'a hard saying'.[20] Thus while Hopkins does make liberal use of the imagery of natural science, it is not for this sake that he uses it in his poetry. Brown's extensive reading of Hopkins' poetry in *Hopkins' Idealism: Philosophy, Physics, Poetry* (1997) comprehensively situates Hopkins as a poet with profound scientific interest, whose poetry works to investigate and further these leanings. In addition to the two important contributions from Brown and Beer, there was a trend in the late 2000s of readings of energy and thermodynamics in Hopkins.[21]

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[17] Gerard Manley Hopkins, *Notebook B1on Mathematics and Trigonometry*, personal copy with notes given to be by R.K.R. Thornton; letter to Robert Bridges, 11th December 1886, in *Correspondence* vol. 2., 841-843 (p. 843).
[18] Beer, *Open Fields*, p. 270-271.
[19] Coventry Patmore, quoted in Beer, *Open Fields,* p. 266.
[20] Hopkins, letter to Coventry Patmore, 20th January 1887, in *Correspondence* vol. 2, 249-250 (p. 250).
[21] Jude V. Nixon, "Death Blots Black Out': Thermodynamics and the poetry of Gerard Manley Hopkins', *Victorian Poetry*, 40.2 (2002), 131-155; Joshua King, 'Hopkins' Affective Rhythm: Grace and Intention in Tension', *Victorian Poetry*, 45.3 (2007), 209-237; Susan Chambers, 'Gerard Manley Hopkins and the Kinesthetics of Conviction', *Victorian Studies*, 51.1 (2007), 7-35; Marie Banfield, 'Darwinism, Doxology, and Energy Physics: The New Sciences, the Poetry and the Poetics of Gerard Manley Hopkins.

Nixon describes Hopkins as a 'first-law apologist' as he expresses an assurance that God is the sustaining factor in the universe, so it would not necessarily end in the way predicted by more pessimistic scientists.[22] King makes a similar suggestion, bringing together form and meaning. His reading of Gerard Manley Hopkins' poetry deals with 'energy' in several senses. He considers Hopkins' creative energies, and the 'energy' as a topic of discussion within his poetry. King suggests that Hopkins' sprung rhythm brings together both of these forms of energy.[23] By combining formal and thematic energy, King creates a theory of Hopkins' prosody which unites Hopkins' largely religious poems with their unconventional rhythms. He argues persuasively that all the types of energy expressed in Hopkins' poetry are part of a greater, eternal divine energy; God is the 'stress' that connects idea with form and which drives Hopkins' poetry.[24]

I complicate King and Nixon's conclusion that much of Hopkins' solution to thermodynamic anxiety is that the universe will continue indefinitely through the grace of God. Indeed, the range of attitudes to energy in the three poems I study demonstrates that Hopkins was acutely conscious of the dynamic, ever-changing nature of the cosmos. While he was sometimes satisfied by an eternal, divinely-maintained world as a solution to a physical apocalypse, this was not his only or final attempt at dealing with the problem. I argue that, in addition to a united energy, Hopkins also often proposed a division between divine and natural energies, so that regardless of the fate of the universe, God and the human soul would endure. Divine energy need not obey the normal laws, for God himself is beyond them. Engaging with the emotional charge of energy on a galactic or even universal scale as Hopkins does, provokes emotion not just in its own right, but also links in with smaller emotional concerns. Energy, or the lack thereof, is a topic which is, by its very nature, likely to excite anxiety, despair, and other strong emotions. Furthermore, not quite tautologically, the idea of solar decay and the loss of energy can be used as a

[22] Nixon, p. 144.
[23] King, pp.209-110.
[24] Ibid., p. 210.

device to cause angst and reflection upon other, more easily imaginable topics such as human mortality.

'God's Grandeur'

The earliest, most hopeful and most confident view of energy can be found in 'God's Grandeur'. The basic reason for the thermodynamic confidence in 'God's Grandeur' is that the speaker trusts in God. Importantly, while the poem is full of energetic imagery associated with God and with earthly endeavours, 'God's Grandeur' depicts all energy as being ultimately divine. The poem's thermodynamic confidence is reflected not just in the type of energetic imagery Hopkins uses, but in its form.

'God's Grandeur' is the most well-studied of the poems I examine here, and Elizabeth Villeponteaux calls it 'one of the most popular and immediately accessible Christian poems in the English language'.[25] As such, nearly all of its readings are centred around religion as expressed through the poem. Brown, Villeponteaux and George E. Montag all focus on the image of 'the ooze of oil crushed' in the beginning of the poem.[26] Each of the critics conclude that the oil is olive oil, and they analyse the image for its Christian connotations, and in Villeponteaux's case, its specifically Trinitarian associations with the Holy Spirit.[27] While I read the poem as an essentially deeply optimistic one, Gertrude White focuses mostly on the aspect of sinning alluded to in the middle quatrain. She argues that the structure of God's Grandeur' is imposed 'by the central Christian doctrines: The Trinity, Original Sin, The Incarnation, The Crucifixion, The Resurrection'.[28] White also considers it,

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[25] Elizabeth Villeponteaux, 'Flashing Foil and Oozing Oil: Trinitarian Images in the First Quatrain of 'God's Grandeur'', *Victorian Poetry*, 40.2 (2002), 201-208 (p.201).
[26] Gerard Manley Hopkins, 'God's Grandeur', in *The Poems of Gerard Manley Hopkins,* ed. by Robert Bridges and W. H. Gardner (London: Oxford University Press, 1948), 70-70 (ll: 3-4).
[27] Villeponteaux, p. 201; Daniel Brown, *Hopkins' Idealism: Philosophy, Physics, Poetry* (Oxford: Clarendon Press, 1997), pp. 221-223; George E. Montag, 'Hopkins' 'God's Grandeur' and 'The Ooze of Oil Crushed'', *Victorian Poetry*, 1.4 (1963), 302-303.
[28] Gertrude White, 'Hopkins' 'God's Grandeur: A Poetic Statement of the Christian Doctrine', *Victorian Poetry*, 4.4 (1966), 284-287.

secondarily, as a 'condemnation of the world of industrialism'. This relative singularity of focus, upon the staunchly devotional nature of the poem, stands testament to the singular confidence of the faith expressed in 'God's Grandeur'. I argue that, based on this devotion, 'God's Grandeur ultimately depicts all energy as divine energy.

The depiction of energy in 'God's Grandeur' supports King's claim that Hopkins allows space for a special type of divine energy in his poetry. King argues that Hopkins creates a divine energy which provides the force that the universe needs to continue indefinitely. Thus there is no fear of the death of the sun because the sustaining energy, for Hopkins, is not subject to the laws of thermodynamics.[29] In the words of Beer, "Nature does not make leaps.' For Hopkins, the way out of the 'world's wildfire' is the leap of faith'.[30] This 'leap' is most apparent in 'God's Grandeur'. Unlike the other two poems I will examine, which both begin with natural scenes, the first image in 'God's Grandeur' is firmly centred around God. The sonnet begins and ends with active images of God or God's power working on Earth. The opening and closing lines: 'The world is charged with the Grandeur of God. / It will flare out: like shining from shook foil' and 'the Holy Ghost over the bent / World broods with warm breast and with ah! Bright wings' put divine energy to two different uses, but the type of energy trope used remains consistent.[31] The second line presents an active, bright simile, charging the poem itself with energy as the light of God flashes forth in the poem. Brown notes that the image of 'shook foil' is meant to refer to lightning. He emphasises that this energetic, electric image directly connects the earthly and the divine: 'the image of lightning, an immense electrostatic charge connecting the earth and the heavens, represents the dialectical synthesis of these domains'.[32]

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[29] King, p. 210.
[30] Gillian Beer, *Darwin's Plots,* p. 23. 'Nature does not make leaps' is quoted from Gottfreid Leibniz, *New Essays on Human Understanding* (1704).
[31] Hopkins, 'God's Grandeur', ll:1-2; 13-14.
[32] Brown, *Hopkins' Idealism*, p. 251

The first line of 'God's Grandeur' is a complete sentence, lending its statement an air of certainty; Hopkins offers no opportunity for a reader to doubt his assertion before he moves onto an elaboration of how God's grandeur manifests. The final two lines depict a much gentler image, but they retain similar tropes of heat and light to the opening lines. The adjectives, 'warm' and 'bright', that are associated with the Holy Ghost nurturing the world, pertain to the same basic energies as the metallic brilliance of the 'flame' and 'shining' of line 2. The exclamation, the breathed 'Ah!' in the final line, signals a release and relief from the electrostatic, and divinely powerful, tension established at the beginning of the poem. Brown observes that Hopkins equates Holy Spirit with breath in his poetry; its 'name' is 'spirit or breath'.[33] This sigh is thus a physical enactment of one of the 'names' of the Holy Spirit, but it is also necessarily a physical act. By necessitating a vocalised breath, a sign of physical life, 'God's Grandeur' finishes as it began, with the assertion of an image which unites the earthly and the divine.

The thermodynamic confidence of 'God's Grandeur' is further reflected in its form, in keeping with Blair's preliminary claim that religious faith is reflected in stable forms and rhythms.[34] It is one of Hopkins' least experimental sonnets, conforming closely with the Petrarchan sonnet form. This familiarity adds a further layer of comfort to the poem. Divine energy will keep the world spinning and the soil producing, despite the worries of humanity. Although there is a moment of concern in the second half of the octave, it is brief; the poem opens and concludes with expressions of unwavering faith and religious devotion. Indeed, the doubt from lines 5-10 is directed not at God or divine power, but at humanity and the possibility that it might be failing itself. In the doubting quintet, separation from God is equated with separation from nature. Hopkins asks: 'Why do men then now not reck His rod?'.[35] The answer to this question makes it clear that God's will, the 'rod' man should 'reck', is that humanity should work with nature. The only hint of weariness in this poem is in the trudging repetition of 'have trod'; humanity is tired out by its own

[33] Ibid., p. 302.
[34] Blair, p. 1.
[35] Hopkins, 'God's Grandeur, ll: 4.

work which takes it away from its connection with nature. Humanity renders the soil bare, and separates itself from the earth physically and spiritually. However, even this error on humanity's part is easily fixed, and the reader is reassured by the end that despite humanity's foolishness, a benevolent, parental God watches over us.

'God's Grandeur' is characterised above all by certainty and hope. It is the only one of the three poems examined here which uses the future tense – the grandeur of God '*will* flame out'.[36] This tense suggests a certainty in an earthly future which is totally absent in 'Sibyl's Leaves' and ambivalent even in 'That Nature'. Divine energy charges even darkness in 'God's Grandeur'. Dark, deep soil nurtures the 'dearest freshness', and when the sun sets, with 'last lights off the black West', there exists utter faith that the sun will rise again.[37] The certainty of 'God's Grandeur' is made possible by asserting a unified earthly and divine energy.

'Spelt from Sibyl's Leaves'

Nine years after the calm reassurance of 'God's Grandeur' and its unified spiritual and earthly energy, Hopkins wrote 'Spelt from Sibyl's Leaves', a poem of acute thermodynamic anxiety. It is Hopkins' only poem dealing with themes of energy, entropy or apocalypse, which offers no hope of eternity or eternal energy to lighten the prospect of entropy. Significantly, it is also one of very few poems that considers energy without ever mentioning God or the divine. In most of Hopkins' poems of doubt, the very worry about the speaker's relationship with or concerns about God, brings God into the poem – even if the speaker is despairing that he can't feel God's presence at all, he is still thinking of God and thus there is still the possibility of, and hope for, a renewed sense of closeness and religious comfort. No such possibility is discussed plainly in 'Sibyl's Leaves'. Earth and humanity are alone in the universe to come to terms with their fate. Hopkins offers no real solutions, but rather simply demonstrates the importance of having a way to

[36] Ibid., ll: 1, italics mine.
[37] Ibid., ll: 10; ll: 11

reconcile any contradictions between God and thermodynamics. Without such a strategy, in Hopkins' poetry at least, the world becomes very bleak.

Nixon describes 'Sibyl's Leaves' as Hopkins' 'most intentional poem on endism, except, perhaps, 'The Wreck of the Deutschland".[38] He examines it in similar terms and with similar conclusions to my own; that the poem depicts the end of the world without divine intervention. However, Nixon's analysis of the poem is based largely on its themes and language, while I add consideration of formal elements to my examination of the poem. The themes of apocalypse naturally dominate readings of the 'Sibyl's Leaves', though the emphasis and methodologies differ. William Joseph Rooney argues that in addition to the failure of the world to survive within the narrative of the poem, the poem itself is a failure, lacking 'structural integrity' and consistency.[39] I disagree with this assessment, arguing that rather the structure is an integral and intentional part of the poem's apocalyptic scheme. While I argue that 'Sibyl's Leaves' is devoid of God's presence, James Finn Cotter conversely argues that the imagery of the evening and night-time in the poem evokes images of the Passion of Christ.[40] While the parallels he draws are persuasive, I argue that the images of 'Night' which he Cotter sees as recalling the passion, rather take after traditions of personifying nature. I concur with Nixon that in 'Sibyl's Leaves', humanity's fate is linked with nature's, both facing an entropic doom.[41]

'Sibyl's Leaves' explores the results of the earth being 'unbound' – succumbing to entropy – and the dreadful uniformity which comes with this development.[42] The poem explores the repercussions of an entropic world, presenting a kind of worst-case scenario. Although there is none of the naked despair that one might find in one of Hopkins' 'terrible sonnets', or Tennyson's *In Memoriam*, for

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[38] Nixon, p.
[39] William Joseph Rooney, 'A Study in Contrasting Methods of Evaluation', *The Journal of Aesthetics and Art Criticism*, 13.4 (1955), 507-519 (p. 511).
[40] Finn James Cotter, "Hornlight Wound to the West': The Inscape of Passion in God's Poetry', *Victorian Poetry*, 16.4 (1978), 297-313 (p. 305).
[41] Nixon, p. 148.
[42] Gerard Manley Hopkins, 'Spelt from Sibyl's Leaves', in *The Poems of Gerard Manley Hopkins,* ed. by Robert Bridges and W. H. Gardner (London: Oxford University Press, 1948), 104-105 (ll: 5).

example, the world presented in 'Sibyl's Leaves' is a dismal one. The bleakness of an entropic future which it communicates is perhaps all the more effective for the lack of explicitly named or described emotion.

Although Hopkins stipulated that 'Sibyl's Leaves' was written to be read aloud, and that he hoped the poem would be 'almost sung', the punctuation defies steady or easy recitation.[43] Only one line has fewer than two punctuation marks, and most are filled with commas and other caesuras. Hopkins comments more than once in his letters that it is the longest sonnet 'ever made'.[44] With an average of ten metrical feet per line, 'Sibyl's Leaves' becomes a kind of double sonnet. This length, combined with the myriad of pauses in each line acts to prevent a reader from gaining a sense of the larger scheme of the poem. Unlike the simplicity of form in 'God's Grandeur', where divine energy within the poem asserts order upon the world, here there is no such guiding force. The reader instead has to fight – to expend their own energy, mentally and performatively – to impose sense and order on the lines. Nixon observes that 'entropy is also loaded with information'; accordingly, in this sonnet of entropy, each line is burdened with a double count of feet, overloading the sonnet form with anxious entropic noise.[45]

The lists of similar-sounding words are reminiscent of those in 'That Nature is Heraclitean Fire': 'long lashes lace, lance and pair' compared to 'selfwrung, selfstrung, sheathe- and shelterless',[46] but to very different effect. In 'That Nature', the poem's use of alliteration and assonance is energetic and joyful, imitating an eternal, God-sustained fire. The same devices in 'Sibyl's Leaves' instead evoke the shapelessness and uniformity that is entropy's final result. Similarly, the use of repetition, which in the closing lines of 'That Nature' are an indication of steadiness

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[43] Gerard Manley Hopkins, letter to Robert Bridges, 11th December 1886, in *Correspondence*, vol. 2, 841-843 (p. 842).
[44] Ibid., also Letter to Robert Bridges, 26th November 1886, in *The Collected Works* Vol 2, 839-840 (p. 839).
[45] Nixon, p. 139.
[46] Hopkins, 'That Nature', ll: 4; 'Sibyl's Leaves', ll: 14.

and certainty imparted by religious faith, has instead an unsteadying effect in 'Sibyl's Leaves'.

The rhyme scheme too speaks of stasis: the octave, describing an evening scene, seems to progress, with three rhyming couplets, but the eighth and final line rhymes with the first: 'stupendous' and 'will end us'. The reader ends up back where they started, despite the sense of movement forward that changing rhymes can give. The sestet too, with its ABABAB scheme, is constantly pulling the rhyme back. Every movement towards the B rhyme is countered in the next line by the move back to A, and the settled repetitive scheme reflects the unchanging nature of a future world with maximum entropy.

Light and other energy tropes are dwarfed here, which is perhaps to be expected with the total absence of God from the poem. After the enormous majesty and relatively lengthy description of 'womb-of-all, hearse-of all-home of all night', the sun and moon described on the next line seem trivial and lifeless. The sun is a 'fond yellow hornlight', the moon a 'wild hollow hoarlight', and both are objects belonging to a personified night.[47] Light here has none of the power, motion and divine strength lent to it in the other poems I discuss here; in 'Spelt from Sibyl's Leaves', darkness and entropy have won out.

'That Nature is a Heraclitean Fire and of the Comfort of the Resurrection'

'That Nature is a Heraclitean Fire and of the Comfort of the Resurrection' is described by Jozef de Vos as Hopkins' 'last masterpiece', yet it was comparatively rarely studied until quite recently.[48] With the notable exception of Stephan Walliser's extremely thorough 'Case Study' of the poem, it tended to be mentioned only in passing, read for one or two lines to strengthen an argument rather than assessed as a

[47] Hopkins, 'Sibyl's Leaves', ll: 4.
[48] Jozef de Vos, 'Walliser (Stephen). *That Nature is a Heraclitean Fire and of the Comfort of the Resurrection: A Case-Study in G.M. Hopkins' Poetry*, *Revue Belge de Philology et d'Histoire*, 60.3 (1982),759-760. (p. 759).

whole or in its own right.[49] The reason for this dearth of criticism for so long is unclear; perhaps it is simply because the poem covers similar ground to other poems, such as 'God's Grandeur', but in an arguably less appealing or accessible manner. Alternatively, it may seem out of place chronologically alongside thematically similar work, since it was written in 1888, long after the bulk of the poems which are identified by Nixon as exploiting 'the general energies of the universe'.[50] Nevertheless, 'That Nature' provides a useful insight into Hopkins' construction of the relationship between energies and God, and it has recently come under closer critical scrutiny. The majority of the studies of the poem focus either upon the exact nature of the religious comfort provided by the poem, or on Hopkins' use of Heraclitus. My examination of the poem addresses both of these things to some extent, but my primary concern is in examining the role and types of energy within the poem.

Daniel Brown's reading of the 'That Nature' focuses mostly upon the final image in the poem: 'This Jack, joke, poor potsherd, patch, matchwood, immortal diamond, / Is immortal diamond'.[51] He argues that the image exemplifies Hopkins' 'principle of Being', which emphasises multiplicity of layers. The layers most relevant to my thesis are the layers of mortality and immortality, human body and eternal soul, which are held in the image of the diamond, which is 'at once God, the transcendent whole of 'Being', and the fluctuous manifold of 'Not-being' manifest in Creation and history'.[52] This tallies with my general argument that 'That Nature' finds comfort in assigning eternity to a specific, divine energy, though my study takes into account the poem as a whole. Brown's focus on the final lines of the poem echoes Michael L. Johnson's emphasis on the same lines in his much earlier study of the function of religion and comfort in the poem. Johnson argues that the consolation

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[49] Stephan Walliser, *'That Nature is a Heraclitean Fire and the Comfort of the Resurrection: A Case Study in G.M Hopkins' Poetry* (Bern: A. Francke, 1977).
[50] Nixon, p. 134.
[51] Gerard Manley Hopkins, 'That Nature is a Heraclitean Fire and of the Comfort of the Resurrection', in *The Poems of Gerard Manley Hopkins,* ed. by Robert Bridges and W. H. Gardner (London: Oxford University Press, 1948), 111-112 (11: 22-23).
[52] Brown, *Hopkins' Idealism*, p.180.

of the poem comes from the synthesis of the natural and the divine, but I maintain that rather the comfort of the poem is found in the fact that two are held mostly separate.[53] Other relatively recent readings include Thomas J. Steele's brief article on the significance of fire and bonfire in 'That Nature' in light of late-Victorian controversies around cremation and L.H. Lesher's reading of Hopkins' use of Heraclitus.[54]

The poem is split into two parts, each of which describes a related but contrasting world view. The first part focuses on nature, depicting a landscape after a storm. It uses Heraclitus' idea that '(The ordered?) world, the same for all, not god or man-made, but it always was, is, and will be, an everliving fire, being kindled in measures and being put out in measures'.[55] The second part turns to religious themes and considers the resurrection. The poem describes humanity's fortune as their nature, being 'all at once what Christ is', exempts them from the vagaries of nature as described in the first part, and grants them immortality in God's divine light.[56] Heraclitus' conception of the world placed fire as the most important of the classical elements, comprising 'the basic material of the world', and much of his work describes the way in which fire works,[57] both with the other elements and in its role as base stuff. Fragment 31 in particular, quoted above, captures the integral role which Heraclitus assigned fire, and shows many of the qualities which 'That Nature' uses in describing the natural world in the first part of the poem. The fragment identifies all of creation as an eternal fire, similar to Hopkins' idea of a sustaining, eternal light; however, there are two key differences between Heraclitus' fire and Hopkins' eternal light. First and foremost, their sources are different – the fire is

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[53] Michael L. Johnson, 'Hopkins, Heraclitus, Cosmic Instress and the Comfort of the Resurrection', *Victorian Poetry*, 10.3 (1972), 235-242 (p.235).
[54] Thomas J. Steele, 'Hopkins' Masonic Bonfire', *Victorian Poetry*, 35.2 (1997), 233-235; J. H. Lesher, 'Hopkins' Creative Use of Heraclitean Materials', *International Journal of the Internation Tradition*, 18.2 (2011), 262-269.
[55] Heraclitus, 'Fragment 30', in *Heraclitus: Fragments: A Text and Translation with a Commentary*, ed. by T.M. Robinson (Toronto: University of Toronto Press, 1991), p. 96.
[56] Hopkins, 'That Nature', ll: 21.
[57] Daniel W. Graham, 'Heraclitus', *The Stanford Encyclopedia of Philosophy (Summer 2011 Edition), ed. by* Edward N. Zalta. <http://plato.stanford.edu/archives/sum2011/entries/heraclitus> [Accessed 30/10/11].

natural while the light is decidedly divine. Second, while the fire flickers, the light is steady.[58]

The first part of the poem, which ends halfway through line 16 with the exclamation, 'Enough!', gives a rousing, energetic description of the natural world according to this philosophy. Because all things inevitably change and transmute within the cycle of Heraclitean fire, humans also ultimately die; their 'firedint' is 'gone', and they are quickly folded back into the 'everliving fire'.[59] Although Heraclitus's fire is not compatible with thermodynamics, relying as it does on a universe that 'always was and is', it does resonate with nineteenth century concerns which sprang up with the formulation of the laws of thermodynamics that eventually the cosmos might become uniform, all energy converted into an inaccessible form. Furthermore, the qualification which Heraclitus grants his fire, stating that is 'kindled in measures' and 'put out in measures' can be seen as an early echo of this idea, or it may at least be related to as such. Similar anxieties can be reflected powerfully in the first part of Hopkins' poem; 'but vastness blurs and time beats level'.[60] After this world view is established, Hopkins abruptly brings it to a halt to commence the second part of the poem, which describes 'the comfort of the resurrection'. In this part, the idea of fire and of eternal energy continues, but it is not mindless and cyclical as Heraclitus describes. Rather, the energy is divine rather than just a fact of the universe, and it removes mankind from Heraclitus' inexorable fire, allowing part of them –presumably their souls – to live on regardless. Fire, heat and light are, as Nixon establishes, a 'trope' of energy which Hopkins often exploits, and fire in particular is a clear focus in 'That Nature'.[61] Here Hopkins establishes an important distinction between natural energy, created by but not of God and which conforms with established, potentially problematic scientific laws, and divine energy, which bypasses the laws to which other forms are subject. This difference is established

[58] In addition to L.H. Lesher's article, another very detailed reading of Heraclitus in Hopkins' poetry can be found in William D. Foltz, 'Hopkins' Greek Fire', *Victorian Poetry*, 18.1 (1980), 23-34.
[59] Hopkins, 'That Nature', ll: 11.
[60] Ibid., ll: 11.
[61] Nixon, p. 131.

from the very title, where 'Nature' and 'the Resurrection' – a clear reference to the spiritual – are set as two decidedly distinct ideas.

'That Nature' is mostly in running rhythm, which is to say, trochaic and with two or three syllables per foot. This metre lends an inexorable, rolling sense to the poem. The enduring, ever-shifting nature of the Heraclitean fire is reflected in the repeated use of several similar-sounding words together, for example 'lashes lace, lance' and 'stanches, starches', each word subtly changing to show the constantly shifting nature of eternal fire according to Heraclitus.[62] The internal rhyme and assonance which runs throughout the poem also adds to this; each word seems to stem from or allude to another, similar to the way in which everything in the system of Heraclitean fire moves from one state to another, each related but separate. The first sentence in particular, from lines 1-3, establish a flowing, unrelenting rhythm reinforced by the enjambment through a hyphenated word; the natural world goes on, ever-changing but unceasing, regardless of what else is happening. Although there are a number of pauses indicated by the punctuation in the earlier part of the poem, the two extreme, exclaimed caesuras between the first and second sections, 'Enough! / The Resurrection, a heart's-clarion!' end a stream of sentences which are all at least two lines long with a series of short, sharp fragments.[63] This interruption, this 'Enough!', happens midway through a line, emphasising the strength of the new idea Hopkins is about to introduce; it is powerful enough to cause the poem to cut itself off and change direction mid-flow.

Along with this formal closing-in, where sentences are long and flowing at the beginning of the poem, but short and sharp at the volta, the poem's viewpoint also narrows in and moves earthward. It begins with a panoramic view of clouds, then brings the view down to the treeline – repeating the word 'down' twice in doing so, and down again to the earth itself.[64] Although the poem then seems to move up again to the people walking on it, the idea of the earth, of pressure and of heat under the

[62] Hopkins, 'That Nature' ll: 4; ll:7
[63] Ibid., ll: 16-17.
[64] Ibid., ll: 3.

earth, clearly remains planted in the poem, as it re-emerges, transformed, at the end of the 'Comfort' section as a metaphor of the saved and soon-to-be resurrected soul; 'immortal diamond'.[65] The repetition of this image, over two lines: 'immortal diamond,/ Is immortal diamond' is a prime example of the change in flow, pace and rhyme which occurs between the two parts of the poem.[66] Whereas the first half is in constant flux, the second is more stable, reflecting the constancy of the divine. The repetition reinforces this idea; any word repeated in the first part of the poem is transmuted into a slightly different one, whereas here, under the 'eternal beam' of God's power, the 'immortal diamond' is protected and exempt from the chaos of constant change.[67]

The rhyme scheme further underscores the distinction between the natural and divine worlds. In the first part, the rhyme scheme changes partway through, from a repeated ABBA scheme to a repeated CDCD one. The fluctuation even within the schemes – alternating rhymes rather than couplets, for example, reflects the changing nature of the world; a word is mentioned, the rhyme abandoned for a couple of lines then picked up again before that scheme is abandoned for a new one as a new measure of Heraclitean fire is kindled. The final nine lines, in contrast, are a trio of rhyming triplets which also feature some internal rhyme. This lends an air of stability to a previously changeable scheme; the triplets hold the rhyme slightly longer than one might expect, as they are not as common as couplets in Hopkins' poetry, so the unusually sustained rhyme emphasises the sustained, unchanging nature of God.

Light, fire and fiery imagery permeate the poem, 'being kindled in measures and being put out in measures', especially at the volta where, 'death blots black out' and the nature of the fire and light changes, as the temperamental fire of the natural world is replaced by the steady beam of divine light.[68] In the first part, light is tumultuous and constantly changing – 'Shivelights and shadowtackle in long ' lashes

[65] Ibid., ll: 23-24.
[66] Ibid.
[67] Ibid.
[68] Ibid., ll:14.

lace, lance, and pair' – reinforcing the sense of movement present throughout the 'Heraclitean fire' section.[69] In addition to its kinetics, it is also intermittent; by the end of the section, light has disappeared altogether, blotted out by death. Likewise, fire takes the shape only as sparks, inevitably snuffed out too soon. The second part, however, characterises light very differently. Whereas in the first part, light and earth are linked, the images of one flowing from and into the other, in the second light is isolated from anything earthly; it is pure, consistent and divine. The reason for this, it is clear, is that the light and fire of the first part are natural, while in the second they are divine; light here is 'a beacon, an eternal beam', preventing man from drowning in 'an enormous dark', i.e. death, and being thus permanently quenched.[70]

'That Nature' in many ways exemplifies the ways in which Hopkins attempts to reconcile the laws of the natural world with his Catholic beliefs. Although the second law of thermodynamics seemed to question the possibility of an eternal or all-powerful God, and suggested a literal and metaphorical dark far future in which the cosmos winds down, Hopkins' solution is to separate the natural and the divine, exempting God and by extension humanity from the harsh laws of the rest of nature. The natural world described in the first part of 'That Nature', while vivid, exhilarating and rather beautiful, is also chaotic and without clear direction. It is the description of the divine part of humanity's makeup, that which may be lit by the 'eternal beam' of God's divine light, which gives the poem its stability, eventually grounding in an image which combines the distinctly earthly with the unquestionably divine. This essentially reassuring poem, replete with light and fire, is fairly typical of Hopkins' approach to questions of faith and nature; he consistently creates a distinction between the natural and the divine, and characterises the divine with energetic imagery.

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[69] Ibid., ll: 4
[70] Ibid., ll:18; ll:12.

The scientific poetry of James Clerk Maxwell

Maxwell and Hopkins necessarily have very different relationships with the laws of thermodynamics, in the sense that Maxwell was one of several physicists who contributed to their development. Hopkins' response to thermodynamics is reactive, an attempt to process something beyond his control, but Maxwell's extensive work in energy physics means that his poetry is in some ways productive; a way to add to the sum of thermodynamic knowledge. In contrast to Hopkins, whose poetry has received a lot of critical attention, Maxwell's poetry has only begun to attract interest from scholars very recently. The exception to this general trend is Beer's twenty-year-old chapter on the rise of literary modernism in *Open Fields*. Jason Rudy suggests that Maxwell's poetry 'is not the sort that rewards reflection', but Stella Pratt-Smith and Daniel Brown have since both published extended assessments of Maxwell's poetry.[71] Brown considers poetry to be 'one of Maxwell's great ludic forms', and argues that his poetry about science offer 'a unique record of the creative play and critical perspectives of the greatest physicist of his age'.[72] He places Maxwell at the centre of his study of Victorian poet-scientists. He argues that nonsense, such as the light-hearted verses penned by Maxwell, helps to challenge accepted norms of knowledge until the 'new and audacious speculations and discoveries' have joined the mainstream, as well as demarcating 'the boundaries of scientific knowledge'.[73] I draw upon Brown's interpretations of play in Maxwell, as Brown's views shed useful light upon Maxwell's general poetic approach, but my analysis of his work is thematically focused upon thermodynamics and thermodynamic anxiety, or its absence, specifically. As I have discussed in my introduction, this thesis explores the relationship between literary and scientific writing in terms of the conversation model, whereby ideas, images and language are shared and move between literature, science and Christianity. In this section I use this conversation model to examine Maxwell's poetry as a means of engaging with and

[71] Rudy, p. 3.
[72] Daniel Brown, *The Poetry of Victorian Scientists,* p. 37.
[73] Ibid.

reflecting his own professional community, beyond formal channels of discussion such as publications or addresses. I shall examine Maxwell's wider view of the relationship between science and religion as expressed in two poetic responses to the physicist and proponent of materialism, John Tyndall. I will also consider Maxwell's religious convictions and their effect upon his views of thermodynamics as expressed through poetry.

Pratt-Smith's work is a fairly general survey of Maxwell's poetry which examines his major poems in chronological order to trace his development personally and professionally. Pratt-Smith notes the connections between mathematics and poetry which may have made both forms appealing to Maxwell: 'Just as mathematical symbols are a method of shorthand, the condensed poetic form can signify the elusive nuances of matters ostensibly beyond its means'.[74] Indeed, the highly formalised nature of Maxwell's work, usually in very regular meter and rhyme, seems to bear out this assessment. The quite detailed map that Pratt-Smith creates of Maxwell's life and social connections as reflected in his poetry is important for my own argument that Maxwell's poetry constitutes a useful contribution to Victorian thermodynamic conversations. Beer considers Maxwell's poetry briefly as part of her more general discussion of realism and imagination in science writing, in which Maxwell's work is the primary case study. Her assessment of the place of Maxwell's religion in his poetry is the most important point she makes for my thesis. She states: 'Maxwell combines the extreme of scepticism with the extreme of faith, remaining always devout while teasing out the obduracies of the invisible material world'.[75] She argues that Maxwell's 'theological comfort' comes from distinguishing between 'human science', which is to say, current scientific knowledge, complete with its shortcomings and limits, and 'the enduring energies and dissipations of the universe'.[76] By accepting that human understanding of the universe can never be complete, says Beer, Maxwell's 'God can remain stable',

[74] Pratt-Smith, p. 241.
[75] Beer, *Open Fields*, p. 309.
[76] Ibid.

existing in the gap between human understanding and the universal realities that exist beyond it.[77] I extend this reading and apply it to a wider range of poems.

Pratt-Smith, and to a lesser extent Brown and Beer, draw attention to the allusive and responsive elements of Maxwell's poetry, illustrating 'Maxwell's continued fascination with interconnectedness and with the place of the individual in relation to the whole'.[78] Many of his poems are written as a play on the work of another poet, such as Tennyson or Shelley. Others are a response to something he read or heard from within the scientific community, such as Tyndall's Belfast Address or Stewart and Tait's *The Unseen Universe* and its sequel *Paradoxical Philosophy*. Still other poems, mostly ones written later in his life, make reference to the British Association for the Advancement of Science (BAAS) and the Red Lion Club. Thus, although Maxwell's poetry did not engage with contemporary discussions through publication to the same extent as other works considered in this thesis, it still conversed in a way with contemporary ideas of poetry, science and religion.

As Brown observes, Maxwell's very initials connect him with the laws of thermodynamics. His letters to Peter Guthrie Tait were often signed '$\partial p/\partial t$', which is explained by Tait's biographer Cargill Gilston Knott to be 'JCM', both Maxwell's initials and an 'expression for the Second Law of Thermodynamics'.[79] This pun, notes Brown, is on both Maxwell's 'initials and his mortality […] The working scientist will become a cold body'.[80] This juxtaposition of a joke with a stark scientific reality typifies Maxwell's approach to poetry, in which he brings lightness and humour to bear on a range of scientific ideas and debates. I will discuss two poems which consider to some degree issues of thermodynamics. Like the Hopkins poems, I shall address them in the order in which they were written. The first, 'To the

[77] Ibid.
[78] Ibid., p. 245.
[79] Cargill Gilston Knott, *Life and Scientific Work of Peter Guthrie Tait, Supplementing the Two Volumes of Scientific Papers* (Cambridge: Cambridge University Press, 1911), p. 101.
[80] Brown, *Victorian Scientists*, p. 39.

Chief Musician Upon Nabla: A Tyndallic Ode' (1871), uses dramatic thermodynamic tropes to criticise Tyndall's materialist views. The other poem I will consider is 'A Paradoxical Ode', a response to Stewart and Tait's *Paradoxical Philosophy*, the sequel to the popular treatise *The Unseen Universe*. Here, Maxwell expresses in gently humorous verse his objections to Stewart and Tait's model of the universe in which, by dint of ether, energy can be transported between the divine and spiritual realms to circumvent the second law and enable the universe to remain eternal. Maxwell's poetry is not as energetically dynamic as Hopkins' poetry, but equally the poems are not fraught with the same degree of thermodynamic anxiety. For Maxwell, the second law, as suggested by his punning signature, is something he has learned to live with.

'To the Chief Musician upon Nabla: A Tyndallic Ode'

'A Tyndallic Ode' is the more publicly shared of the two poems examined here. Published anonymously in *Nature* in 1871, the title immediately places the poem within a specific network of physicists.[81] The 'Chief Musician' to whom the poem is dedicated is Maxwell's friend and fellow North British Physicist, Tait. The title Maxwell bestows upon him refers to Tait's discussion of the 'nabla' symbol in mathematics, which resembles a harp.[82] The 'Ode' is named for John Tyndall, with whom Maxwell differed ideologically, theologically and personally. Pratt-Smith and Brown provide the two most extended readings of the poem, though Beer discusses it briefly as a 'half celebration, half mockery' of Tyndall's Rede Lecture on radiation and his paper 'On the Blue Colour of the Sky, and the Polarisation of Skylight'.[83]

Pratt-Smith's reading of the poem draws attention to the personal and religious differences it demonstrates between Maxwell and Tyndall. She identifies erotic

[81] Pratt-Smith, p. 249.
[82] Lewis Campbell and William Garnett, *The Life of James Clerk Maxwell: With a Selection from his Correspondence and Occasional Writings and a Sketch of his Contributions to Science* (London: Macmillan and Co, 1882), p. 322 fn.
[83] Beer, *Open Fields*, p.308-309.

imagery which she suggests is Maxwell's way of mocking Tyndall's reputation for being overly fond of women, a trait of which Maxwell disapproved.[84] She also notes that the conclusion of the poem illustrates the fundamental incompatibility between Maxwell and Tyndall's approach; Maxwell cannot agree with Tyndall's point of view because 'it has no proper foundation in religious belief'.[85] Daniel Brown makes many of the same general points as Beer and Pratt-Smith, focusing again upon what the poem reveals about Maxwell and Tyndall and their professional and personal relationship. He supplies very thorough context for the poem, considering not just the direct allusions from within 'A Tyndallic Ode', but explaining in some detail each of the debates involving Tyndall to which the poem refers. Brown includes Tait in his discussion of the poem's background.

The version of 'A Tyndallic Ode' I will consider here is the longer version from Maxwell's collected papers; the one published in *Nature* was only four stanzas, while the full version is twice as long. The poem is a parody of Tyndall's style and his conclusions. It is ultimately a rejection of Tyndall's world view. The first three stanzas are each a study in a thermodynamic trope: heat and cold, fire, and light and dark respectively, as well as a summary of three of Tyndall's experiments.

The dramatic thermodynamic images are given urgency by the rattling iambic meter, while the use of balladic quatrain, trimeters framed by tetrameters, calls to mind traditions of rousing tales of adventure. Each of the first three sections are studies in contrasts. The second stanza, based on Tyndall's experiments producing variously coloured lights from different metals, including thallium, uses particularly strong imagery:[86]

> I come from empyrean fires—
> From microscopic spaces,
> Where molecules with fierce desires,

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[84] Pratt-Smith, p. 250.
[85] Ibid.
[86] John Tyndall, *Heat: A Mode of Motion* (London: Longmans, Green & Co., 1868), pp. 467-468.

> Shiver in hot embraces.
> The atoms clash, the spectra flash,
> Projected on the screen,
> The double D, magnesian b,
> And Thallium's living green.[87]

Maxwell evokes excitingly physical imagery, in which molecules embrace and shiver together, and light of different varieties abound. The stanza ranges throughout time and scale, from ancient Greece, to the private lives of personified atoms and molecules, and then finishes with a return to human scale and Tyndall's Victorian experiments. The stanza, and the poem as a whole, is chaotic with ever-changing images, from 'fields of fractured ice' which 'get warm again by freezing', to 'empyrean fire', the 'electric ray' and the 'thrilling, drilling scream' of industrial sirens.[88] The point of view moves from the first person narrator, the character of Tyndall, to first person plural in the third stanza, and second person in the final stanza. It only becomes apparent that the speaker is Tyndall in the fifth stanza, when Maxwell mocks Tyndall's energetic presentation style: 'I stamp, I whistle, clap my hands, and stamp upon the platform'.[89] As well as narrative voice, the location of the poem changes in every stanza, from ice fields to a lecture theatre to the sun.

In short, the poem is filled with movement, colour, heat, light and energy, in chaotic diversity. Schaffer suggests that Maxwell saw 'molecular uniformity as a sign of divine purpose and free will'.[90] Certainly, without the guiding hand of God, a materialist world as envisioned in 'Tyndallic Ode' is unordered and overwhelming, calling to mind the entropically unbound elements in 'Sybil's Leaves'. Despite this similarity in tone, the anxieties in 'Tyndallic Ode' are not to do with

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[87] James Clerk Maxwell, 'To the Chief Musician upon Nabla; A Tyndallic Ode', in Lewis Campbell and William Garnett, *The Life of James Clerk Maxwell: With a Selection from his Correspondence and Occasional Writings and a Sketch of his Contributions to Science* (London: Macmillan and Co, 1882), 323-324 (ll: 9-16).
[88] Ibid., ll: 1; ll: 4; ll: 9; ll: 25, ll: 49.
[89] Ibid., ll: 37.
[90] Simon Schaffer, 'Metrology, Metrication, and Victorian Values', in *Victorian Science in Context*, ed. by Bernard Lightman (Chicago: University of Chicago Press, 1997), 438-474 (p. 465).

thermodynamics; the lavish energetic imagery is unaccompanied by any hint or fear of entropy. Rather, the poem's objection is to Tyndall's materialism. The instability of view and image expressed throughout the poem finds its most explicit image in the final stanza, when the Tyndall character instructs his audience to 'prepare your mental bricks' to construct a tower of Babel. The instability of the viewpoint is echoed by the instability of the tower of knowledge Tyndall invites his followers construct, and it is, of course, doomed to fail as it has not been sanctioned by God. Thus the varied energetic imagery in 'Tyndallic Ode' does not necessarily speak to thermodynamic anxieties, but tropes of energy can be used more broadly to demonstrate proper and improper constructions of the relationship between science and religion.

To Hermann Stoffkraft, PhD: A Paradoxical Ode

The second poem I will discuss is 'To Hermann Stoffkraft, PhD: A Paradoxical Ode'. The poem is Maxwell's response to Stewart and Tait's scientific treatise, *Paradoxical Philosophy*. The treatise is a continuation of their argument in *The Unseen Universe* that energy moves between physical and divine realms in such a way as to permit entropy to exist in the physical world, whilst permitting for an eternal God and human soul.[91] Brown and Silver both draw attention to the biographical parallels with the poem's theme. Maxwell wrote the poem in 1878, the year before he died of stomach cancer. Brown suggests that Maxwell's illness was 'not unsuspected' when he wrote 'A Paradoxical Ode', a poem which deals themes of mortality and anxieties around death.[92] 'A Paradoxical Ode' is Maxwell's most well-known poem, and, in Pratt-Smith's estimation, his most 'poetically accomplished'; it is this poem which evokes for Beer similarities to Hopkins in its 'semantic vigour and precision'.[93]

[91] Chapter Two of this thesis contains detailed discussion of *Unseen* and its arguments.
[92] Brown, *Victorian Scientists,* p. 238.
[93] Pratt-Smith, p. 254; Beer, *Open Fields*, p. 256.

As with the other two poems examined here, 'A Paradoxical Ode' is responding to very specific texts and discussions within particular scientific circles, but unlike 'Tyndallic Ode, it draws upon literary as well as scientific inspiration, with its subtitle 'After Shelley'. The subtitle alludes to Percy Shelley's lyrical drama *Prometheus Unbound* (1819), and the poem is a parody of Asia's song at the end of Act II.[94] Shelley's poem follows the travails of Prometheus, who Brown notes 'is conventionally identified with science', and in his version, Maxwell casts Tait in the role of Asia, Prometheus' lover.[95]

'Paradoxical Ode' is the most revealing of the three poems discussed here in terms of Maxwell's views of the theological repercussions of the afterlife. In it, he finds a middle ground between Tyndall's materialism, which utterly excludes God from scientific discussion and Stewart and Tait's highly moralised, religiously-invested version of physics which specifically aims to minimise the boundaries between science and religion.[96] For Maxwell, religion and science do not need to overlap in the way that Stewart and Tait suggest; science is human knowledge, and can thus be limited by human understanding. He suggests in his address 'Discourse on Molecules' (1873) that 'Science is arrested when she assures herself, on the one hand, that the molecule has been made, and on the other, that it has not been made by any process we call natural'.[97] In short, for Maxwell, science explains the 'what', but not the 'why' of the world; the latter can be accounted for by God. This is not to say that Maxwell's scientific practice was materialistic; his scientific views were certainly informed by his religious convictions, despite the separation in function he proposes. As Pratt-Smith notes, he was 'guided in all things by biblical teachings', but identifying the limitations of science and distinguishing its purpose from that of religion, allowed him to simply place his faith in God when science fails to provide proper answers.[98] This attitude, which places his faith in God's power above any

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[94] Percy Bysshe Shelley, *Prometheus Unbound: A Lyrical Drama in Four Acts with Other Poems* (London: C & J Ollier, 1820), Act II Scene IV, pp. 95-96.
[95] Brown, *Victorian Scientists*, p. 242
[96] Maxwell, 'Notes', ll: 39.
[97] Quoted in Garnett and Campbell, p. 176.
[98] Pratt-Smith, p. 255.

concerns of the earthly sort, is similar to that of Hopkins' in God's Grandeur. As such, a cohesive cosmology combining science and religion is not a priority for him in the way that it is for Stewart and Tait, or for Hopkins in his more thermodynamically conflicted poems.

'Paradoxical Ode' pokes gentle fun at both Tait's ideas, and those of materialists. Hermann Stoffkraft, the fictional materialist physicist who is won over to Stewart and Tait's thermodynamic views in the course of *Paradoxical Philosophy*, acts as an antagonist to the 'I' in the poem, Tait. 'Paradoxical Ode' makes use of knot theory, which Tait and William Thomson worked on together and which Maxwell contributed to.[99] The poem is told from the point of view of Tait, who declares in an arresting opening image, 'My soul is an amphicheiral knot', though Garnett and Campbell offer 'entangled' as an alternative adjective.[100] This opening riddle is reminiscent of the series of scientific riddle-images in 'Tyndallic Ode'; although Maxwell does not allude to Tyndall specifically in 'Paradoxical Ode', this and other similarities suggests that the battle fields drawn in the other ode have not changed in this later poem. The soul, with its knotty properties, is immediately associated with a contemporary scientific theory. Thomson and Tait's work on knots suggested that atoms were each tiny knots in the ether, of varying complexity. Tait's soul in 'Paradoxical Ode', in being an amphicheiral knot, is therefore suggested to be made of the same stuff as any object in the universe. Stoffkraft's was named by Stewart and Tait in *Paradoxical Philosophy*, and his name is taken from the German words for 'force' and 'matter'. Here, Stoffkraft, an agent of materialism and the material world, sets himself to 'untwisting' Tait's amphicheiral soul 'like a convict', calling to mind, as Silver suggests, criminals whose punishment involved untangling damaged rope from usable fibres.[101] The irony of Stoffkraft's attempts to untangle the knot –

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[99] Daniel S. Silver, 'The Last Poem of James Clerk Maxwell', *Notices of the AmericanMathematical Society*, 55.10 (2008), 1266-1270 (p. 1267).
[100] Maxwell, James Clerk, 'To Hermann Stoffkraft, PhD: A Paradoxical Ode', in Lewis Campbell and William Garnett, *The Life of James Clerk Maxwell: With a Selection from his Correspondence and Occasional Writings and a Sketch of his Contributions to Science* (London: Macmillan and Co, 1882), 333-334 (p. 333, ll: 1).
[101] Silver, p. 1270.

to understand the soul – is that all knots can be undone in four dimensions. It is only his refusal to accept the suggestion of a fourth dimension and all it means to Tait for human immortality that necessitates Stoffkraft's unpleasant efforts. The amphicheiral knot's twisting strands are reflected in the rhyme scheme of the poem; the unusual thirteen-line stanzas are each made up of a rhyming couplet, then a quatrain in BCCB pattern, followed by a pair of couplets and a rhyming triplet. The return to the B rhyme in the middle of the stanza acts as a loop or knot which holds together the rhyming strands of the couplets and triplets in the rest of the stanza.

By mocking both the materialist Stoffkraft and the reconciliatory Tait, Maxwell suggests that neither denying God outright nor insisting on including a deity in scientific concerns is a satisfactory way of dealing with religion as it related to science. The second stanza, which imagines an entropic apocalypse, is most pertinent to my topic and is worth quoting in full:

> But when thy Science lifts her pinions
> In Speculation's wild dominions,
> I treasure every dictum thou emittest;
> While down the stream of Evolution
> We drift, and look for no solution
> But that of survival of the fittest,
> Till in that twilight of the gods
> When earth and sun are frozen clods,
> When, all its matter degraded,
> Matter in aether shall have faded,
> We, that is, all the work we've done,
> As waves in aether, shall for ever run
> In swift expanding spheres, through heavens beyond the sun.[102]

[102] Maxwell, 'Paradoxical Ode', ll: 14-26.

'Science' becomes a winged creature, possibly, as Pratt-Smith suggests, one about to take off on a flight of fancy.[103] An amphicheiral knot is one which can be transformed into a mirrored reflection of itself, and at this point in the poem, the amphicheiral knot has permitted access into a paradoxical, mirror other-world where Stewart and Tait's theories have come to bear. Maxwell criticises materialist views of evolution, using Huxley's phrase 'survival of the fittest', against its proponents. Here evolution is, counterintuitively, a disincentive to progress; caught in its 'stream', humanity can 'drift' and concern itself with nothing more than survival. The 'stream' leads the reader from one scientific viewpoint with which Maxwell disagrees, materialism, to the other, an attempt to combine science and religion, represented by Stewart and Tait's theories of ether.

By permitting humanity to 'for ever run' as 'waves in ether', Maxwell takes Stewart and Tait's argument, which gives the soul the properties of energy, to its scientific end, and reduces Tait and Stoffkraft to their 'work', a technical term in physics to do with force and distance enacted on an object. By bringing science too close to religion, Maxwell suggests, the ability for the soul to have any abilities or properties which transcend human understanding is lost. The image of the run-down, entropic cosmos is matter-of-fact, with none of the angst and lack of control seen in the same scenario as imagined by Hopkins in 'Sibyl's Leaves':

> Till in that twilight of the gods
> When earth and sun are frozen clods,
> When, all its matter degraded,
> Matter in aether shall have faded[104]

The image of the sun and earth as 'clods' minimises them and, in a feat of poetic perspective, distances the reader from the celestial bodies by making the sun and earth seem as small as possible. Their fate is further trivialised by the simple metre

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[103] Pratt-Smith, p. 255.
[104] Maxwell, 'Paradoxical Ode', ll: 22.

and rhyme in this portion of the poem. The only line which does not conform exactly to iambic tetrameter is ‘When, all its matter degraded’, the degradation of matter and energy reflected in the stumbling meter caused by the mid-line caesura and the falling meter of the word ‘matter’.

‘A Paradoxical Ode’ responds to two relationships between science and religion with which Maxwell disagrees, by combining and parodying them. The poem gently mocks both the theological anxieties which afflicted the likes of Hopkins and Stewart and Tait, and the materialist views of Tyndall and others. Despite his mocking them, Maxwell does not present in the poem a specific alternative to these two conflicting views. Although he personally had strong views about the separate aims and capabilities of science and religion, ‘Paradoxical Ode’ reflects them only in his rejection of the views he disagrees with.

Conclusion

Energy in the nineteenth century, and particularly thermodynamics, was a topic fraught with anxiety; it raised uncomfortable questions about the future of humanity and the universe as a whole, and possibly even called God’s power into question. The affective power of this topic, both in terms of inspiring emotion in its own right and as a device or shorthand for topics expected to produce affect, is vast. Hopkins and Maxwell represent two revealing approaches to matters of thermodynamics. The contrast in their backgrounds and their resulting reaction to contemporary thermodynamic science helps to delineate some of the fault lines between the fields of literature and science. Hopkins attempted several approaches to reconciling the laws of thermodynamics, with his own faith, which was quietly confident that God, as the driving force of the universe, would keep it running regardless. Two of his main solutions can be seen most clearly in ‘That Nature is a Heraclitean Fire’ and ‘God’s Grandeur’. The first, which is demonstrated only in the first poem, creates a clear division between the natural and the divine, so while the former may succumb to entropy, the latter is exempt and can continue anon. Second, he provides conditions which grant humanity exemption from the vagaries of thermodynamics; while the rest of the world might be doomed to stillness and darkness, God will save

humanity, as they are able to be touched and guided by divine energy. These solutions demonstrate a marked similarity to that proposed by Stewart and Tait in the *Unseen Universe*, to be discussed in the next chapter. Maxwell, meanwhile, was less obviously emotionally moved by the implications of entropy. However, his very responsive style of poetry, writing poems directly to react to and comment upon the publications of his peers, permits a different perspective on the same discussions which I will be examining in greater detail in Chapter Two.

The Thermodynamic Consolation of *The Unseen Universe*

Introduction

The Unseen Universe (1875) by Balfour Stewart and Peter Guthrie Tait presents a view of the universe which attempts to reconcile religious and scientific ideas and form a cohesive whole. By combining the rhetoric of poetry and scripture with scientific theories, Stewart and Tait adapt scientific knowledge and apply it to religious belief to create a comforting middle way between the two schools of science and religion. This appealing worldview, though it was not received without controversy, is achieved through use of the tropes of the popular science text, which both authors had experience in, but then applying these conventions to original ideas. The authors aim to find a place for God in science, and, with some creative interpretation of the scientific theories to which they were contemporary, they are able to find one in the eponymous unseen universe.

The Unseen Universe, like Hopkins and Maxwell's poetry, is a notable example of a model of thermodynamics that attempts to deal with the challenges presented by entropy to the prospect of an eternal God and future life. *Unseen Universe* is a response to the types of thermodynamic anxiety expressed in Gerard Manley Hopkins' poetry. Stewart and Tait's ultimate solution to the problem of entropy, dividing the universe and the types of energy within it into two parts, the seen and the unseen, bears similarities to the split-energy model suggested by Hopkins in 'That Nature'. Although Stewart and Tait express thermodynamic confidence, the very fact that they devoted an entire treatise to quelling the issues raised by the laws is a tacit acknowledgement of the anxieties at play. This very successful treatise provided a solution to the problem of entropy that unites God and thermodynamics in a single cosmology, but it has achieved limited attention in modern scholarship. I discuss *The Unseen Universe* at this point in my thesis because

it provides a counterpoint to the poetic reactions to thermodynamics discussed in the previous chapter, and stands as a comparison to the other two treatises examined in this thesis, *Of the Plurality of Worlds* and *More Worlds than One*, which I will consider in the next chapter. *The Unseen Universe* introduces a solution in the form of a scientific treatise, influenced, informed and supplemented by biblical and poetic sources, rather than a poetic form influenced by scientific and biblical sources. I trace these influences and draw attention to the rhetorical similarities which suggest an interdisciplinary conversation. *The Unseen Universe* shares its strongest thematic links with the thermodynamic poetry discussed in the previous chapter, given that it is a response to the same scientifically-based theological concerns. Further, it is one example of a model that distinguishes between the seen and unseen as a means of reconciling scientific and religious viewpoints which I consider at length in my examination of the eschatological epic.

First, I will consider the Victorian reception of this understudied work. I draw particular attention to the place of *The Unseen Universe* in the debate around scientific materialism, and consider it as a response to Tyndall's 1874 Belfast Address. I then analyse *The Unseen Universe* as a work of popular science, focusing on the rhetorical devices used by Stewart and Tait to make their work as accessible as possible, thus contributing to its success. Next, I give a general overview of the text and its argument, then focus on the divide between the seen and the unseen established by the authors. I then consider in greater depth the finer points of Stewart and Tait's reconciliation between science and religion, arguing that their attribution of moral traits to energy is a key feature of their synthesised cosmology. Finally, I trace and analyse poetic allusion and quotation in the text, arguing that poetry acts as a mediating factor in the text to better facilitate the relationship between science and religion which Stewart and Tait propound.

First published in 1875 by Macmillan & Co., Stewart and Tait's book is part of a wider argument taking place about the place of God in science and its relationship with faith. While it was originally published anonymously, Tait's contemporary and biographer, the physicist Cargill Gilston Knott notes, 'it seemed to be known from

the beginning' who the authors were, and from the fourth edition, published in 1876, Stewart and Tait revealed their names.[1] The sequel, *Paradoxical Philosophy*, followed in 1878 and continued in the same vein, responding further to criticism and unpacking the problems identified in *The Unseen Universe*. *The Unseen Universe* was itself a response to an ongoing conversation about the place of science in religion and vice versa. Historian P.M. Heimann and literary critic Bruce Clarke both see *The Unseen Universe* as a response to John Tyndall's Belfast Address (1874).[2] The address, which he had given the previous year, placed Tyndall firmly in the category of men whom Stewart and Tait deemed 'of the extreme materialistic school'.[3] Knott adds weight to this assertion when he states that shortly after Tyndall delivered his address, 'it began to be whispered among students that Tait was engaged on a book which was to overthrow materialism by a purely scientific argument'.[4]

In his Belfast Address, Tyndall gives a detailed explanation of the ways in which rationality is superior to and excludes religion or a god; scientific thought, in his view, arose from 'a desire and determination to sweep from the field of theory this mob of gods and demons'.[5] Tyndall characterises religion as an outmoded way of understanding the world, with science inevitably and rightly overtaking it; he directly blames Christianity for making the 'scientific intellect…lie fallow for nearly two millenniums' because 'The Scriptures which ministered to their [early Christians'] spiritual needs were also the measure of their Science'.[6] While Huxley's views were in keeping with scientific naturalism rather than materialism, and he was one of a number of intellectuals who shared his views, the address was deemed sufficiently

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[1] Cargill Gilston Knott, *Life and Scientific Work of Peter Guthrie Tait, Supplementing the Two Volumes of Scientific Papers* (Cambridge: Cambridge University Press, 1911), p. 236.
[2] P.M. Heimann, 'The *Unseen Universe*: Physics and the Philosophy of Nature in Victorian Britain' *British Journal for the History of Science,* 6.1 (1972), pp.73-79 (p. 73); Bruce Clarke, 'Allegories of Victorian Thermodynamics', *Configurations,* 4.1 (1996), pp. 67-90 (p. 77).
[3] Balfour Stewart and Peter Guthrie Tait, *The Unseen Universe: Or, Physical Speculations on a Future State* (4th edition, London: Macmillan and Co., 1876), p. 71.
[4] Knott, p. 236.
[5] John Tyndall, *Address delivered before the British Association Assembly at Belfast: With additions* (London: Longmans, 1874), p. 2.
[6] Ibid., p. 11.

materialist enough that he and his allies were attacked for being materialists.[7] In contrast, Stewart and Tait's stated aim on the very first page of the preface to the first edition is 'to endeavour to show that the presumed incompatibility of Science and Religion does not exist'.[8] They argue for a universe which quite clearly runs upon laws, and is in every way rational, but which is at the same time overseen by a 'Supreme Governor'.[9]

The text underwent two significant revisions; unless otherwise indicated, all quotations will refer to the fourth edition. There will also be some discussion of the first edition, as tracking the way in which their arguments were amended provides an insight into the shifting priorities of the authors as well as the extent to which they engaged with their readers. For example, the preface to the second edition devotes almost three pages to responding to W.K. Clifford's review of the first edition, and a final new preface detailing the overall argument in brief was added to the third edition, to 'put ourselves right with the public', as the authors felt their argument was still not 'clearly understood'.[10] The fourth edition was published with all three prefaces, and is some sixty pages longer than the original. Much of this additional material is due to the addition of an introduction which gives a brief explanation of the argument as well as a rationale for writing the book. While the gist of the argument is unchanged throughout the revisions, the argument is refined and subtly altered; notably, there is an increased reliance upon and slight redefinition of the 'Principle of Continuity' and an admission that they 'may possibly have given an undue prominence to the particular argument in favour of the Unseen, which is derived from the future degradation of the energy of the present universe'.[11] The fourth edition also adds a number of new examples to explicate Stewart and Tait's

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[7] Bernard Lightman, "On Tyndall's Belfast Address, 1874." *BRANCH: Britain, Representation and Nineteenth-Century History*. ed. by Dino Franco Felluga. Extension of *Romanticism and Victorianism on the Net*. < http://www.branchcollective.org/?ps_articles=bernard-lightman-on-tyndalls-belfast-address-1874>. [Last accessed 10/12/13] (not paginated).
[8] Balfour Stewart and Peter Guthrie Tait, *Unseen Universe*, (1st edition, London: Macmillan and Co., 1875), p. vii.
[9] Ibid., p. 60.
[10] Stewart and Tait, *Unseen Universe* (3rd edition), p. v.
[11] Stewart and Tait, *Unseen Universe* (4th edition), p. 9.

ideas, notably and most relevant here a second analogy regarding the precise nature of the relationship between the seen and unseen.

While *The Unseen Universe* may be somewhat lacking in clarity of argument and soundness of scientific principle, it is clear in its structure and in its aims, and is stylistically persuasive. Its stated audience is decidedly those 'occupying a middle position', those with a religious conviction and faith in the intangible, but equally who accept that there is a strong argument for scientific explanations of the universe.[12] Stewart and Tait aim to find, for that section of society with allegiance to both science and to religion, the space which God can occupy within the laws of science, and vice versa.

Tait and Stewart wrote *The Unseen Universe* at different points in their careers. Both were reputable scientists, Tait for his work on energy physics and Stewart for his work on radiant heat and meteorology, in particular magnetic disturbances and solar flares. Tait's career was largely university based, working first as a fellow in Cambridge, then as a professor at Queen's College Belfast, and finally as chair of natural philosophy at Edinburgh University.[13] Stewart, meanwhile, had a more diverse working life; his first scientific job was as an assistant observer at Kew Observatory, then as an assistant to his former teacher at Edinburgh University. He spent some time working in Australia. On his return, he was the director of the Kew Observatory for eleven years, and finally was a professor of natural philosophy at Owens College Manchester.[14] Stewart and Tait met at the University of Edinburgh in 1861, and worked together to research how heat radiated in a vacuum, before co-writing *The Unseen Universe*.[15] In letters to other scientists at the time, their respect for each other is clear – every time Tait referred to Stewart in his letters to William

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[12] Ibid., p. 70.
[13] Knott, p.8; 12; 16.
[14] Unsigned obituary, 'Balfour Stewart', *Proceedings of the American Academy of Arts and Sciences,* 23.2 (1887-1888), 375-377 *(*p. 377).
[15] Peter Guthrie Tait, 'Balfour Stewart', *Nature* 37.948 (1887), pp.202-203 (p.203).

Thomson, he included a compliment for Tait – 'that most intelligent of men', for example.[16]

While both were respected, neither man's work was without controversy; by the end of Stewart's life many of his theories had been replaced by more up-to-date ones. Stewart was a devout Anglican, elected in 1881 at Lambeth Palace to sit on a committee 'promoting interchange of views between scientific men of orthodox views in religious matters'.[17] In addition to his Anglican faith, he was also a significant patron of scientific research, and was a founding member of the Society for Psychical Research as well as a member of several scientific and cultural societies.[18] *The Unseen Universe* and *Paradoxical Philosophy* were among his last significant works. The legacy of *The Unseen Universe* can be seen to some extent in Stewart's obituaries, the tone of which varied depending upon type of periodical publishing it. All agreed that Stewart was a renowned and respected scientist, but many of those publications which had a general readership, such as *The Scotsman*, specifically mentioned *The Unseen Universe* as a 'very important' work.[19] On the other hand, *The Proceedings of the American Academy of Arts and Sciences* which had a more academic bent spoke more cautiously of Stewart's interest in the topics explored in the book.[20]

In his examination of allegorical uses of Maxwell's demon, literary critic Bruce Clarke refers to P.G Tait as 'a prominent Christian moralist and also a controversialist of the first order'.[21] Tait's career took a different trajectory from that of Stewart. Both

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[16] Letter, Tait to William Thomson, 31 Mar 1865, Kelvin Collection, University of Glasgow.
[17] Graeme Gooday, 'Sunspots, Weather and the *Unseen Universe*: Balfour Stewarts Anti-Materialist Representations of "Energy" in British Periodicals', in *Science Serialized: Representations of the Sciences in Nineteenth-Century Periodicals*, ed. by Geoffrey Cantor and Sally Shuttleworth (London: MIT Press, 2004), 111-149 (p. 140).
[18] William James, *The Will to Believe: and Other Essays in Popular Philosophy* (London: Harvard University Press, 1979), p.228; Unsigned obituary, 'Balfour Stewart', *The Athenaeum*, 3139 (1887), 866-866, p. 866.
[19] Unsigned obituary, *The Scotsman* (21 December 1887), 7-7, p. 7.
[20] Anonymous obituary, 'Balfour Stewart', *Proceedings of the American Academy of Arts and Sciences*, p. 377.
[21] Bruce Clarke, 'Allegories', p. 77.

spent some time at Edinburgh University, but Tait quickly moved to Cambridge.[22] While Stewart was largely solitary in his work, Tait's education and career were conducted in the midst of his peers, and he often collaborated with others in the group that Crosbie Smith terms the 'North British' physicists, notably James Clark Maxwell and William Thomson.[23] Tait's interest in the topics discussed in *The Unseen Universe* is less biographically apparent than for Stewart, as he did not engage as fully with the spiritual or religious communities as Stewart did in his work. However, before the publication of *The Unseen Universe* he had published many successful books on energy physics and natural philosophy, and was arguably more engaged with the scientific community than Stewart, whose links were more cross-disciplinary, combining religion and science. *The Unseen Universe* was written at an earlier point in his career than for Stewart; after its publication, Tait continued to work and research for some years.

Reception and the Belfast Address

The Unseen Universe has rarely been subjected to thorough academic attention outside of Stewart and Tait's own lifetime, though the number of allusions and references to it is clear evidence of its contemporary importance, and very recently increased interest has arisen. Despite its relative lack of in depth studies, it is often mentioned fairly briefly in relation to many other topics. This stands testament to the significance of the work; it had a profound enough effect on Stewart and Tait's contemporaries that the text is examined as a source of peripheral importance to a variety of subjects. One of most extended assessment of *The Unseen Universe* can be found in Heimann's short review of the text in relation to its place in and contribution to the philosophy of nature, while Bruce Clarke analyses Stewart and Tait's use of the Maxwell's Demon thought experiment in his article which looks at

[22] Knott, p. 6
[23] Crosbie Smith, *The Science of Energy*: *A Cultural History of Energy Physics in Victorian Britain* (London: Athlone Press, 1998).

several treatments of the idea.[24] Further, much less detailed references connect *The Unseen Universe* with, variously, Oliver Lodge and late Victorian physics, Scottish energy science, popularisations of thermodynamics, Spiritualism, and fourth dimension writing.[25] Those works which give any extended treatment to *The Unseen Universe* suggest a general consensus that despite its shortcomings in the writing and indeed the argument, with its 'blithely [mixed] metaphors' and 'confusing' use of scientific principles, the work is of real interest for a variety of academic ends.[26]

In addition to these reasonably brief considerations of *The Unseen Universe*, which nevertheless show the contemporary significance of the text for a variety of topics, the last fifteen years has seen an increased interest in the work. Two of the earlier texts in this upturn in interest are Barri J. Gold's *ThermoPoetics* (2010) and Bruce Clarke's *Energy Forms* (2001). Gold considers *The Unseen Universe* as an attempt to popularise the science of energy and 'reconcile the new physics with a spiritual understanding of the universe'.[27] *Energy Forms* represents an expansion of Clarke's article 'Allegories of Victorian Thermodynamics', and is focused chiefly upon allegory in *The Unseen Universe*, particularly Stewart and Tait's manipulation of ether and Maxwell's demon for their own thermodynamic gain. Clarke considers the work alongside works of speculative fiction such as *The Time Machine* (1895).

Most recently, Tamara Ketabgian's forthcoming chapter, 'The Energy of Belief', focuses on what she terms the 'forgotten legacy' of *The Unseen Universe*,

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[24] Clarke considers *Unseen* in the article 'Allegories', previously cited, and in Bruce Clarke, *Energy Forms: Allegory and Science in the Era of Classical Thermodynamics* (Ann Arbor: University of Michigan Press, 2001).
[25] Respectively: David B. Wilson,'The Thought of Late Victorian Phycisists: Oliver Lodge's Ethereal Body', *Victorian Studies*, 15.1 (1971), 29-48; Allen MacDuffie, 'Irreversible Transformations: Robert Louis Stevenson's *Dr Jekyll and Mr Hyde* and Scottish Energy Science', *Representations*, 96. 1 (2006), 1-20; Greg Myers, 'Nineteenth-Century Popularizations of Thermodynamics and the Rhetoric of Social Prophecy', *Victorian Studies*, 29.1 (1985), 35-36; James E. Beichler, 'Either/Or: Spiritualism and the Roots of Paranormal Science', *Yggdrasil: The Journal of Paraphysics*, 1.1 (1996), 81-118 and K.G. Valente, 'Who Will Explain the Explanation?: The Ambivalent Reception of Higher Dimensional Space in the British Spiritualist Press, 1875-1900', *Victorian Periodicals Review,* 41.2 (2008), 124-149; Bork, 'The Fourth Dimension in Nineteenth-Century Physics', *Isis*, 55.3 (1964), pp. 326-338.
[26] Respectively: Barri J. Gold, *ThermoPoetics*, p. 126; Heimann, p. 76.
[27] Gold, pp. 126-127

namely its influence on 'occult practices' and the 'psychology of belief'.[28] As such, much of Ketabgian's analysis of the text is based on its influence upon occultist Madame Blatavsky and the philosopher William James. She considers the text as a work of natural theology and posits it as a potential work of speculative fiction, expanding on Clarke's decision to examine it along with works of that genre. Elizabeth Lewis' chapter in *Mathematicians and their Gods* (2015), provides a general introduction to *The Unseen Universe:* its authors, its argument, and its position on science and religion. Both of these very recent chapters demonstrate an increased interest in what this work has to offer in the fields of science and religion and literature and science.

Stewart and Tait's contemporaries, as well as later critics and historians, have identified *The Unseen Universe* as a response to Tyndall's Belfast Address. The Belfast Address, presented in Belfast to the British Association for the Advancement of Science (BAAS) at their annual meeting in 1874, is considered by many, including Ruth Barton and Bernard Lightman to be 'an important event in the "war" between science and religion'.[29] Lightman cites Blinderman and Turner's estimations of its value as a weapon for science in an ongoing conflict as evidence of this acceptance among modern historian of this 'war'.[30] Regardless of the historical debate around the conflict or otherwise between science and religion, the strong effect the address upon the scientific community is undeniable. Immediately after the address was given, the *Irish Jesuit Province* published an article expressing admiration for the work of scientists, and gratitude that BAAS selected Belfast as the location for their meeting. However, the main concern of the article was a warning to any readers who admired the address against the 'danger to which such enthusiasm may expose them', before proceeding to talk scathingly about Tyndall's work.[31] They make a show of

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[28] Tamara Ketabgian, 'The Energy of Belief: *The Unseen Universe* and the Spirit of Thermodynamics', in *Strange Science: Investigating the Limits of Knowledge in the Victorian Age*, ed. by Lara Karpenko and Shalyn Claggett (Ann Abor: University of Michigan Press, forthcoming), 254-278 (256).
[29] Ibid; Ruth Barton, 'John Tyndall, Pantheist: A Rereading of the Belfast Address', *Osiris*, 3 (1987), 111-134.
[30] Lightman, 'On Tyndall's Belfast Address'.
[31] T.F., 'Mr. Tyndall at Belfast', *The Irish Monthly,* 2 (1874), 563-578 (p. 563).

recognising that the 'old enthusiasm for knowledge seems to be springing up in the heart of the [Irish] nation', making knowledge a delicately blossoming national property which must be protected from Tyndall's 'unfortunate' and dangerous ideas.[32] *Blackwood's Edinburgh Magazine* saw a 'degree of impertinence' in Tyndall's decision to address matters of religion and Lightman notes a general trend of disapproval of Tyndall after the address, compared to his respectable reputation before it.[33]

Tyndall is never named in *The Unseen Universe* and neither Stewart nor Tait appear to have seen the speech being delivered, but Tait corresponded with James Clerk Maxwell regarding the address, with Maxwell sending Tait notes on the address as well as a poem he terms a 'Tyndallian Ode'.[34] Furthermore, while they do not comment on Tyndall's 1874 address in Belfast, they do talk about the much more obscure and less-discussed talk which Tyndall's materialist ally Huxley gave in the same place, in the same year.[35] This oversight in not referencing Tyndall, given Stewart and Tait's eagerness to show engagement with current debates and ideas, begins to seem like deliberate silence; they refer to a great many other scientists of varying relevance to their own work throughout the book, but neglect to explicitly discuss one which deals with very similar issues to the ones which they address.

While the evidence of Tyndall's influence on *The Unseen Universe* is circumstantial, then, depending as it does upon rumour, timing and the themes of the two texts, it is strong, and even if Heimann, Knott and Clarke are mistaken, it is undeniable that *The Unseen Universe* is a refutation of the materialistic worldview which Tyndall championed. The Belfast Address summarises this strongly materialistic approach. While Tyndall accepts that 'science cannot cover all the demands' of human nature – humanity will always ask questions which science

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[32] Ibid., p. 563; p. 566.
[33] Unsigned article, 'Modern Scientific Materialism', *Blackwood's Edinburgh Magazine*, 116.709 (1874), 519-539 (p. 520); Lightman, 'On Tyndall's Belfast Address'.
[34] Knott, p. 173.
[35] Stewart and Tait, *Unseen Universe*, p. 78.

cannot answer – he posits that the ability to judge what sort of question it is results in scientifically explicable phenomenon being wrongly attributed to unnatural explanations.[36] This therefore creates a very clear divide – a realm of the religious and a realm of the scientific, which should be kept separate, with 'gods never interfering' with that which is observable and can be learned through 'the direct appeal to nature by observation and experiment'.[37] Stewart and Tait seek to overthrow this divide, which Tyndall sees as the key to reliable, rational science, and instead of keeping the two separate, they allow science and religion to run entwined, one informing the other to form a cohesive world view. The numerous and extensive examples and references to esteemed scientists in *The Unseen Universe*, as well as the authors' stated intention to 'show that the presumed incompatibility of Science and Religion does not exist', are an attempt to refute the 'materialistic statements' at which they are 'aghast'.[38]

Beyond the thematic and circumstantial, there is also structural and rhetorical evidence that even if it is not a direct response to Tyndall's address, *The Unseen Universe* is certainly responding to its type. Both begin with a brief history of knowledge, move into a discussion of modern understanding of energy science, and conclude with a final statement on the relationship between science and religion. Each is clearly writing from the same genre – both use standard devices for popular science, such as a reliance upon analogies and examples, and both raise awareness of the issues surrounding scientific analogy and its shortcomings.

An example of using similar devices to different ends can be seen in the treatment of poetry by each treatise. While it is to be expected that religion would be integrated with science in a treatise arguing that there exists no conflict between the two, and that they would be explicitly separated from each other in a materialist address, poetry is a more surprising topic to hold stakes in such an exchange. Tyndall groups poetry and religion together in his address, describing the former as being

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[36] Tyndall, *Belfast Address,* pp. 6-7.
[37] Ibid., p. 6; p. 12.
[38] Stewart and Tait, 1st edition, p. vii.

'incorporated' with the latter, and the whole to be 'woven into the texture of man' but to be entirely separated from science, as religion – and by extension poetry – would be 'dangerous', destructive', and 'mischievous' if they were allowed to 'intrude on the region of *knowledge'*.[39] Meanwhile, Stewart and Tait specifically include poetry in the text or epigram of each chapter, treating poetry, like religion, as part of a whole which must be understood in conjunction with science. Tyndall and Stewart and Tait alike speak about Lucretius, as was fashionable in the debate around materialism, but to markedly different effect.[40] For Tyndall, Lucretius was a scientist or philosopher first and foremost, with Tyndall only once mentioning that Lucretius' work on the atom was contained within a poem, thus minimising the artistic element of the philosopher. For Stewart and Tait meanwhile, Lucretius' worth as a poet is indivisible from his theories on how the world worked; nearly every reference to Lucretius includes a mention that he is a poet or wrote a poem. [41] These two approaches to poetry are one example of a fundamental difference in the way each side of the debate understood or valued knowledge.

Tyndall's emphasis on knowledge – even italicising it at points in the printed edition of the address – betrays a fundamental epistemological difference between Tyndall and the authors of *The Unseen Universe*. For Tyndall, knowledge is entirely divorced from religion and all that is connected with it, or, if they must touch, religion 'must submit to the control of science'.[42] Religion, poetry and art, are the stuff of 'passion', 'as ancient and valid as understanding' but also fundamentally and rightly separate.[43] To Stewart and Tait, however, one can have 'knowledge of God's character', and it is this knowledge which one must seek to augment with knowledge from 'other sources', such as science, scripture and poetry.[44] Understanding of each supplements that of the other. Thus the structure of *The Unseen Universe* is a direct

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[39] Tyndall, *Belfast Address,* pp. 60-61.
[40] Frank, M. Turner, 'Lucretius Among the Victorians', *Victorian Studies*, 16.3 (1973), 329-348 (p. 329).
[41] Stewart and Tait, 4th edition, pp. 37; 131.
[42] Tyndall, *Address*, p. 61.
[43] Ibid., p. 61; p. 60.
[44] Stewart and Tait, p. 18.

response in type, at least, to that of the Belfast Address – the first seeks to blend types of knowledge where the other must separate them.

In addition to this fairly direct response to Tyndall, *The Unseen Universe* also functions as a more general response to all materialists who precluded God from the material world. Indeed, the description of the men 'of the extreme materialistic school', who are satisfied with the idea that life on Earth arose 'as the result of the interaction of material atoms guided by certain physical forces', and who 'have no reason to believe there is anything beyond the physical universe', does chime with the tone of Tyndall's Address.[45] These criteria also apply to others who shared his allegiance to materialism or scientific naturalism, such as T.H Huxley, W.K Clifford – who Stewart and Tait directly attack – and Herbert Spencer. They also build upon the theories of other scientists, for example Struve's work on ether.[46] In turn, *The Unseen Universe* was itself responded to. Unsurprisingly, the reception was mixed, and undoubtedly Stewart and Tait would have been able to justify any criticism as being the fault of the reader for not being part of the 'middling group' of readers for which the book was written. Indeed, the type of response did tend to correspond to the 'class' which the reader fell under, be it a devout Christian, an 'extreme material[ist]' or a member of the 'middling' group.

Some of this last type of reader, such as the theologian Thomas Rawson Birks, simply adopted *The Unseen Universe* as a source which usefully summed up a particular point of view, that of the very 'middling group' at which the authors aimed their treatise. In his address to The Victoria Institute, of Philosophical Society of Great Britain, Birks is fairly neutral towards Stewart and Tait's ideas or Philosophical Society of Great Britain. Birks' address is a survey of modern science that merely presents them as one of several opinions in a discussion, but the fact that it is being used in this way in itself shows an acceptance almost as strong as

[45] Ibid., p. 71.
[46] Ibid., p. 156.

approval.[47] Furthermore, the Victoria Institute was a group whose first stated aim in their constitution was to 'investigate fully and impartially the most important questions of Philosophy and Science … especially those that bear upon the great truths revealed in Holy Scripture, with a view to reconciling any apparent discrepancies between Christianity and the sciences'.[48] Thus, though approval is not clearly indicated, it would probably be expected, given how closely the intentions of *The Unseen Universe* and the Victoria Institute match.

The Unseen Universe received many positive reviews in popular review publications such as *The British Quarterly Review*, whose anonymous reviewer described the book as one of the most 'remarkable' books that had 'recently made a sensation in the literary world'.[49] Though 'E.C', writing for *Fraser's Magazine*, highlights the general criticism of the book among scientists as 'being neither fish nor fowl nor good red herring', it is also largely approving and notes the excitement which the ideas caused.[50] *The Unseen Universe* was not without its critics, however. Stewart and Tait show on their strenuous refutation of detractors in the introduction which they add to the third edition. As Stewart and Tait predict, many of their critics are people who have fundamentally differing views to Stewart and Tait on the way in which science and religion should interact. While the anonymous reviewer in *The London Quarterly Review* does 'acknowledge some measure of success', they qualify it with discomfort over the way in which the authors treat their own religious standing; by not declaring it outright, they feel, Stewart and Tait both frustrates the reader and renders their general discussion of the soul irrelevant as they 'ground no argument on it'.[51] Even Charles Beard, who roundly praises the book, wishes 'our physicists had extended their partnership so far as to ask the help of a thoroughly

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[47] Thomas Rawson Birks, 'The uncertainties of modern physical science: being the annual address of the Victoria Institute, or, the Philosophical Society of Great Britain, delivered on the 29th of May, 1876', in *Cowen Tracts* (London: Hardwicke & Bogue, 1876).
[48] Victoria Institute Committee, *Objects, Constitutions and Bye-Laws of the Victoria Institute, or Philosophical Society of Great Britain* (London: Victoria Institute, 1872), p. 1.
[49] Unsigned Review, 'Art II – *The Unseen Universe*', *The British Quarterly Review*, 64.127 (1876), 35-57 (p.35).
[50] E.C., 'The Unseen Universe', *Fraser's Magazine*, 13.73 (1876), 60-68 (p. 61).
[51] Unsigned review, 'Art. III. – *The Unseen Universe; Or, Physical Speculations on a Future State*', *The London Quarterly Review*, 44.89 (1875), pp. 49-83 (pp.49-50).

competent theologian'.[52] From the other direction, W.K. Clifford, an ally of Tyndall and a well-known atheist, published a review in *The Fortnightly Review* which goaded Stewart and Tait into printing a venomous response in the introduction of the subsequent edition.[53]

The Unseen Universe as popular science

The Unseen Universe is a deeply persuasive work, on many levels. First, and most significant is the treatise's argument; the comfort it offers of a thermodynamically viable future life is in itself an appealing prospect. Ketabgian posits that one of the many alternative energies with which the work deals is persuasion, 'working towards the spiritualist and thermodynamic conversion of the readers'.[54] As important as Stewart and Tait's conclusions and rhetoric is the audience at which the book is aimed, which is to say, a general rather than an expert one. *The Unseen Universe* is carefully aimed to maximise its pool of potential converts, full of personable asides and detailed explanations suitable for readers of all levels of scientific experience.

The Unseen Universe was one of many popular scientific tracts in both Stewart and Tait's careers; both writers, particularly Stewart, had independently written primers and other works suitable for general consumption before the publication of this collaborative work (Stewart, *Elementary Treatise on Heat* (1865); *Lessons on Elementary Physics* (1871); *Lessons in Practical Physics* (1885). Tait, *An Elementary treatise on Quarternions* (1867); *Elements of Natural Philosophy* (1872); *Sketch of Thermodynamics* (1875)). As such, it is reasonable to expect the authors to be practiced at providing accessible and clear explanations to their readers, as proves to be the case. While the argument which Stewart and Tait construct is not without

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[52] Charles Beard, 'Physical Speculations on Immortality', *The Theological Review: A Journal of Religious Thought and Life*, 12.5 (1875), 406-423 (p. 407).
[53] William Kingdon Clifford, 'The Unseen Universe', *The Fortnightly Review*, 17.102 (1875), 776-793.
[54] Ketabgian, p.260.

problems, the way in which it is presented is concise, appealing and easy to follow. Some of the success of the text's delivery comes from the use of very simple devices. The argument in each chapter is divided into numbered, modular sections; this was a common style of presentation for such works which were popular at the time and is therefore by no means unique to Stewart and Tait. For example, William Paley's *Natural Theology* (1801), John F.W. Herschel's *Preliminary Discourse on the Study of Natural Philosophy* (1830), and George Boole's *An Investigation of the Laws of Thought* (1854) all use this device. The commonness of this style of presentation does not detract from its effectiveness as a structure here for a measured argument; indeed, these sorts of similarity help *The Unseen Universe* to fit in as a book of science. By giving it the format and presentation familiar to readers of scientific treatises, Stewart and Tait show that they intend *The Unseen Universe* to be considered on the same terms as these respected texts. Because of their numbered, modular nature, each section builds upon the last more clearly and more gracefully than if the change in section was not indicated.

Secondly, Stewart and Tait pace and direct their rhetoric in *The Unseen Universe* well, through a variety of fairly simple devices. As writers, Stewart and Tait are quite controlling in their guidance of the reader through their exploration of the unseen universe, which has advantages and disadvantages; every turn in the argument is clearly marked, and the reader is led through with painstaking thoroughness, but this very attentiveness can come across as stifling at times. As each section covers only one idea, it means that it is easy to refer back to points, which Stewart and Tait often encourage the reader to do by putting references to previous sections in parts of the book where prior understanding of a topic is required. This is in itself a helpful device for keeping the reader up to speed, as it would be much slower for a reader to attempt to find an article from memory than by authorial direction. As such, the need for repetition is minimised and the argument can move forward even if the reader does not read the book in a linear manner. As well as doing their utmost to ensure that each reader is at a specific level, in later editions, Stewart and Tait begin to create streamed versions of the text, allowing readers who feel their own understanding of energy science is limited, suggesting they may skip whole sections which might be too technical, and giving direction as to which article

to turn to in order to join the argument again at a more easily comprehensible point.[55] The introduction and conclusion of each chapter is thorough and solicitous; a clear introduction and conclusion may seem a simple thing, but for a scientific treatise which was designed to be read by the general population, and which deals as it does with unusual ideas and conclusions, the effectiveness of even the most basic elements are of vital importance for the text's accessibility and thus its success. Each following the same structure of an introduction which summarises the previous chapter, explains how the current chapter will build upon it, and sets out what the chapter will achieve. Likewise, every conclusion summarises and justifies the topic of its chapter. Complex ideas are invariably summed up with a sentence beginning either 'in fine' or 'in conclusion'. This sort of consistency, verging on repetitiveness, in the use of key phrases and structures, again helps the reader to follow the argument because they are aware of relevant signposts to watch for within the argument.

Many of the devices which help the persuasiveness and clarity – which aids accessibility and thus indirectly effectiveness – of the argument can be seen in the initial explanation of the divide between consciousness and matter. The initial explanation constitutes one article, and its further elucidation directly follows in a separate section. The two articles grow more and more complex in content with each sentence, while the sentences themselves become more concise. To begin with, the sentences are relatively long and conversational, with lots of rhetorical questions to draw in the reader:

> Is there not therefore a reality about matter which there is not about mind? Can we conceive of a single particle of matter to go out of the universe for six or eight hours and then return to it; but do we not every day see our consciousness disappearing in the case of deep sleep, or in a swoon, and then returning to us again?[56]

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[55] Stewart and Tait, *Unseen Universe*, p. 117.
[56] Ibid., p. 74.

The tone is inviting, refers only to experiences which anyone might have had, sleeping or swooning, and requires only a little scientific imagination. The next section begins with a charming image, describing matter as 'mistress of the house, and consciousness as an occasional visitor whom she permits to take of her hospitality, turning him out of doors whenever the larder is empty.'[57] This light-hearted scenario in which consciousness is an overly demanding guest rather than an essential part of intelligent life opens an article which broaches the complex idea or objectivity and subjectivity, and regards not abstract concepts, but physical substances existing as both visible and invisible. At this point, the sentences become terse for maximum clarity: 'Phosphorous, on the other hand, is a substance which may become the vehicle of both kinds', or 'We cannot thus argue from one state to another'.[58] Having thus read two articles – two and a half pages of text – the reader has been guided through a materialist counterargument; an explanation of the dependence of mind upon matter, and the connection between the two, from the point of view of both mind and matter; the implications subjectivity has on the visibility or otherwise of human experience; and the possibility that substances less abstract than thought might be able to exist both visibly and invisibly. Aiding the reader were four examples and one analogy, none of which require anything more than common human experience such as getting a headache or falling asleep. The tone is light and friendly while remaining largely formal. All of these things allow the reader to grasp the argument quickly and confidently, without the writers labouring their point and without the reader becoming offended by tone or by content.

Third, the writers engage with the reader in a variety of ways. They use a question and answer format at certain points in the book, which gives the impression that the writers are engaging directly with the reader, and that their approach is balanced because they anticipate questions and criticisms. The examples given are numerous, relatable and usually well-explained. For example, in the chapter on matter and ether, Stewart and Tait explain the relationship between energy and mass

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[57] Ibid.
[58] Ibid., p.75; p. 76.

first through a comparison of the effect of being hit with a heavy pillow, or a bullet with a certain amount of energy, and then exemplify it further still with an aside about boxing:

> In the brutal pastimes of the last generation, as we now in our advanced humanitarianism call them, this was well known as the difference between the effects of a slow knock-down blow by a heavy-weight, and a "punishing facer" from a feather-weight. Alas for the good old times! For our comparison, apt as it is, is too probably thrown away on the degenerate inhabitants of (once) merry England, erewhile, the home of the "Miller", with his honest quarterstaff, of jolly and chivalrous wrestlers, boxers and bowmen, now the hell of running-kicks garrotting, gouging and stabbing.[59]

This example, followed by an unattributed quotation from Horace, in the original Latin and without the footnoted translation they provide for other quotes through the text, summarises in many ways the appeal of *The Unseen Universe* as well as showing clearly who the expected readership might be. The initial example would have been sufficient to demonstrate the 'very curious manner' in which 'the transformability for a given amount of energy' depends upon 'the relative quantity of matter with which it is associated', but it was reinforced with this second one which would be even easier for the readership to recognise and understand.[60] The informal aside with its theatrical exclamations and gossiping tone further elucidates the idea. The example and the tone suggest that the writers expect that their readership will share their opinion of the degeneracy of contemporary violence. The mourning for times past shows the essentially conservative nature of the text; they attempt to use up to date scientific theories to validate a worldview which harks back to pre-thermodynamic ideas. The use of an unattributed, Latin quotation and the light-hearted references to '(once) merry England' indicate that they expect their reader to be reasonably well-educated – able to read and recognise Horace in the original Latin

[59] Ibid., p.143.
[60] Ibid.

– and either be of Stewart and Tait's own generation, or of the view that the world has, indeed, become more vicious.[61]

At certain points, the authors provide lists of possibilities and work their way through each; they demonstrate a penchant for defining and categorising throughout the book. For example, at the beginning of the body of their argument, they define 'three great classes' of 'those who concern themselves about our theme', sketch each type of reader in brief, then devote a numbered section to each different group with a more extended description.[62] Many of their methods can be exemplified at once further on in the book, when they bring their argument together in the chapter 'The Unseen Universe'. They reply 'by anticipation to certain objections', first by dividing the types of objections into religious, then theological and scientific categories, for easy reference so each reader might choose those which most interest them.[63] This has the effect of engaging with the reader, which adds to the personable and persuasive tone throughout the book, as well as potentially heading off argument about the contents of the book before the reader has even finished it. This done, the writers treat each objection with a separate section, in a statement and response style, thus creating for the reader a simulated debate of each point. Each objection is labelled with its type; '*Objection First (Religious)*', *Theological* or *Scientific*, and the reply clearly indicated.[64] The refutation of anticipated points is rhetorically persuasive, as it suggests that the weaknesses of the argument have been addressed, as well as arming the reader with answers so that, should they agree, they may more effectively espouse and argue the theories of *The Unseen Universe.*

Each technical idea or theme is explained, though often the theories are subtly edited to reflect Stewart and Tait's own opinions. For example, as the many questions regarding the laws of thermodynamics demonstrate, Stewart and Tait recognise that their interpretation of the laws of thermodynamics and their limitations

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[61] Ibid.
[62] Ibid., p. 69.
[63] Ibid., p.202.
[64] Ibid., pp.202-204.

are not those widely accepted when they grant that their interpretations of the laws require an 'addition'.[65] While the devices which Stewart and Tait use to construct and present their argument are not necessarily uncommon, they do go some way towards explaining the appeal of the text. The clear structure, accessible examples and the great care which Stewart and Tait take to ensure that each of their points is understood and fully expounded upon means that it is truly a text which might be understood by anyone with an interest in the themes of the book and the available funds to access it. As Clerk Maxwell states in his review of the text, 'There must be many who would never have heard of Carnot's reversible engine, if they had not been led through its cycle of operations while endeavouring to explore the Unseen Universe'.[66] In short, while the authors assume the intelligence and interest of their readers, they do not necessarily expect prior knowledge and take pains to ensure that they explain all of their ideas fully and carefully. This attitude is an appealing one because it educates without patronising and ensures that no reader is alienated from the book by lack or surfeit of knowledge and therefore they are more open to the specifics of the argument.

Beyond the methodical and patient style, the content of the argument was decisive in the popular success of *The Unseen Universe.* The book is essentially for those who want the best of both worlds – the comfort of religion and the transparency of science – and Stewart and Tait provide a scientifically ratified worldview which seems to allow ample space for both. By bypassing the second law of thermodynamics' bleak inevitability with the idea that the unseen parts of the universe balance with the visible so that even when the latter has run down, there will remain usable energy in the realm of the invisible, Stewart and Tait give hope for the far future as well as providing a space in the universe for God to inhabit.

***The Unseen Universe*: Overview**

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[65] Ibid., p. 208.
[66] James Clerk Maxwell, 'Paradoxical Philosophy, a Sequel to the "Unseen Universe"', *Nature*, 477 (1878), 141-143 (p. 141).

The prefaces provide an abundance of context for the reader regarding the text they are about to read, though those for the second and third editions seem to assume a familiarity with the original text. The first is merely a brief statement expressing alarm on the part of Stewart and Tait at the 'too hastily reached conclusion, that modern science is incompatible with Christian doctrine' and show that, through adherence to the principle of continuity, this incompatibility does not exist.[67] The second is largely a response to criticism – characteristically, they divide their critics into three groups, which also correspond to their anticipated audience. There are those who are too devoted to their own way of understanding religion to 'interpret the works of nature' of 'really scientific men'; those too devoted to science to 'have faith in…revelation or theology'; and those of the middle ground, who are, of course, unanimously approving of the text.[68] The authors openly attack materialists, describing their world view as a 'hideous mask' obscuring the 'the surpassing beauty, yet inscrutable depth' of the world as the authors see it.[69] They scathingly demolish Clifford's unfavourable review of the work, accusing him of being small-minded, creating straw men in the form of 'a most grotesque and ludicrous figure, which he calls *our argument*', and of having but limited reading comprehension skills.[70] The third and final preface once more pleads for open-mindedness on the part of the 'school of scientific men who assert the incompatibility of science with Christianity', and the authors conjure an image of a 'King's highway' between the seen and the unseen which 'must surely be left open'; this idea of a path or road is a motif in the text.[71]

The introduction, new to the fourth edition, opens with a dramatic natural image:

> The present age is one of very rapid progress in almost all branches of knowledge. Like a wave swelling as it advances shoreward,

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[67] Stewart and Tait, p. ix.
[68] Ibid., pp. xi-xii.
[69] Ibid., pp. xiii.
[70] Ibid., pp. xiv-xv.
[71] Ibid., pp. xviii.

> this progress has violently transformed whole regions of thought, while it has repeatedly invaded others which had not heretofore been deemed accessible to such catastrophes. Presuming upon a soil of great natural richness, the inhabitants of these latter regions had for a long series of years given themselves up to a species of husbandry which was beginning at length to be detrimental in its effects. It thus came to pass that while the immediate result of each inundation was a sudden alarm and consequent confusion, yet nevertheless a fertilising residuum was always left behind, together with a very plain intimation that no region of thought can permanently flourish if it be entirely cut off from any of the intellectual influences around it.[72]

This new opening image is a dynamic and attention grabbing gambit; rather than the fairly sedate introduction to the history of the soul which opens the first edition, the reader is immediately presented with a whole ecosystem of knowledge, from branch to deluge to delta of inspiration. This image represents a microcosm of Stewart and Tait's approach: the language and style remains scientific, methodically describing the idea and mentioning a 'fertilising residuum', and the image is one which might easily be experienced and understood – a wave transforming a landscape and helping it to flourish. There are also religious overtones – the catastrophe and fresh start of Noah's flood may perhaps be shadowed here. Thus the authors' continuing effort to treat science and religion on equal and simultaneous terms in an accessible manner is introduced in the first sentences of the text proper. The natural, straightforward tone makes the actual message of the passage – interdisciplinarity, particularly between science and religion, and embracing the new, brings beneficial change – seem accordingly natural and unthreatening, though the initial wave of progress may seem daunting. It is Stewart and Tait's stated 'endeavour to reassure this somewhat over-timid people' that Christianity is safe from the tide of progress, and they frame their role in specifically scientific terms, explaining they 'will try to gauge the strength of the tide, and more especially the forces which give it motion'.[73] They thus

[72] Ibid., p. 1.
[73] Ibid., p. 2.

position themselves immediately as men of fact and scientific comfort to their religious brethren, a role they attempt to uphold throughout the treatise.

Having concluded this extended metaphor, they take pains in the rest of the introduction to state the limitations of their argument, repeatedly stating that they are 'neither metaphysicians nor moral philosophers', and thus must limit themselves to examining 'the *physical* aspects of the argument regarding a future state' alone.[74] Again, they take pains to address the criticism levelled at them following the first two editions of the text. Much emphasis is put on what is not known, and to draw a distinction between what can and cannot be learnt about the unseen through science: for Stewart and Tait, science and religion can both reveal things about the unseen, but each reveals different elements. As scientists, they can uncover only the physical elements, and leave it to theologians to take their part in discovering the unseen from another point of view. This strict limiting of their own purview allows Stewart and Tait a focused approach.

The book continues with a brief history of the theology of the soul in particular. This 'Introductory Sketch' is by no means complete – the attempt to cover, in forty-five pages, the general religious beliefs and particularly those regarding the soul of Greeks, Egyptians, Romans, Jews, Muslims, Zoroastrians, Buddhists, Hindus and Christians, Spiritualists and Swedenborgians, was ambitious in the extreme. In addition to attempting to describe the notion of the soul and/or future life in these eleven systems, Stewart and Tait also begin to lay the foundations for its argument that the scientific and the religious can coexist and intermingle. They draw parallels between science and Christianity: both systems are dependent upon laws which will not change, be they imposed by a deity or by the necessities of physics; both are in agreement that the 'outer works of the visible universe' do not in and of themselves lead to the conclusion that God exists.[75] The idea that 'the outer works of the visible universe are insufficient to manifest certain attributes of the Deity' in both physics and Christianity, introduces Stewart and Tait's vital distinction between the 'visible'

[74] Ibid., p. 3.
[75] Ibid., p. 60.

and 'unseen universe'.[76] The first refers to all that is tangible and that can be measured and explained by science, the second to that beyond the reach of contemporary scientific knowledge. The chapter is not without its shortcomings, but it raises the beginnings of questions which are explored to innovative effect in later chapters.

The central chapters present the 'visible' world as Stewart and Tait understand it, and the separate but communicating 'unseen'. They begin by paying particular attention to the idea of 'Continuity'. With a detailed example which imagines an early astronomer observing how the sun moves in the sky at different times of the year, they explain that Continuity is a path – though not a smooth one – from less to more accurate knowledge; evidence is accrued which suggests a hypothesis, the hypothesis is refined until it is as accurate as possible, and eventually results in a law.[77] Discontinuity, meanwhile, is that which breaks all of these established laws without discernible reason, and would render current knowledge meaningless. The first edition describes Continuity as a progress in knowledge from 'the less to the more perfect', but in subsequent revisions the definition is less equivocally simple.[78] Stewart and Tait use the principle of continuity to two slightly confusing ends. While they acknowledge that the laws of thermodynamics, devised around twenty years prior to the release of *The Unseen Universe*, dictated that the universe would eventually come to an end, they disagree with this on the basis that the uniformity of nature would prevent this eventuality. However, they also state that they could not deny that 'the visible universe must, in matter, as well as in transformable energy, come to an end'.[79] They reconcile these two seemingly contradictory results by positing that there must be a separate, 'eternal' order of 'the things which are not seen', which provides a place for the 'eternal' elements of nature, notably the human soul, to transfer to when the visible universe finally ends.[80] Thus while the universe

[76] Ibid.
[77] Ibid., pp. 79-82.
[78] *Unseen Universe* 1st edition, p. 58.
[79] *Unseen Universe* 4th edition, p.94.
[80] Ibid.

in part will end, this connected order will sustain beyond it, as 'the available energy of the visible universe will ultimately be appropriated by the ether' and thus conducted to the unseen universe.[81]

Stewart and Tait speculate that ether acts as a type of bridge or conduit through which things might pass from the visible to the invisible in their chapter 'Matter and Ether'. The authors explain that there must be some intervening substance in the cosmos for any particle to move, be it an atom conforming to the already-established natural laws, or a soul moving from the visible to the invisible worlds. Having decided that there must be another order to which visible things or parts thereof can migrate, the authors deal with the intangible and the tangible on the same terms, assigning qualities associated with energy to concepts such as the soul and morality. They conclude that death is a 'transference from the visible universe to some other order of things intimately connected with it'.[82] They discuss a number of models of how ether functions mathematically and as a substance, and conclude that ether acts as a medium not just between objects in the void, but also the seen and the unseen. Stewart and Tait begin their examination of ether first by establishing the facts, as far as they were concerned, of its nature. They call upon Sir William Thomson's work to demonstrate its minimum mass, both Struve and Herschel's work to show that ether was not perfectly transparent as it was thought to absorb light from stars. Stewart and Tait use, as ever, many analogies to explain the nature of ether, most of which compare the substance to a liquid, even as they class it as being 'of a much higher order in the arcana of nature than those of tangible matter'.[83]

In early editions, having established with appeal to respected studies and scientists the basics facts of ether, the authors extend the knowledge of ether to new conclusions, identifying it as a 'bridge between one order of things and another, forming as it were a species of cement' holding together the 'various orders of the

[81] Ibid., p. 157.
[82] Ibid., p. 97.
[83] Ibid., p. 154.

universe'.[84] However, by the fourth edition Stewart and Tait are far more cautious in asserting the bridging properties of ether. They do hint heavily at the great mysteries and potential properties of such a mysterious substance, but rather than repeat their claim of ether as universal medium, they modify their claim to demonstrate ether as a competent but imperfect substance which fills the gaps between matter, across all orders. They retain the assertion from earlier editions that 'every motion of the visible universe is caused by the unseen, and that its energy is ultimately carried again into the unseen'.[85] However, in the article which in earlier editions makes the claim that ether is the bridge, Stewart and Tait instead reiterate their general conclusion that the seen and unseen universes are joined in such a way that energy can be transferred between them, and can be transformed in the unseen.[86] In the fourth edition, ether is certainly able to carry energies of all kinds, and is the vehicle for the vast majority of energy throughout the universe, seen and unseen, and the implication that the human soul is a type of energy remains, but the ability of ether to bear souls across to the unseen is not commented upon.

Having established thought and even morality as immaterial types of energy, then, it is not a great leap on the parts of Stewart and Tait to see the chance for immortality of the human race in the transference of mankind's eternal parts from the seen to the unseen, perhaps over a bridge of ether. Much as ether transports all types of energy as it dissipates to the invisible universe to be 'made use of or stored up', so might each human's eternal soul be similarly carried to the unseen.[87] Even with the later caveats in place regarding the limits of their knowledge of ether, Stewart and Tait are clear enough in ether's role as a vehicle for energy, the ability of certain substances to exist or facilitate both seen and unseen experiences, and the energetic properties of concepts such as consciousness and morality that the leap, if more tentative, is still discernible. The division between science and religion is thus partially demolished in *The Unseen Universe*; by treating the soul as simply another

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[84] *Unseen Universe,* 3rd edition, p. 158.
[85] *Unseen Universe*, 4th edition, p.199
[86] Ibid.
[87] *Unseen Universe*, 3rd edition, p. 159.

part of the natural world, beyond the realm of the detectable, Stewart and Tait are able to bring together the visible and the invisible, the religious and the scientific.

The final chapter, 'The Unseen Universe' brings together all of the elements discussed in each chapter to synthesise a complete view of the universe in which the visible universe is part of, yet separate from the invisible, the former sustained yet outlived by the latter, which offers hope of immortality. Stewart and Tait offer two possible models for this arrangement. The first imagines the universe as a series of smoke-rings, which act as nested orders, each providing for and forming the mass of the lesser one. The second explicitly introduces the idea of a fourth dimension, though the position of these different dimensions in relation to each other is slightly more confusing than the smoke ring model. At the time of *The Unseen Universe's* publication and revision in subsequent editions in the mid and late 1870s, thinking on the fourth dimension was mostly confined to mathematicians, usually geometry, but the idea was beginning to gain traction in the physical sciences.[88] Geometers were interested in the effect on geometric shapes of considering a higher dimension. For example, in 1827 mathematician August Ferdinand Mobius imagined transforming a 3D shape, a crystal shaped like a left-spiralling staircase, into a mirror image – a right-spiralling suitcase. Mobius concluded that it would be possible if the shape passed through a fourth dimension, and this type of strictly mathematical consideration of the fourth dimension was the chief mode of thought on the fourth dimension until the 1880s.[89] Two friends of Stewart and Tait, James Clerk Maxwell and William Kingdon Clifford, both demonstrated an interest in fourth dimensions prior to the publication of *The Unseen Universe* in 1874.[90] The 1870s saw an early emergence of some of the first theories of the fourth dimension which considered it

[88] Bork, p.326. Bork's article as a whole offers a useful survey of the fourth dimension in the nineteenth century.
[89] Snezana Lawrence, 'Life, Architecture, Mathematics, and the Fourth Dimension', *Nexus Network Journal* 17 (2015), 587-604 (p. 589).
[90] James Clerk Maxwell discusses the fourth dimension in an 1871 letter to C.J. Munroe, quoted in Bork, p. 330. W.K. Clifford considered it in his paper 'Preliminary Sketch of Biquarternions', *Proceedings of the London Mathematical Society* 4 (1873), 381-395.

as more than a plane which could affect geometry, coinciding, suggests Lawrence, with the increasing popularity of spiritualism.[91]

Stewart and Tait take two separate approaches to describing the fourth dimension – a concept only introduced by name in the third edition, though they had essentially described the fourth dimension without calling it such, from the book's first publication. The entire passage regarding the fourth dimension is slightly grudging – it is relegated to square brackets, as an aside 'to prevent, in future, the possibility of a mistake', but it does demonstrate an awareness of relevant developments, and the willingness and flexibility to use them to enhance their own argument, even if it is not entirely wholehearted.[92] They explain the idea of the fourth dimension through two examples, the first describing our dimension as the 'skin or boundary' of the fourth dimension, in the same way that a one-dimensional line forms the edge of a two-dimensional shape, and a two dimensional shape acts as a surface for a three-dimensional one.[93] The second example builds on both the shape analogy and the smoke ring model by explaining how one dimension may act upon the other, describing matter in the third dimension as a product of 'rents or cracks' in the fourth.[94]

Having established these models of the fourth dimension, the authors immediately connect these very theoretical ideas with the notion of a deity: 'let us…consider the position into which science has brought us. ... our conclusion is, that the visible universe has been developed by an intelligence resident in the Unseen'.[95] This phrase, 'where science has brought us', sums up Stewart and Tait's view of science as being a vehicle to bring one closer to God. They then highlight the questions which science cannot answer, and rather coyly suggest that the Bible – 'Christian records' – is the ultimate evidence of the scientifically theorised unseen

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[91] Lawrence, p. 294.
[92] *Unseen Universe*, p. 220.
[93] Ibid.
[94] Ibid.
[95] Ibid., p. 221.

universe, because it contains evidence, of 'supreme importance', that communication exists or has existed 'with the spiritual intelligences of the unseen'.[96] It is at this point that the integration of science and religion for which Stewart and Tait argue, is ultimately demonstrated in their own text.

The seen and the unseen

A vital distinction in *The Unseen Universe* is that between the visible and the intangible, and the relationship between the two forms the basis of the Stewart and Tait's argument bringing together God and science. The authors announced the publication of *The Unseen Universe* with an anagram in the scientific journal *Nature* which, when decoded, read '*Thought conceived to affect the matter of another universe simultaneously with this may explain a future state'*, and in earlier chapters of the book they state that thought is an immaterial concept with material results.[97] Thus the complex tension between the material and the immaterial, and its importance in determining that there is some form of afterlife was established as a central idea in the work even before its publication.

Stewart and Tait explore a number of different interpretations and uses of the terms tangible/intangible and visible/invisible, but are fairly consistent with their own definition of the divide and the relation between the two. They quote extensively from Thomas Young's lectures on natural philosophy, which arranges everything in the universe on a scale from more to less material, with solids at the most material end, through liquids, gases, energies, ether and 'the causes of gravitation, and the immediate agents in attractions of all kinds', to 'existences absolutely immaterial and spiritual'.[98] Stewart and Tait agree with the 'spirit' of this arrangement, but somewhat refine the letter, preferring to 'substitute for *matter* the

[96] Ibid., p. 222.
[97] Ibid., p. 200; 116.
[98] Thomas Young, *A Course of Lectures on Natural Philosophy and the Mechanical Arts* (London: J. Johnson, 1807), quoted in Stewart and Tait, p.160-161.

words *gross matter,* and for *immaterial* the words *not grossly material*'.[99] For the purposes of *The Unseen Universe*, Stewart and Tait use several binaries, 'gross matter'/'not grossly material', tangible/intangible, visible/invisible and seen/unseen more or less interchangeably.[100] The parts of the universe which they deem to be tangible and intangible are generally fairly intuitive. Any substance which is perceivable and physically experienced is grossly material; the examples Stewart and Tait give are 'a block of wood, or a bar of iron'.[101] Meanwhile, anything which can be guessed or assumed to be there, for example a deity, but which cannot be deduced or induced through Tyndall's watchwords of observation and experience, is categorised in *Unseen* as 'not grossly material' and thus belongs to the unseen universe.[102]

The broad strokes of the distinction between the seen and the unseen have already been introduced, but the use in early editions of *The Unseen Universe* of ether as a bridging medium means that it requires further expansion.[103] There are several exceptions to the binary of tangible and intangible noted throughout the text. Stewart and Tait introduce a number of substances or concepts which act as a bridge between each side of these pairs. These bridges provide the basis of hope for a future, immortal state. The first thing which the authors identify as crossing the divide between the material and the immaterial, as already discussed, is thought or consciousness, which is 'utterly distinct from matter and the properties of matter', yet 'cannot exist' without matter to house it.[104] Thus it is in between the states of seen and unseen, an immaterial concept until it can dwell within a material shell, yet leaving a material mark and maintaining a hold upon Continuity in the shape, the authors claim, of memories.[105]

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[99] Ibid.
[100] Ibid., p. 161; 76.
[101] Ibid., p. 73.
[102] Ibid.
[103] A detailed assessment of the various roles with ether played in different cosmologies in the nineteenth century can be found in Geoffrey Cantor, 'The Theological Significance of Ethers', in *Conceptions of Ether: Studies in the History of Ether Theories, 1740-1900*, ed. by G.N. Cantor and W.J.S. Hodge (Cambridge: Cambridge University Press, 1981).
[104] Ibid., p. 74; 73.
[105] Ibid., p. 77.

Thus thought and spirit are the only parts of the human makeup which can transfer from the seen to the unseen, and ether is the medium which permits this movement. This transmission is important because in the unseen lies God; the visible universe is 'a limited area bounded by an impenetrable wall, which, if we could only pierce it, would admit us at once into the presence of the eternal'.[106] This 'impenetrable wall' is what ultimately divides the seen from the unseen, and while a human body may not be able to cross it, Stewart and Tait conceive a model by which the wall might be porous to those substances – particularly spirit and ether – which can traverse the divide between the visible and the invisible. The core of the argument for a connected but separate unseen universe is based for the most part upon the behaviour of ether, but relies also upon the assumed behaviour of a number of intangible things, such as thought and the human soul.

Reconciliation between science and religion

The Unseen Universe calls upon a number of scientific theories to support its central idea that religion and science are not mutually exclusive and that energy can pass between orders, from the seen, material realm, to the unseen, where much that seems inexplicable by science, such as God, may dwell. Stewart and Tait's use of other, established theories lends credence to their own, however on several occasions their use of these principles – for example continuity, discussed above, Maxwell's demon, the laws of thermodynamics, or ether – is highly interpretive, subtly or overtly twisting the ideas or indeed laws of others to fit with their view of how the universe works. They devote some time to the laws of thermodynamics, especially in their examination of potential objections. Two of the 'scientific' objections to their theory of the unseen which they anticipate relate to the conservation of energy. The first states that the model of immortality propounded by Stewart and Tait violated the principle of the conservation of energy because 'it is manifest that if energy is transferred from the visible into the invisible universe, its constancy in the present

[106] Ibid., p. 96.

universe can no longer be maintained'.[107] Second, 'the dissipation of energy must hold true also, and although the process of decay may be delayed […] it cannot be permanently arrested'.[108] Ultimately, that argument follows, every part of the universe – visible or otherwise – has an equal supply of energy and thus its end is equally inevitable. In the first case, Stewart and Tait essentially exhort the reader to think of the universe as a whole; the unseen universe is one part of the whole. In the second, almost conflicting question, the holistic view is called for again and the reader is directed to 'what follows of this book'.[109] These answers are not entirely satisfactory, however they are all that the authors say on the topic.

Stewart and Tait's use of existing scientific ideas – Maxwell's Demon and ether in particular – for their own original ends, gives a twist of novelty and innovation to an essentially comforting, old-fashioned worldview in which the heat death of the universe is not a cause for anxiety and God is accessible over just a short bridge through the void. Clarke notes that the efforts of *Unseen* to 'accommodate the demon and to evade the threat that it posed to their particular moralization of thermodynamics' is an example of 'dogmatic allegory defending against the daemonic potential of a strong revisionary trope'.[110] Stewart and Tait's solution to the problem of entropy calls upon both religious faith and scientific curiosity. As such it is precisely the sort of answer which they might expect would please and convince their intended audience, those whose allegiances lie neither entirely with science nor religion. Indeed, when describing their audience, Stewart and Tait explicitly state that their aim is not to attempt to win over 'those of the extreme materialistic school' or 'those who are so absolutely certain of the truth of their religion' that they cannot 'entertain or even to perceive any scientific objection'. Rather, they aim to provide an explanation for a world in which the two can co-exist, for those 'occupying a middle position'.[111] This sort of optimism largely accepts

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[107] Ibid., p. 207.
[108] Ibid., p. 208.
[109] Ibid., p. 209.
[110] Clarke, *Energy Forms,* p.107.
[111] Ibid., p. 71; 69; 70.

scientific laws without excluding other, religious, ideas; one clear example is the laws of thermodynamics. While Stewart and Tait insist that their idea of an eternal realm does not violate the laws of thermodynamics, they also admit that they amend it with the addition of 'the gradual carriage of some part at least of this energy into the invisible universe'.[112] They also maintain that the 'potential energy of the solar system' alone is 'so enormous' that it approaches an 'infinite' supply, though earlier in the book they deal directly with the certainty of idea of the dissipation of energy.[113] Instead of committing fully to the vagaries of a natural world ungoverned by any divine being, the authors find loopholes through which God can slip to save humanity; however this is again by no means a unique way of reconciling the laws of science with the tenets of faith. Natural theology also treats science and religion in parallel and with God at its centre as an eternal force for the maintenance of human life, though to different ends and with a different rationale, and outside of science poets such as Gerard Manley Hopkins found comfort in finding spaces for God to sustain humanity even after the universe succumbed to its own laws.

The God of *The Unseen Universe* may be assumed to be a Christian God, as the authors are both Christian and the perception of the soul which is established as Christian in their 'Introductory sketch' is the one which is used throughout the book. However, the religion in question is never explicitly named and while Clarke identifies it as Presbyterian, Ketabgian calls the work 'polytheistic'.[114] There are some clues which gesture towards a presumed Christian God, for example, of the two 'religious' objections anticipated by the authors, one directly quotes from the Bible and the other uses specifically Christian eschatology.[115] While these are the voices of detractors rather than the authors, it shows that the authors expect their book to be viewed in terms of Christianity. However, the stated object of the work is to 'show that the presumed incompatibility of Science and Religion does not exist'; not the

[112] Ibid., p. 207.
[113] Ibid., p. 127; 107.
[114] Clarke, p. 156; Ketabgian, p. 254.
[115] Ibid., pp. 202-203.

incompatibility of Science and Christianity specifically.[116] Thus *The Unseen Universe*, though clearly aimed at fellow Christians, does not exclude other faiths. The appeal of a system which brought together God and science did not extend just to Christianity; Beichler and Valente both demonstrate the interest which *The Unseen Universe* held for spiritualists in particular. Stewart and Tait's suggestion of the existence of what would now be understood as a separate dimension, and their penchant for hierarchy and order, seems to have many elements which would appeal to Spiritualists.

Many descriptions of the spiritualist afterlife include an analysis of a future state which uses very scientific language. For example *Where are the Dead* (1873), a collection of very detailed accounts of the afterlife, refers to 'spiritualized particles in the earthly body, which are too coarse to form part of the earthly body, and too ethereal to remain upon the surface of the earth'.[117] Attempts of this sort to couch decidedly spiritual, theological matters in scientific language were common in spiritualist writing.[118] Therefore, a text like *The Unseen Universe*, which takes a similar approach and creates a space in which scientific and religious knowledge can interact without overt conflict, has an understandable appeal to Spiritualists. This appeal is perhaps intensified by the presentation of *The Unseen Universe* as a decidedly scientific rather than religious text; the idea that the beliefs which Spiritualism espoused might have scientific corroboration from sources beyond the religious would undoubtedly have been an attractive one. Paraphysicist and science historian James E. Beichler identifies in Spiritualist writing a preoccupation with the Principle of Continuity, as the 'justification for a link between the living and the dead', and as a 'linking mechanism in the evolution of man', both materially and

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[116] Stewart and Tait, p. ix.
[117] Binner, Frederick Altona 'Fritz'., *Where Are the Dead? or, Spiritualism Explained* (Manchester: A. Ireland & Co., 1873), p. 90.
[118] Richard Noakes. 'Spiritualism, science and the supernatural in mid-Victorian Britain', in *The Victorian Supernatural* ed. Nicola Bown, Caroline Burdett and Pamela Thurschwell (Cambridge: Cambridge University Press, 2004), 23-43 (p. 24).

spiritually.[119] Meanwhile Stewart and Tait have a similar interest in Continuity as a 'linking mechanism' not for humanity as a whole but rather for human knowledge.

When Stewart and Tait draw specific parallels between science and religion, they usually do so in terms of Christianity, but allow that in the case of Spirituality and Swedenborgianism there are strong bonds between the central line of argument in *The Unseen Universe* and the central ideas of those religions. In the conclusion of their 'Introductory Sketch', Stewart and Tait reject the idea of spirits appearing to Spiritualists on the basis that they happen in 'insufficient light, if not total darkness, and in presence of those who are in a state of mental excitement', and their engagement with Spiritualism on scientific grounds is in and of itself a recognition that Spiritualism has already begun dealing with faith and science on equal terms.[120] Even as they dismiss one part of Spirtualism, Stewart and Tait place at the heart of their argument the idea that the 'invisible world' is not 'something absolutely distinct from the visible universe, and absolutely unconnected with it, … but rather as a universe that has some kind of bond of union with the present', which they attribute directly to Swedenborg and Spiritualists.[121]

In addition to bringing together science and religion, *The Unseen Universe* is a highly moralistic text; it does not simply explain how science and faith can happily coexist, but also details how science and morality directly combine. Throughout the book there are hints that Stewart and Tait have a moral agenda or at least a very specific moral viewpoint, mostly from their asides – for example the comment on boxing, quoted above, while not directly about morals per se, shows that the authors see the world as becoming more tolerant of undisciplined violence, that they feel this is a change for the worse, and, crucially, that they feel this sort of commentary is appropriate in a book of science. Stewart and Tait's approach to science, faith and morality is interesting and relatively simple. Stewart and Tait counter a lot of scientific conundrums and anxieties, for example concerns about the fate of a

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[119] Beichler, pp.91-92.
[120] Ibid., p. 67.
[121] Ibid., p. 68.

universe subject to the laws of thermodynamics, with an ultimate faith in a 'Supreme Governor' which provides stability and the promise of an eternal life, in a cosmos which 'must in matter, as well as transformable energy, come to an end'.[122]

The introduction of morality to an ostensibly scientific worldview is thus a response to materialists. If morality and religion are connected, so that humanity should do good because that is what God desires, and God is excluded from science, then that leaves science morally vacant and in need of balance by religion's strict codes. According to a strongly materialist world view that excludes God and religion's intrinsic morality altogether, there is left a moral vacuum, as there is no deity to fill the void. Stewart and Tait get around this absence by imbuing science with an inherent morality. Thus, even when God is across a bridge of ether and trusting creation to its laws and patterns, there is an ingrained sense of right and wrong in the universe. Morality for the authors becomes a force equivalent to physical types of energy, as discussed below. Admittedly, for Stewart and Tait there is little or no separation between science and God; in their theory they go to great pains to make a space for a deity and a home for it, in 'some other order of things intimately connected with it'.[123] In Stewart and Tait's model, science does not preclude God, and while God cannot be explained or bound in scientific terms, a deity can be defined or explained to the extent that assuming the existence of one does not break continuity, and such a being can be trusted not to abuse their power and break it themselves.

Energy becomes decidedly moral – depicted as both the cause and cure of social ills – in the section 'Matter and Ether'. In the same aside that bemoans the decline of 'jolly and chivalrous wrestlers, boxers, and bowmen', Stewart and Tait show a strangely fatalistic view of morality:[124]

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[122] Ibid., p. 88; p. 94.
[123] Ibid., p. 90.
[124] Ibid., p. 143.

> The dissipation of energy is a great fact in a moral as well as in a physical sense. In those good old times when *men* fought with *men*, – irrepressible energy, rather than any sordid passion or uncontrolled vice, constantly pulling the trigger! *Now* creatures in the likeness of men vent their despicable passions in murderous assaults upon women and children. But science hints at an effectual cure. It is probable that before many years have passed, electricity, which by some mysterious means enables our nerves to converse with one another at distances of thousands of miles, which alike plates the teaspoon and illumines the lighthouse, will be called upon by an enlightened legislature to produce absolutely indescribable torture (unaccompanied by wound or even bruise), thrilling through the frame of such miscreants.[125]

Although they bend or break the second law of thermodynamics on more than one occasion on the basis that the unseen universe, the separate but connected order, is a part of the wider laws and therefore an eternal life is viable, they apply the idea of the dissipation of energy to morality without the same optimism. Unlike material energy, which through one way or another continues anon, there does not seem to be any redemption suggested for the dissipation of morality. The connection between the physical and the moral, which is at the centre of Stewart and Tait's argument, seems to be so strong that it implies that morality is a type of energy, especially in this passage where it is explicitly dealt with in the same terms as any other sort of energy. The introduction of this sort of moral energy does not seem to have precedent in the book, but the idea that some people have more of this sort of energy than others does provide a sense of hierarchy, which seems to appeal to the authors. How energy is the 'effectual cure' to this dissipation is unclear. It is possible that the idea suggested by Stewart and Tait is entirely punitive and the efficacy of electricity to punish is simply the 'indescribable torture' that it inflicts. However, it is unclear whether there is a further function, for example if the pain is a method of atonement, with the pain curing the miscreant of their sins, or if the introduction of energy to someone lacking in morality is

[125] Ibid., pp. 143-144.

thought to charge the recipient with fresh moral strength. The use of the word 'cure' is a strange choice if the only result is pain, but any further advantages of this punishment are not explained.

Poetry in *The Unseen Universe*

The universe which Stewart and Tait imagine in their treatise is a curiously literary one – they refer to the struggle of humanity to scientifically comprehend the universe in terms of literacy, and call the universe a 'Great Book'.[126] This literary analogy for understanding the universe perhaps shows the extent of the authors' interdisciplinarity, or at the very least their commitment to finding analogies and metaphors which are impressive to any level of scientific knowledge, as long as the reader has a sufficient level of literacy and literary knowledge. This commitment to appeal to a reader who is perhaps not au fait with scientific terms, combined with Stewart and Tait's engagement with contemporary scientific and theological questions means that *The Unseen Universe* contains a web of reference and allusion. Many of these are to other scientists – both modern and historical – and to the Bible, which is to be expected of a book attempting to reconcile science and religion. Others refer to classical philosophy, history, and world religion; others still are literary and, in particular, poetic. The types of text called upon are those with which a reasonably well-educated person could be expected to be familiar, for example the works of John Bunyan, Lucretius, Shakespeare, Byron and Tennyson. The most conspicuous way in which references are used is in the epigrams at the beginning of each chapter. In the early chapters, the quotations are non-literary: 'Introductory Sketch' uses Plato and Pascal, while 'Position Taken by the Authors' uses a passage from the Bible. However, during the central, scientific chapters, the epigrams are exclusively poetic, and the final chapter begins with three quotes; one poetic, one Biblical, and one Talmudic. The method of selection for these texts is unclear, and they are somewhat surprising at times. The inclusion of the teachings of Rabbis in a text which, though it is not explicitly specifically for the Christian faith, is certainly

[126] Ibid., p. 236.

Christian in practice, seems an unusual choice, for example. Furthermore, while the juxtaposition of religious epigram with scientific subject matter seems like a reasonable combination for *The Unseen Universe*, poetry is not as comfortable a fit, especially when the combination is between the text's most intensely technical chapters and a relatively undemanding poem.

Poetic epigrams give the reader a lyrical glimpse into the gist of the upcoming chapter, and perhaps help to strengthen the intellectual democracy which Stewart and Tait propound throughout the text. Though the first epigram of the chapter is entirely in Greek and therefore not necessarily particularly accessible, this second quote is by a writer who would be easily recognised by Stewart and Tait's intended audience. Shakespeare, neither a theologian nor a scientist, was selected as the first words in English of the chapter 'The Present Physical Universe', and the five lines of *The Tempest* quoted as an epigram do effectively summarise or at least introduce the world view which Stewart and Tait explain in scientific terms in the following chapter. The epigram is an extract from the speech made by Prospero, a character whose knowledge encompasses both the spiritual and physical worlds, as he puts an end to a magical masque which he conjured as a gift to Miranda and Ferdinand:

> The cloud-capp'd towers, the gorgeous palaces, The solemn temples. The great globe itself, Yea, all which it inherit, shall dissolve; And, like this insubstantial pageant, faded, Leave not a rack behind.[127]

The magical element notwithstanding, this extract evokes the same tone of wonder which Stewart and Tait have when discussing the physical universe and, like Stewart and Tait, Prospero shows the same resignation that the 'great globe itself' will, inevitably, 'dissolve'. However, the authors equate this only to the 'Present Physical Universe', leaving the possibility of a future life or an immaterial universe open to be theorised

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[127] William Shakespeare, *The Tempest*, IV:1, ll:882-886, quoted in Stewart and Tait, *Unseen Universe*, p. 99.

about.[128] The choice to include a literary quotation, as a kind of third path between the scientific and the religious, tallies with Stewart and Tait's desire to appeal to the 'middling' group of men; like their target audience, poetry does not intrinsically align itself to either science or religion. However, certain types of poetry are dealt with in *The Unseen Universe* in spiritual terms.

There are several purposes to which the references to poems or poetry itself are put which illuminate why it is quoted from so often, over other genres such as prose fiction or even types also used in the text such as classical history. Chiefly, poetry is portrayed as being quite spiritual. Half of the references to the word 'poem' in *The Unseen Universe* refer to scripture – 'the poem of Job' for example – and Stewart and Tait call hymns and devotional prose such as *The Pilgrim's Progress* 'true poetry'.[129] Many, but by no means all, of the poets mentioned in the text are known for their engagement with topics of religion or science. Tennyson is quoted in two epigrams, and is treated at length in terms of his engagement with theological questions, while a hymn by Pope is placed at the centre of Stewart and Tait's discussion of devotional song.

Two of the three passages of Tennyson's work which are quoted – one of which is used as an epigram, then examined more extensively in a later chapter – all come from *In Memoriam*, a poem which has itself been widely discussed in modern criticism in terms of its struggles with science and religious belief. In addition to its modern interest, it became something of a contemporary keystone; Queen Victoria, influentially, was vocal about her admiration of the poem and wrote in her journals that she received 'much comfort' from it, and Susan Gliserman states that Tennyson's poem 'became another of the ways in which some Victorians understood science'.[130] Stewart and Tait were therefore not making a controversial or particularly original choice when they included *In Memoriam*. Like most of the examples which the

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[128] Stewart and Tait, *Unseen Universe*, p. 99.
[129] Ibid., p. 225; 259.
[130] Susan Gliserman, 'Early Science Writers and Tennyson's 'In Memoriam': A Study in Cultural Exchange: Part I', *Victorian Studies*, 18.3 (1975), 277-308 (p. 278).

authors use, it is designed to be familiar in order to lead their reader to more challenging concepts through a series of less controversial examples and interim ideas. The third passage quoted is from 'The Lotus Eaters' and is used in direct reference to Lucretius.

The extended reading of Tennyson comes in the eponymous final chapter, after two excerpts were used in epigrams to 'Development' and 'The Unseen Universe'. The first epigram includes the line which asks 'are God and nature then at strife' and concludes "a thousand types are gone: / I care for nothing, all shall go', summing up in just a few lines the sentiment which Stewart and Tait aim to refute – to them, there is no 'strife' between 'God and nature', and that eternal life exists and shall just prevent 'all' from going.[131] The second epigram shows accordance rather than disagreement with Stewart and Tait's thesis. In the chapter where they synthesise their ideas and reach their conclusion about eternal life, the authors use as their epigram a passage which describes 'Eternal process moving on / From state to state'.[132]

In the final chapter, they return to the first passage to quote it more extensively, praising Tennyson for 'proposing the same riddle' regarding reconciling religious and scientific experiences of the natural world, particularly regarding the idea of providence, 'in very beautiful language'.[133] They use it as one of a volley of examples of esteemed minds battling with the conundrum which Stewart and Tait address. In addition to Tennyson, the representative poet, they include quotations from the religious philosopher and Reverend James Martineau, the philosopher J.S. Mill, and the economist and logician William Stanley Jevons. These other figures, however, go without comment, and are quoted in much shorter form; it is only Tennyson who is given accompanying adjectives, and who is quoted as giving a solution to this 'riddle'.[134] Where the non-poetic figures simply struggle with the

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[131] Alfred Tennyson, *In Memoriam* quoted in Stewart and Tait, *Unseen Universe*, pp.158; 195.
[132] Stewart and Tait, p. 195.
[133] Ibid., p. 254.
[134] Ibid.

conundrum, Tennyson is uniquely presented as coming to an optimistic conclusion regarding this struggle, deciding 'That nothing walks with aimless feet: / That not one life shall be destroyed / Or cast as rubbish to the void, / When God hath made the pile complete'.[135] In this way Tennyson is presented as taking the kind of journey which Stewart and Tait desire of their intended readership, transitioning from struggling with questions about the place of God in the cosmos, to an acceptance that a divine purpose is compatible with a world which can be experienced scientifically. The reason for this role being given uniquely to a poet is somewhat unclear. Perhaps they simply felt Tennyson put forward the idea most succinctly; they certainly thought it was the most beautiful expression of this confusion. Additionally, poetry is often conflated in the text with scripture; the privilege of discovering a satisfactory end to the problem of God's role in a scientific universe is given to what Stewart and Tait consider the most spiritual of mediums, which further underscores the idea that scientific and theological ideas can be united harmoniously.

Stewart and Tait expand upon the role of spiritual verse further in their discussion of hymns, with particular attention to Pope, who, like Tennyson, was a well-known and respected poet, and, again like Tennyson, is quoted in short form in an epigram, and then more extensively as part of a wider argument. The epigram is used to head 'Development', but unlike the forlorn questioning in *In Memoriam* of God's place in nature, which constitutes the other epigram for that chapter, Pope's passage is far more assured:

> All nature is but art, unknown to thee;
> All chance, direction, which thou canst not see,
> All discord, harmony not understood ;
> All partial evil, universal good ;
> And spite of pride, in erring reason's spite,
> One truth is clear, whatever is, is right.[136]

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[135] Ibid., pp. 254-255.
[136] Alexander Pope, *Essay On Man*, quoted in Stewart and Tait, *Unseen Universe*, p. 158.

This excerpt from 'An Essay On Man' functions as a kind of answer to the Tennyson passage located immediately above it on the page; where one struggles to find God in nature, the other accepts divine invisibility and makes a simple declaration of acceptance of the divine plan and human ignorance; any apparent problem is a result of being unable to see the full picture – 'partial evil' is 'universal good', and 'discord, harmony not understood'. This idea, like all of the epigrams, feeds into Stewart and Tait's overall argument, this time emphasising a divine element – what is unknowable by humans is known by God – before an intensely scientific chapter about the parts of the universe beyond human experience which can only be speculated upon. Pope's epigram thus acts as a reassurance before the chapter that although the immaterial world may only be speculated upon, it is there as part of a greater picture – 'art, unknown to thee'. Pope is then invoked again in 'The Unseen Universe' to give an example of 'one of the finest' hymns, when hymns are discussed as a source of insight into the 'joys of the Christian Heaven'.[137] Though the idea of hymns as giving literal insight into the 'material conditions' of a future state is quickly dismissed, they are still considered important for their effect and their beauty which raises them almost to the standard of 'true poetry' or scripture.[138] Thus poetry is an access point to the divine, but also a space suitable for scientific thought, as shown in discussion of Tennyson or Lucretius.

The most commonly referenced and fulsomely praised of the poets mentioned in *The Unseen Universe* is the Roman philosopher and poet Lucretius. Record of only one poem survives, *De Rerum Natura* or 'On the Nature of the Universe', and Stewart and Tait see the poem as a kind of classical precursor of their own work. In a similar way that Stewart and Tait's treatise treats the spiritual and the scientific as two paths to a single truth, and deals with them in common terms, so Lucretius writes, in separate parts of the same poem, upon matter and void, atoms, the nature and mortality of the soul, and the mortality of the universe. This similarity of subject

[137] Stewart and Tait, p. 258
[138] Ibid., p. 259.

matter, expressed in a different form, is greatly appealing to Stewart and Tait. They quote or mention him in three separate chapters; the only unique entity mentioned more often or in more chapters is God, though God, unsurprisingly, does outstrip Lucretius by far in terms of references. The terms in which Lucretius is mentioned is always with explicit respect. In contrast, Byron or Clerk Maxwell, to take two examples, are simply mentioned as people who produced work which is considered useful or relevant to the immediate argument, with no proximal adjectives. Lucretius, however, is 'well-known', his poem 'beautifully interpreted' his philosophy, which was 'remarkable', and a translation of his work is 'splendid'. Even though Lucretius' approach is 'the very opposite' of that of Stewart and Tait, he is treated with utmost respect in the text.[139]

Stewart and Tait's curious preoccupation with Lucretius is by no means unique; Tyndall mentions him in passing in his Belfast address, perhaps intentionally conforming to trend, while the *Encyclopedia Britannica* entry for Lucretius for the ninth edition, for the years 1875-1890, gives a six page essay discussing the fact that 'more than any of the Great Roman writers, [he] has acquired a new interest in the present day'.[140] Intellectual historian Frank M. Turner confirms this renewed interest, and, in his survey of the way in which Lucretius is discussed, finds that this leap in popularity in the final third of the nineteenth century coincides with the poet being discussed not in terms of poetic merit, but solely as a tool in various debates around science and religion. Turner identifies Lucretius as a key weapon in the late Victorian discussion of materialism. Self-described materialists such as Huxley and Tyndall used Lucretius as a learned and respected forebear, while traditional, theological, critics of materialism portrayed these scientists as 'revivers of an ancient and inadequate philosophy', while 'combatting modern scientific thought through classicism'.[141]

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[139] Stewart and Tait, *Unseen Universe*, pp. 37; 131.
[140] W.Y. Sellar, 'Lucretius', *Encyclopedia Britannica* vol. 15 (9th edition, Edinburgh: A. and C. Black, 1875), pp. 50-56 (p. 50).
[141] Frank M. Turner, 'Lucretius Among the Victorians', *Victorian Studies,* 16.3 (1973), 329-348 (p. 333).

The treatment of Lucretius in *The Unseen Universe*, then, is a useful example of how Stewart and Tait traverse contemporary scientific-theological battle lines. While they made clear their distaste for 'the horrors and blasphemies' of materialism almost to the point of absurdity, they did not use Lucretius against materialists in the way that Turner describes most opponents of materialism as doing.[142] A possible reason for this is that these writers, liberal Christians such as John Tulloch and James Martineau, to name two of the examples which Turner uses, fall under the group of men which Stewart and Tait dismiss from their audience as 'they will not be influenced by anything that [the authors] can say' because they 'are so absolutely certain of the truth of their views of religion'.[143] Instead, they and Tyndall, a representative of 'the extreme materialistic school' with whom the authors have nothing to discuss because the authors and materialists find each other's world views 'utterly worthless', both refer to Lucretius in similarly admiring terms, even as Stewart and Tait accept that Lucretius fundamentally disagrees with their worldview.[144] In this way, they are able to capitalise on appearing up to date with current rhetorical trends in scientific discussion. They parallel their use of an ancient yet still relevant theological text, the Bible, with a similarly archaic but relevant scientific text – though of course the significance of Lucretius' work in *The Unseen Universe* pales utterly in comparison to the Bible's role in it. The authors pick and choose from both sides of the discussion of materialism to create a middle ground which appeals to their own world view, without ever explicitly validating the worth of such a discussion, similarly to the way in which they dismiss utterly the existence of any conflict between science and religion even as they engage with it. The use of Lucretius is thus an imitation of their approach to the relationship between science and religion as a whole.

While precedence in terms of the number of references is given to various scientists throughout the book, only one of the chapters, 'Development', exclusively

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[142] Stewart and Tait, *Unseen Universe*, p. 21.
[143] Ibid., p. 70; p. 69.
[144] Stewart and Tait, *Unseen Universe*, p. 71; p. 131.

references scientific sources. Though it is headed by both Pope and Tennyson writing on God's relationship with nature, the former with optimism and the latter with pessimism, and the authors use, as ever, relatable examples and the friendly tone of one speaking with their equals, there are none of the religious and poetic references which pepper the rest of the book. One explanation for this may be that this chapter is much more narrative than the others, with the exception of the 'Introductory Sketch' which necessitated discussion of scripture by nature of its theme. 'Development' pieces together the process of the formation of the universe from its birth to its present state, as well as the process of its population. The act of creation itself is conspicuously absent – instead the chapter is essentially a summary of the current theories of the development of the universe with which Stewart and Tait agreed, to create a linear account upon which they could build their own theories of the future of mankind and the universe as a whole. This unequivocally scientific chapter serves as a contrast to the interdisciplinarity of the others, which reference poets, scientists and scripture as sources of equal relevance and importance.

Conclusion

While the theories which Stewart and Tait propose are somewhat arcane – one obituary of Balfour Stewart reflects with a slight note of bemusement upon his 'indulgence in peculiar physical speculations' in *The Unseen Universe* – and not always entirely sound or clear, they are also an important part of the debate in the 1870s over where God's place in the universe lay.[145] By theorising what is essentially an example of a parallel universe, and filling the discomforting voids in space with a fluid which connect the two orders, they do create a much desired compromise between faith and science, the intangible and the visible. Despite the treatise's peculiarity and its occasional lack of clarity, *The Unseen Universe* intervenes in important debates around where God's place in the universe lay – or if God had a place in a scientific universe at all. By imbuing the soul with properties analogous to that of energy, and soothing thermodynamic anxieties regarding the dissipation of

[145] Anonymous obituary, *Proceedings of the American Academy of Arts and Sciences,* p. 377.

energy through theorisation of a fourth dimension, they create a much-desired compromise between faith and science, the intangible and the visible. *The Unseen Universe* stands as an example of an attempt to negotiate the distance between science and religion whose influence has been largely forgotten by modern scholarship.

‘Left in the universe alone with God’?: Whewell, Brewster and the Cosmic Plurality Debate

Introduction

In 1853, the influential scientist and theologian William Whewell anonymously published a treatise denying the possibility of life on other planets. *Of the Plurality of Worlds: An Essay*, triggered what historian of science Michael J.Crowe describes as ‘one of the most intense phases of the extra-terrestrial life debate’.[1] Whewell’s conclusion that Earth was probably the only inhabited planet in the universe ran counter to prevailing opinion on the question of life on other planets, and raised disturbing questions about humanity’s position and role in the universe, as well as its relationship with God. In January of 1854, a few months after *Plurality* appeared in late 1853, David Brewster, the Scottish physicist and prolific science writer, was invited to review the text for *The North British Review.* Incensed by the argument in *Plurality*, Brewster wrote a scathing forty-four-page review which was published in May of 1854, and followed it in June with a book-length response to the treatise. In the second edition of *Plurality*, Whewell responded directly, and mockingly, to Brewster’s criticisms, and the argument raged on over multiple years and editions. The argument between these two ‘aging titans’ was seen by some as the centrepiece of the controversy which *Plurality* triggered.[2] *Plurality* and *More Worlds* were often reviewed together, and Crowe identifies them as two key voices in the debate of the time.[3] In this chapter, I move away from an examination of the anxieties elicited by thermodynamics regarding the death of the universe and the thermodynamic viability of an eternal god. I turn my attention instead to astronomical anxieties, specifically

[1] Michael Crowe, *The Extraterrestrial Life Debate,* p. 265.
[2] Ibid., p. 300; Unsigned review, ‘The Plurality of Worlds’, *Journal of Sacred Literature and Biblical Record* 1.2 (1855), 462-465 p. 463.
[3] Crowe, p. 300.

the theological consternation aroused by the question of whether or not there is life on other planets.

This chapter seeks to explore the theological, scientific and rhetorical stakes of the cosmic plurality debate, drawing upon the work of Michael Crowe in particular. The debate between Whewell and Brewster is one of the most literal forms of conversation I consider in this thesis, consisting as it does of a series of arguments and counterarguments, with each edition of Brewster's treatise responding to Whewell's criticisms of *More Worlds than One* and vice versa. Beyond this type of conversation, I use the conversation model here to consider how scripture, theological writing, poetry and poetic devices informed and influenced the arguments posed by both sides. *Of the Plurality of Worlds* in particular offers an especially clear example of the type of cross-disciplinary communication I find of interest. Whewell quotes from and uses as part of his rhetoric passages from Edward Young's *Night Thoughts*, a devotional poem, to support his argument. In turn, *Plurality* was read and apparently enjoyed by Edward Henry Bickersteth, who includes it in the bibliography for his devotional poem *Yesterday, Today and Forever*. I will conduct a full discussion of Whewell and Brewster's use of *Night Thoughts* and Bickersteth's references to the plurality debate in Chapters Four and Five respectively. The debate, and David Brewster's contribution especially, is largely understudied. Chapter Two considered an instance of a new scientific discovery threatening traditional understandings of God and the afterlife, and one attempt to resolve this threat through ostensibly scientific means. In this chapter, I examine a different kind of cosmological quandary. The issues raised by the existence of extraterrestrial life are primarily theological, and Whewell uses the most up-to-date geology and astronomy to prove that such life is impossible, thus avoiding the religious complications of cosmic plurality. I will show that the controversy offers an important insight into multiple, opposing methods of dealing with theological questions as they intersect with astronomical and cosmological issues. I will analyse and compare the figurative devices and poetic allusion employed by these two texts to help them answer an ultimately theological question through scientific method. The next two chapters examine poetry pertaining to some degree to the cosmic plurality debate. Chapter 4

examines *Night Thoughts,* which both Whewell and Brewster quote in their texts. I will read *Night Thoughts* in light of Whewell and Brewster's treatment of the poem, so this more general study of Whewell, Brewster and the cosmic plurality debate serves in small part as an introduction to the stakes of the narrower discussion of the role of *Night Thoughts* in the cosmic plurality debate in the following chapter. The final chapter studies two poems, one of which directly references *Plurality*, while the other describes at some length inhabitants of other planets. Thus, these three chapters shows a movement and exchange of ideas and images, from religious poetry, to religiously-motivated scientific treatise, and back to poetry.

First I will consider the theological stakes of the debate, with particular reference to Thomas Chalmers' 1817 series of sermons, *Discourses on the Christian Revelation: Viewed in Connexion with the Modern Astronomy* (henceforth referred to as *Astronomical Discourses*), whose sermons in favour of cosmic plurality formed the theological basis of both *Plurality* and *More Worlds*. I will then explore the broader scientific, poetic and theological influences upon both texts, as well as their nineteenth-century receptions and notable responses. Finally, I will compare *Plurality* and *More Worlds* in their treatment of three key topics: the relationship between science and religion; analogy; and imaginative language. I argue that Whewell's discomfort with analogy, poetry and what he perceives as fanciful language, is indicative of his broader move away from traditional views of cosmic plurality. Unless otherwise stated, all quotations from *More Worlds Than One* are from the fifth British edition, published in 1865 and the last which contained significant substantive changes. All quotations from *Of the Plurality of Worlds* are from the fourth British edition (1855) unless indicated otherwise.

The terms 'plurality of worlds' and 'cosmic pluralism' refer to the idea that there are multiple inhabited planets, while the terms 'unity of worlds' and 'cosmic unity' denote the suggestion that Earth is the only planet in the universe that supports life. Whewell's book leads the reader through a variety of arguments and counterarguments which come to the conclusion that 'the plurality of inhabited worlds [is] improbable on physical grounds'; in short, Earth is probably the only

inhabited planet and humanity certainly the sole intelligent species in the universe.[4] *More Worlds* is largely structurally similar, but maintains the historically and scientifically more traditional opinion that many other bodies in the solar system and the universe at large might be inhabited. Brewster relies largely upon analogy and an abiding belief that the ultimate purpose of the universe is to sustain life to make his cosmic pluralist argument.

According to William C. Heffernan, 'Ever since the acceptance of Copernican doctrine, most scientists had taken plurality for granted'.[5] Historically, the idea of extra-terrestrial life has not necessarily been a controversial one; before *Plurality*, the majority of writing on the subject came from pluralist sources, notably Thomas Chalmers, William Herschel and Robert Harrington.[6] Indeed, according to Crowe's survey of the debate, the chief topic of debate about pluralism in the first half of the nineteenth century concerned not whether extra-terrestrial life existed, but how such a thing might be reconciled with Christian theology and what the practicalities of pluralism might be.[7] Although Crowe significantly problematizes Heffernan's rather simplistic view of the plurality debate, it is true that discussion was not especially intense until the mid-nineteenth century.

The debate relied, for both sides, on both scientific and religious proofs. Whewell frames the question as an 'essential part' of the religious faith of 'many persons', and as a question regarding the nature of humanity's relationship with God. Whewell states that 'he has tried to give the book not only a moral, but a scientific interest', implying that moral, religious interest was his primary concern, and the scientific something of an afterthought.[8] Despite the apparent primacy of religion in Whewell's opinions, he relies upon arguments from science, particularly astronomy, geology and to a lesser extent evolutionary biology, more than those from theology

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[4] William Whewell, *Of the Plurality of Worlds: An Essay, Also, a Dialogue on the Same Subject,* (4th edition, London: John W. Parker and Son, 1855), p. 7.
[5] Heffernan, p. 81.
[6] Crowe, p. 167; p. 41; p. 168.
[7] Ibid., pp. 168-169.
[8] Ibid., p. 15.

to support his conclusion.[9] Eight of the thirteen chapters deal specifically with the physical realities and scientific theories which support the idea of cosmic unity. Despite the lengthy and detailed attention paid to various aspects of astronomy and geology, Whewell ultimately states that 'the stars are intended and fitted to draw our thoughts to God': for Whewell the workings of the universe may be scientific but, more importantly, its purpose is devotional.[10] Brewster, meanwhile, is far less explicit about a distinction between science and religion. Indeed, he specifically conflates heaven with the heavens, and does not declare his endeavour to be either scientific or religious.[11] Rather, he broadens Whewell's claim that it is important within religious faith to assert that the plurality of worlds is the most 'universally interesting' subject in 'the entire range of human knowledge', sidestepping the need to declare the question as being primarily scientific or religious. Brewster's arguments for cosmic plurality are many and include both theological and scientific ideas, but they are all based on four key underlying convictions on Brewster's part. These are: a near-unconditional faith in the usefulness and accuracy of properly deployed analogy; a certainty that everything in the universe must have a specific purpose; a belief that intuition, what one's mind does or does not reject, is a reliable indicator of whether something is in fact true; and finally, springing from these last two points and his Christian faith, the idea that 'matter [is made] for life'.[12]

Plurality of Worlds and *More Worlds than On*e provide an insight from both main sides into the cosmic plurality debate as an important scientific and religious discussion in the nineteenth century. This debate, and these two texts within it, are important to modern scholarship of science and religion because they demonstrate one way in which some Victorians negotiated the relationship between humanity and God in the face of an increasingly scientifically understood universe. Further, the 'battle' between Whewell and Brewster is unusually compact and lively compared to

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[9] Ibid., p. 14.
[10] Ibid., p. 21.
[11] David Brewster, *More Worlds than One: The Creed of the Philosopher and the Hope of the Christian,* (5th edition, London: John Murray, 1865), p. 21.
[12] Brewster, p, 189.

Whewell's other controversies, offering an excellent opportunity to examine the anatomy of a Victorian scientific debate.[13] Whewell's struggle to reject analogy in his work, particularly during the moments where scientific and religious concerns run closest together, also highlights and emphasises pressure points within the relationship between science and religion which may be identified in other, similar debates.

Most of the arguments for and against cosmic plurality were apparently scientific, for example discussing the geological properties of Earth and comparing Earth to observations and hypotheses regarding other planets. However, Whewell and those who respond to him all treat the debate as one of theological as much as scientific import. Whewell and Brewster in particular both approach the question as one with vital repercussions regarding the relationship between God and humanity, the nature of God and the capabilities of divine power. For Whewell, belief in other creatures, distant and strange and beyond contact, would create more issues than it resolved; the idea of solitude of the infinite vastness of space is a lonely and terrifying one, but 'it does not appear how any supposition of a population belonging to other planets and other suns can make this thought less awful'.[14] Brewster, however, found the proposal of cosmic unity deeply offensive on philosophical and religious grounds. Despite the astronomical and geological arguments employed by both writers, the issue of extra-terrestrial life is ultimately a question of whether man is 'left in the universe alone with God'.[15]

Plurality was arguably more influential than *More Worlds*, since it directly triggered an intense phase of the cosmic plurality debate, it has attracted more modern academic attention, and it certainly enjoyed sustained interest and influence among Whewell's contemporaries. However *More Worlds* had a longer publishing

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[13] Whewell's major comparable debate is that with John Stewart Mill, the origins and stakes of which are discussed succinctly in John Wettersten and Joseph Agassi, 'Whewell's Problematic Heritage', in *William Whewell: A Composite Portrait*, ed. by Menachem Fisch and Simon Schaffer (Oxford: Clarendon Press, 1991), pp. 345-370.
[14] Whewell, p. 12.
[15] Ibid.

history, as well as a higher volume of sales, and a similar level of critical interest. *Plurality* went through five editions, the first four of which were published within two years, and the fifth five years later. This fairly compact history suggests relatively high interest over a brief period of time. Each edition was amended in response to criticisms of the previous version, with a new preface and some changes to the main body of the text. The most significant substantive change to *Plurality* was the 'Dialogue on the Same Subject', added to the second edition of *Plurality*. This substantial and unusual addition constitutes ninety pages of imagined discussion between Whewell's mouthpiece 'Z' and his critics. The prefaces in the second and subsequent editions were all largely focussed on addressing various – mainly pointedly unnamed – critics, including Brewster's *More Worlds*, which was quoted at some length but never named.[16]

Whewell's decision to engage with critics in the preface had a double effect; as well as offering a more complete version of his argument, it also enabled Whewell to demonstrate the influence his work had, and show how widely it was read. The prefaces are heavily packed with names of significant scientists in the field, as well as oblique references to others, usually those with whom Whewell disagreed. For example, the prefaces alone refer to Struve, William Parsons or Lord Rosse, John Herschel, William Thomson, George Wilson, William Herschel, and Whewell himself outlining a part of the web of scientists in which Whewell, as the anonymous author of *Plurality*, placed himself.[17] Despite Whewell's general avoidance of poetry and poetic language, he refers on more than one occasion to Edward Young's influential poem *Night Thoughts* (1748), as well as Alexander Pope's *Essay on Man* (1734) and Milton's *Paradise Lost* (1667).[18] Whewell also references his own work, particularly *Indications of a Creator* (1845), his response to *Vestiges of the Natural History of Creation*, though he protects his anonymity by using the third person to refer to the author or *Indications*. Whewell only names his supporters and positive

[16] Whewell, p. 85.
[17] First mentions of each respectively: ibid., vii; vii; viii; ix; 4; 9 (f.n.); 3.
[18] Ibid., p. 109; 360, a passage from *Night Thoughts* was the epigraph for the US editions of *Plurality* (1st edition, Boston: Gould & Lincoln, 1854); 70; 72 respectively.

influences; though he mentions several different articles criticising him, Whewell never gives the names of their authors.[19] Part of Whewell's apparent reluctance to name his critics can be attributed to the fact that many of these criticisms were published anonymously. However, it also shows some expectation that his readership has a similar level of involvement or at least currency within the scientific community, that they would know who Whewell meant, or would have the resources to find out to whom he was referring.

More Worlds, meanwhile, was published in a new edition for every other thousandth copy, each described as 'corrected and greatly enlarged'.[20] The fifth and last of these editions of *More Worlds*, for the ninth thousand copy, appeared in 1865, three years after the fifth edition of *Plurality*, but further editions were published after Brewster's death, in 1874 and 1895. *More Worlds* was published by John Murray Publishers, a firm which had published the work of other significant popular scientists such as Mary Somerville and George Lyell, as well as, five years after *More Worlds* was first published, *Origin of Species*.[21] Unlike Whewell, who included a fresh preface with each edition explaining the latest amendments and engaging with new arguments, Brewster does not explicitly detail what is entailed in each edition being 'revised and greatly enlarged'. Furthermore, while Whewell addresses a wide variety of his critics, and especially Brewster, *More Worlds* is focused solely upon countering Whewell's argument. The text is split into two parts: the first ten chapters present a range of general arguments in favour of the possibility of life on other planets, which occasionally references *Plurality* and echoes it in the structure of the argument, though Brewster contradicts Whewell in content, and the following four chapters each explicitly aim to analyse and refute individual arguments within *Plurality*.

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[19] Whewell, *Plurality,* 4th ed. p. vii; x; 1.
[20] Brewster, title page.
[21] John Murray Archive, National Library of Scotland <http://digital.nls.uk/jma/topics/science/index.html> [accessed 20/8/16].

Whewell's wider career, including his contribution to the natural theology project, the *Bridgewater Treatises*, has meant that his view of the relationship between science and religion has been quite extensively studied, as has his approach to scientific and moral thought more generally.[22] *Plurality* is one of his less studied works. A reprint of *Plurality*, edited and introduced by Michael Ruse, was published in 2001, which led to a brief spate of reviews. The general consensus was that *Plurality* is 'curious', that the text is in part a reaction to theories of evolution and that it sheds 'considerable light both on Whewell and on the scientific, philosophical and theological controversies that raged' in the middle of the nineteenth century.[23] Beyond Crowe and these reviews, *Plurality* is often used as a point of comparison for other texts, whether in parallel to create a dialogue with other figures such as Alfred Russell and Percival Lowell, or simply in passing to recognise *Plurality* as a significant text in the plurality of worlds debate.[24] David Brewster is very understudied outside of Crowe's work. He has enjoyed two biographies in the twentieth century, and the majority of the writing on him outside of biography focuses on Brewster's work on optics or the kaleidoscope.[25] All but one of these texts

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[22] Key texts for Whewell and his other work include: Menachem Fisch and Simon Schaffer (eds). *William Whewell: A Composite Portrait*; Ian Todhunter, *William Whewell, D.D., Master of Trinity College, Cambridge. An Account of His Writings with Selections from His Literary and Scientific Correspondence*, 2 vols (London: Macmillan and Co.,1876); Jonathan Topham, 'Beyond the "common context": the production and reading of the Bridgewater Treatises', *Isis*, 89 (1998), 233-62; Richard Yeo, *Defining Science: William Whewell, natural knowledge, and public debate in early Victorian Britain* (Cambridge: Cambridge University Press, 1993).

[23] William Whewell, *Of the Plurality of Worlds: A Facsimile of the First Edition of 1853: Plus Previously Unpublished Material Excised by the Author Just Before the Book Went to Press; And Whewell's Dialogue Rebutting his Critics, Reprinted from the Second Edition*, ed. by Michael Ruse (Chicago: University of Chicago Press, 2001); On *Plurality* being curious: Margaret Morrison, Review of William Whewell, *Plurality of Worlds* ed. by Michael Ruse (2001), *Isis*, 93.3 (2002), 499-500 (p. 499); on *Plurality* as a reaction to evolution: Michael T. Ghiselin, Review of *Plurality of Worlds* ed. by Michael Ruse (2001), *History and Philosophy of the Life Sciences* 25.4 (2003), 543-543 (p. 543); on *Plurality* shedding 'considerable light…': Geoffrey Cantor, Review of William Whewell, *Plurality of Worlds* ed. by Michael Ruse (2001), *The British Journal for the History of Science* 35.3 (2002), 362-363 (p.363).

[24] William C. Heffernan, 'The Singularity of our Inhabited World: William Whewell and A.R. Wallace in Dissent', *Journal of the History of Ideas*, 39.1 (1978), 81-100; Norriss S. Hetherington, 'Percival Lowell: Professional Scientist or Interloper?', *Journal of the History of Ideas*, 42.1 (1981), 159-161; Francis Reid, 'Isaac Frost's "Two Systems of Astronomy" (1846): Plebian Resistance and Scriptural Astronomy', *The British Journal for the History of Science*, 38.2 (2005), 161-177 (p. 174).

[25] Roy Campbell, *Sir David Brewster (1781-1868)*, (Scotland's Cultural Heritage: Research Centre for Social Sciences, University of Edinburgh, 1984); *Martyr of Science: Sir David Brewster 1781-1868*, ed. by A.D. Morrison-Low and J.R.R. Christie, (The Royal Scottish Museum: Edinburgh, 1984).

are works of science or the history of science; the remaining article considers the kaleidoscope in light of thing theory and in conjunction with a reading of Byron's 'Don Juan'.[26]

Two relatively early discussions of the cosmic plurality debate are John Hedley Brooke's article 'Natural Theology and the Plurality of Worlds' (1977) and Richard Yeo's 'William Whewell, Natural Theology and the Philosophy of Science in Mid Nineteenth Century Britain' (1979). Brooke considers what the cosmic plurality debate revealed about the complexities of natural theology, considering that both Brewster and Whewell were natural theologians to some degree, yet came to 'mutually exclusive' positions.[27] He argues that the deep philosophical divide between Whewell and Brewster demonstrates that natural theology as a school of thought was fragmented and varied before the publication of *Origin of Species*, the traditionally understood death knell for natural theology. With this in mind, Brooke advocates for a softening of the lines between natural theology and natural science. His assertion that 'Theological arguments drawn from the physical world were used to reassure the faithful, to provoke the apathetic, to anticipate and to refute the sceptics, to reinforce a Providentialist reading of history, and to contribute towards a systematic theology' summarises and informs much of my analysis of Whewell and Brewster's debate and the popular attention it drew.[28] Yeo's article is focussed mostly upon Whewell and his philosophy of science more generally rather than the cosmic plurality debate. He uses *Plurality of Worlds* as a case study of Whewell's 'idealist epistemology' which 'confirmed Christian values associated with man's special place in nature' and 'sought to dissociate science from Utilitarianism and empiricist

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[26] Michael W. Davidson, 'Sir David Brewster: Microscopy: Kaleidoscope, Stereoscope, Polarized Light', *Laboratory Medicine* 40.9 (2009), 563-564 <DOI:10.1309/LMJKOY889KYLMQBI> [accessed 30/08/2016]; Helen Groth, 'Kaleidoscopic Vision and Literary invention in an "Age of Things": David Brewster, Don Juan and "A Lady's Kaleidoscope"', *ELH*, 74.1 (2007), 217-237; Klaus-Dieter Graf and Bernard R. Hodgson, 'Popularizing Geometrical Concepts: The Case of the Kaleidoscope', *For the Learning of Mathematics*, 10.3 (1990), 42-50; Jutta Schickore, 'Misperception, illusion and epistemological optimism: Vision studies in early nineteenth-century Britain and Germany', *The British Journal for the History of Science,* 39.3 (2006), 383-405; *Brewster and Wheatstone on Vision*, ed. by Nicholas J. Wade (Academic Press: London, 1983).
[27] John Hedley Brooke, 'Natural Theology and the Plurality of Worlds: Observations of the Brewster-Whewell Debate', *Annals of Science*, 34.3 (1977), 221-286 (221).
[28] Ibid., p. 227.

philosophy'.[29] Yeo does not address the debate a whole, but simply considers *Plurality* in terms of its value for better understanding Whewell's philosophy as a whole.

Yeo and Brooke's work form the basis of Crowe's discussion of Whewell and Brewster's controversy, and *Plurality* and *More Worlds* find their most extended reading in his history of the idea of life on other planets, *The Extraterrestrial Life Debate 1750-1900*. Crowe presents Whewell as a key figure in the renewal of the debate over cosmic plurality, stating that his book 'was nearly without precedent'.[30] He positions the discussion provoked by Whewell's book as an argument between and for physico-theologists in order to effect 'fundamental reorientations' within the field, rather than as an argument between those who are materialist and those who are not.[31] Crowe also, importantly, notes that the 'although the origin of [*Plurality*] was religious, its arguments were primarily philosophical and scientific', an observation which will be explored in greater depth within this chapter.[32] Crowe gives Brewster a key role in the pluralism debate, commenting that 'the central feature of the controversy is frequently seen as the clash between these two aging titans', and characterises Brewster's 'tone severe if not savage, his views extreme'.[33] He connects this extreme reaction to a personal antipathy towards Whewell and an ideological connection to Thomas Chalmers, as well as to 'systemic reasons' such as a reliance upon analogy with 'an inadequate awareness of its limitations'.[34] I concur with Crowe's estimation of the extra-terrestrial life debate in the mid-nineteenth century, and the reasons he gives for the ferocity of the clash between Whewell and Brewster, but I use his assessment, based largely in the field of history and science, to consider the significance of literary elements of the argument.

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[29] Richard Yeo, 'William Whewell, Natural Theology and the Philosophy of Science in Mid Nineteenth Century Britain', *Annals of Science* 36.4 (1979), pp. 493-516 (p. 493; 402; 503).
[30] Crowe, p. 299.
[31] Ibid., p. 298.
[32] Ibid.
[33] Ibid., p. 300; 303.
[34] Ibid., pp. 303-304.

Theology and cosmic plurality

The stakes of the cosmic plurality debate were theological; the question of whether or not life existed on other planets affected fundamentally the relationship between God and humanity. The crux of the disagreement between Whewell and Brewster pertained to the theological repercussions each of them finds in the question of cosmic plurality. For Whewell, plurality calls into question mankind's place in the universe, but for Brewster, denying plurality calls into question God's divine power. The debate becomes one of guessing divine priorities: Whewell argues that the fact that God chose only one species in the universe, humanity, to elevate above all others by making them intelligent does not necessarily affect His ability to create more such beings. Meanwhile, Brewster's interpretation of God's infinite power and love means that he cannot conceive of a deity that would not use this power to fill the universe with life. Whewell also perceived a tension between the possibility of extraterrestrial life, and the unique nature of the sacrifice that Jesus made when He died on the cross, which Brewster dismissed entirely.

Both authors rely primarily upon Thomas Chalmers' *Astronomical Discourses* to provide the theological backing for their opposing arguments, despite Whewell and Brewster's diametrically opposing views and Chalmers' firm belief in cosmic pluralism. Whewell made a curious choice to rely upon the writing of a cosmic pluralist, especially given that although writing in favour of cosmic unity was scarce, some notable examples, such as Ludwig Feuerbach and G.W.F Hegel, did exist.[35] An explanation for this choice may be that, although Whewell and Chalmers differed in their conclusions, their general sensibilities and broad approaches, based on principles of natural theology, are quite similar. Further, the use of a more traditional text may help to provide his reader with a reassuring familiar theological groundwork, making it easier to accept an idea that went against common assumption. Brewster's choice to follow Whewell in using *Discourses*, as well as

[35] Crowe, p. 258-260.

several of the same quotations from scripture, in an argument that directly contradicts Whewell's conclusions, reflects the wider sense that Brewster is writing the version of *Plurality* which he expected to read when first agreeing to review the treatise.

Thomas Chalmers' *Astronomical Discourses* was a series of seven sermons he gave in Glasgow in 1815 and 1816. When they were collected and published in 1817, over 9,000 copies were sold in ten days and the book ran to nine editions within two years.[36] The text is described by Crowe as 'the most influential pluralist book' published in the first two decades of the nineteenth century.[37] Whewell and Brewster were both friends and correspondents of Chalmers'; Whewell stayed with Chalmers on occasion, and shared with him an essay by Thomas Rawson Birks.[38] Brewster's association with the *North British Review* was a result of his friendship with Chalmers, who also wrote for the *Review,* most notably with his article 'Morell's Modern Philosophy' which targeted *Vestiges of the Natural History of Creation*.[39] Thus both men had a personal respect for Chalmers as well as an academic interest. Chalmers features in both texts, and certain elements of *Discourses,* are echoed in *Plurality* and *More Worlds*, notably an imaginative description of a journey through the solar system, and a reading of Psalm 8:3-4.

Chalmers' central aim in *Discourses* is to argue against 'Treatises of Infidelity' which questioned God's power, such as arguments in favour of cosmic unity. For Chalmers, cosmic plurality was intrinsically connected with Christian faith, and a belief in cosmic unity bespeaks religious infidelity.[40] *Discourses* is a detailed refutation of and argument made up of 'an assertion and an inference' from opponents to cosmic plurality, characterised as 'the young, the ardent and the ambitious'.[41] For Chalmers,

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[36] Ibid., p. 167.
[37] Ibid., p.162.
[38] Todhunter, vol. I, p. 90.
[39] Secord, p. 277.
[40] Chalmers, p. vii.
[41] Ibid., p. viii; vii.

> the assertion is, that Christianity is a religion which professes to be designed for the single benefit of our world; and the inference is, that God cannot be the author of this religion, for He would not lavish on so insignificant a field, such peculiar and distinguishing attentions, as are ascribed to him [in scripture].[42]

Chalmers' solution to the assertion, that Christianity exists only for our single planet, apart from dismissing it as the concern of an infidel, is the possibility of cosmic plurality. If God exists universally, then there must be other worlds which also worship God. This possibility renders the inference irrelevant, as the possibility of extra-terrestrial life means that Christianity is not for 'the exclusive benefit' of Earth, and God's boundless love and power is focused not just on humanity, but on life across the Universe.[43]

Unlike Whewell and Brewster, who both attempt to minimise any possibility of a conflict between science and religion, Chalmers argues that science, and particularly astronomy, are being weaponised against revealed religion. As such, Chalmers seeks to reclaim astronomy for theological purposes. He refers to the inherent 'infidelity of natural science', which he aims to 'soften and subdue' and 'if possible to bring over to the humility of the Gospel, those who expatiate with delight on the wonders and sublimities of creation'.[44] For Chalmers, the sciences, or the 'works and appearances of nature' are improved by the addition of 'most Christian exercise' of extracting from them a 'sentiment of piety'.[45] For all three authors, Christianity and God are at the centre of their concerns, but whereas Chalmers sees science as an enemy to subjugate, for Whewell and to a lesser extent Brewster, it is instead a tool for better understanding the universe, God's creation.

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[42] Ibid., p. viii.
[43] Ibid., p. 57.
[44] Ibid., p.16.
[45] Ibid.

Chalmers' sermons were an important influence upon both Whewell and Brewster. Much of their engagement with the theological consequences of cosmic unity were based on the *Astronomical Discourses*, and both writers quoted from him and referred to him frequently in their respective texts. Neither Whewell nor Brewster are in complete accord with Chalmers' argument: Whewell concurred with the basic methodology of his approach, although he disagreed with Chalmers' conclusion, while Brewster was in accordance with the conclusion, but challenged some of the finer points of the argument. I will consider Chalmers' influence on *Plurality* and *More Worlds* in greater depth later in this chapter; having established Chalmers' argument and importance to the debate, I will now consider more broadly the possible theological repercussions of cosmic plurality or unity.

The central Christian proof of God's love for humanity is Jesus' death on the cross to save mankind. This redemption, Whewell suggests, 'shows, of course, that God has an especial care of man' which gives Earth the status of the 'selected [...] theatre of redemption', and places it above 'being on a level with any other domiciles'.[46] If this act of sacrifice is as truly singular as Whewell understands it, then no other planet can have benefitted from God's love in the same way, and thus humanity must be a correspondingly unique life form in terms of intelligence and moral capacity. If, on the other hand, Earth was not the only planet on which such an event took place, there would be the possibility of equivalent life on other planets, but this also means that mankind loses its elevated and most cherished place as God's chosen children, as well as casting the essential veracity of the Bible into doubt. Whewell accepts this line of reasoning as prime theological proof of humanity's status as sole intelligent life in the universe. Even Brewster admits that it is a discouraging thought, and allows any reader too disturbed by this prospect to 'justly renounce his faith in a plurality of worlds, and rejoice in the more limited but safer creed of the anti-pluralist author', though this is more a challenge than genuine sympathy on Brewster's part.[47] Brewster spends some time at other parts of the

[46] Whewell, p. 144.
[47] Brewster, p. 143.

treatise suggesting that to think that only human-like life can exist is unimaginative and intellectually limiting. He asks, 'is it necessary that an immortal soul should be hung on a skeleton of bone, or imprisoned in a cage of cartilage and of skin?' and he imagines the many ways in which life might vary on other planets.[48] Brewster presents cosmic unity as the easy option, for people who are too small-minded and cowardly to deal with the challenges presented by plurality.

Chalmers and Brewster both suggest solutions to this apparent contradiction between religious truth and the possibility of life on other planets. Chalmers' solution to the conundrum is that other species simply did not require redemption in the way that humanity does, and on these 'habitations of the unfallen', 'God is their all. They walk in His light.'[49] The possibility that humanity may not be the universe's moral apex troubles both Whewell and Brewster, though they naturally come to very different conclusions based upon this similar disagreement. For Whewell, the idea that humanity alone of all the intelligent species in the universe required saving is unacceptable, because it would only throw into greater relief the 'sin and misery, which deform and sadden the aspect of our earth' and would thus fail to provide any meaningful consolation.[50] Chalmers' solution to the question of Jesus' sacrifice, in Brewster's words, 'cut the knot of the difficulty rather than untied it', though arguably Brewster's own theory of redemption is no less simplistic.[51]

Brewster addresses the problem of salvation with a simple answer: an assertion of the literal universality of Jesus' sacrifice. He states that 'When our Saviour died, the influence of His death extended backwards, in the past [...] and forwards in the future [...] Distance in time and distance in place did not diminish its healing virtue'.[52] In short, Brewster's suggestion is that Jesus' single sacrifice on earth served to save all intelligent individual to exist in the universe, regardless of when they

[48] Ibid., p. 72.
[49] Chalmers, p. 138.
[50] Whewell, p. 387.
[51] Brewster, p. 141.
[52] Ibid., p. 149.

lived, or will live, or what planet they lived on. This solution resolves the issue of a species needing to benefit from a sacrifice like Jesus', in order to be considered moral, intelligent, and chosen by God. However, it neglects Whewell's central conundrum, that allowing Jesus' sacrifice to apply on other planets negates the aforementioned 'especial care' that God shows to mankind. When presented with this argument in the Dialogue, Whewell dismisses it as being 'entirely without warrant or countenance'.[53] He further remarks that Jesus' actions 'were connected with a train of events in the history of man', and they would not make sense or have the same effect in the context of any other planetary chronology.[54] Whewell also identifies a contradiction in this solution, as Brewster is adamant that analogy suggests that all planets are equally suited to and likely to house life, yet he allows Earth to retain its position as what Whewell terms the 'theatre of […] Redemption' which affects the entire universe, without explaining why Earth in particular would be chosen for this privilege.[55]

Although there is only a single, though significant, section specifically discussing redemption in *Plurality*, the anxieties raised by this question run throughout Whewell's more extensive discussion of God's interaction with man. He mainly refers to God's relationship with mankind in terms of 'Divine Interposition'.[56] Although he gives only one specific example of such an event, when God 'interposed to place Man upon it [Earth],' he describes interposition more generally as God's action to 'remedy man's feebleness in moral and spiritual tasks' and aid 'the moral and spiritual elevation of the human race'.[57] These unspecified acts of loving intervention specifically for the moral wellbeing of humanity are in Whewell's opinion a greater demonstration of power than 'any supposed multiplication of a population'.[58] For Whewell, cosmic plurality is only relevant if the extraterrestrial life is chosen by God, which necessitates similar moral and

[53] Whewell, p. 79.
[54] Ibid.
[55] Ibid., p. 144.
[56] Ibid., p. 285; 304; 305.
[57] Ibid., p. 408; 386.
[58] Ibid., p. 387.

intellectual capacity to humanity's. The 'multiplication of a population', such as a multitude of planets inhabited by mindless animals, is far less meaningful to his understanding of God's power than the existence of intelligent life. Whewell's certainty that Jesus' salvation only applies to humans, means that no other species can have been so chosen, and thus there are no other intelligent life forms in the universe. Brewster's faith in the universality of Jesus' act, meanwhile, means that he is freed from these considerations.

The existence of life on other planets was thus a question with significant theological weight. For Whewell, the cosmic plurality diminished humanity's special relationship with God, and at worst completely undermined the miracle of Jesus' resurrection. Meanwhile, in Brewster's view, the theological implications of the resurrection in a pluralist cosmos were more easily resolved than the challenge to God's omnipotence presented by cosmic unity.

Influences

Whewell and Brewster each situated their texts within a network of theological, poetic and scientific writing to indicate their philosophical and ideological allegiances. Whewell and Brewster both claim many of the same scientific and theological influences; Humboldt, Herschel, LaPlace and Chalmers in particular are notable presences in both works. They also allude to the same poetic canon, including John Milton's *Paradise Lost*, Samuel Pope's *An Essay on Man* and Edward Young's *Night Thoughts*, and make allusions to many of the same passages from the Bible. Despite their very similar intellectual heritage, their opposing conclusions necessitate very different treatment of their sources.

Chalmers, whose theological influence and standpoint has been discussed above, was discussed at some length by both Brewster and Whewell within their treatises. Although Whewell does to some extent acknowledge that he and Chalmers have a difference in opinion, he attempts to position himself not as contradicting or arguing against Chalmers, but rather as building upon his work and taking it in a new and more accurate direction. Whewell discusses him in an extremely flattering and

careful way; he describes *Discourses* as 'remarkable', 'laudable', 'interesting and instructive', while Chalmers himself is a 'pious' 'master of dignified and persuasive eloquence', even though he and Chalmers are fundamentally at odds in terms of whether or not extraterrestrial life exists.[59] Whewell repositions Chalmers' argument to suit his own point of view without specifically stating that Chalmers is wrong. While Chalmers rails against infidels, Whewell proposes to reposition the Chalmers' assessment of the 'infidel's' assertion and argument, as 'difficulties of religious men, rather than objections of irreligious men; to examine rather how we can quiet the troubled and perplexed believer, than how we can triumph over the dogmatic and self-satisfied infidel'.[60] Whewell uses 'we' to show that although he is making only a slight variation on the very assertion which Chalmers excoriates, they are nonetheless part of the same overall endeavour: to soothe religious concerns and triumph over non-believers.

Brewster is somewhat less careful in his praise of Chalmers. Despite broadly in agreement with Chalmers on the matter of cosmic plurality, he finds many ways to gently object to Chalmers' writing – he disagrees with the reading of Psalm 8.4 in *Discourses* and identifies the same 'mistake' that Whewell does.[61] Although Chalmers states that it is infidels who assert that the earth is too 'insignificant' to be the recipient of God's special attention in the form of Christ's sacrifice, in the view of both Whewell and Brewster, this assertion is wrongly attributed – it is a concern of the Christian rather than the infidel. Whewell and Brewster both rely upon *Discourses*, but their relationships with the text are necessarily different. In *Plurality,* frequent and respectful reference to Chalmers, as well as positioning the key argument as an extension rather than a contradiction of *Discourses*, is a way for Whewell to provide a kind of bridge for readers which closes the gap between cosmic plurality and cosmic unity. Whewell attempts to soften and shrink the difference through deferential language and rhetorical gymnastics. However, while Whewell needs to go to some lengths to prove that his argument basically chimes

[59] Whewell respectively: p. 95; 113; 114; 115; 112.
[60] Ibid., 119.
[61] Brewster, 10; Whewell, 148.

with Chalmers, for Brewster *Discourses* is a lot more obviously in keeping with the tone and opinion of *More Worlds*, which gives Brewster more freedom to criticise Chalmers and assess it as a more natural predecessor to his own arguments.

The footnotes of Whewell's text feature many of the significant scientific names of the nineteenth century. The mathematician and astronomer Pierre-Simon Laplace; astronomer William Herschel; geographer, naturalist and explorer Alexander von Humboldt and theologian Thomas Chalmers in particular are repeatedly cited. Whewell had a great personal and academic admiration for Chalmers, and was clearly academically engaged with the work of LaPlace, Herschel and von Humboldt.[62] Like Chalmers, Herschel was an important contributor to pluralism, but where the former's views were religiously founded, Herschel's were based on astronomical observation. Based on his observation of the moon and the sun, Herschel proposed that every celestial body may well be inhabited. He wondered, 'who can say that it is not extremely probable, nay beyond doubt, that there must be inhabitants on the Moon of some kind or other?', and, indeed, that the sun 'is most probably also inhabited' – an idea that Brewster continued to champion sixty years later.[63] The fact that Whewell uses several authors who are clearly pluralists in a book which argues for the singularity of humankind is a touch unusual, perhaps, as the references which Whewell makes to them are not necessarily refutations. Unlike the dismissal which he shows his own detractors, to his pluralist forbears Whewell gives nothing but respect, and uses or expands upon the constructions of the solar system which these authors provide. For example, Whewell makes use of nebular hypothesis, 'suggested by the elder Herschel, and adopted by the great mathematician LaPlace', both of whom were pluralists.[64]

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[62] Relationship with Chalmers: Crowe 303; von Humboldt: Henry W., 'William Whewell's Odyssey: From Mathematics to Moral Philosophy', in *William Whewell: A Composite Portrait*, ed. by Menachem Fisch and Simon Schaffer (Oxford: Oxford University Press, 1991), 1-31 (p.14); LaPlace: Becher, pp. 12-13; Whewell's discussion of Herschel shows a detailed familiarity with his work, for example *Plurality,* p. 117; 228.
[63] Herschel, letter to Astronomer Royal Nevil Maskelyne, quoted in Crowe, p.63.
[64] Whewell, p. 225.

LaPlace, Humboldt, Chalmers and Herschel are each put to a specific use within *Plurality*. LaPlace and Humboldt are confined mostly to the footnotes, providing an opportunity for curious readers to expand their mathematical and scientific knowledge at the relevant points should they so desire, without either man's work impinging on the main body of the text. Although their roles are therefore more marginal than those of the more frequently and fully mentioned Herschel and Chalmers, they help to show readers that the author is up to date with scientific thought, as anonymity somewhat divorces *Plurality* from Whewell's reputation. Chalmers was a figure whom Whewell deeply admired, and according to Becher, Whewell 'was stimulated to write [*Plurality]* by his association with Thomas Chalmers and the reading of Chalmers' writing'.[65] This respect is borne out by the many references throughout the body of the text and in the footnotes. Despite their opposing views, Whewell is careful to position himself not as Chalmers' opponent, but rather an admirer of the man and a critic of the faulty foundations upon which Chalmers rested his strong arguments.[66]

Unlike *Plurality*, which assumes a certain level of scientific education, nearly every concept mentioned by Brewster is carefully explained; no technical term goes undefined, from parallax and its use in determining the distance of stars, to reductio ad absurdum as a rhetorical device.[67] In a similar vein, while both Brewster and Whewell frequently quote or allude to other scientists, poets and theologians, clear citations are rare in *Plurality*, with the assumption that the reader is familiar with the work of Herschel, Laplace and other well-known scientists, and would be able to easily access each resource. In *More Worlds*, clearly referenced quotations are the norm – no assumption about the reader's level of knowledge is made. This leads to a certain amount of repetitiveness within the text, as each chapter begins with an overview of its respective subject in terms of current and historical scientific theory, which is then reviewed and discussed in terms of its relevance as an argument for plurality, and the frequent pauses for explanation slow the progression of Brewster's

[65] Becher, p. 21.
[66] Whewell, p.39
[67] Distance of stars, Brewster, p. 165; reductio ad absurdum, Ibid., p. 133.

argument somewhat. However, it ensures that no reader is left behind, and shows that Brewster's intentions do not necessarily lie solely in confronting Whewell for his 'dangerous speculation', but also in inviting even those who had not read *Plurality* but perhaps simply heard of its reputation, to join the pluralist cause.[68] That Brewster presented the plurality debate more accessibly than Whewell, even within the popular science genre, is in keeping with his wider career; he was a key figure in the foundation of the British Association for the Advancement of Science, and wrote prolifically in both popular and expert science.[69]

Reception and responses

Whewell played a pivotal role in the eruption of the cosmic plurality debate in the middle of the nineteenth century. Usage of the phrase 'plurality of worlds' in books and journals, though it fluctuated throughout the nineteenth century, saw its highest and most sustained usage in the 1850s.[70] Within that decade, the increased usage began in 1853, the year in which *Plurality* was published, peaked in 1854 with Brewster's response, and remained high for the two following years before stabilising over the rest of the decade and generally declining through the century.[71] A correlation between the increased usage of the phrase 'plurality of worlds' and the publication of *Plurality,* does not necessarily indicate causation. However, a survey of newspaper and journal articles at the time suggests that a significant proportion of the articles using this phrase are directly engaging with Whewell's *Plurality*. *Plurality* was reviewed around fifty times in depth, featured regularly in advertisements and editorials on the issue of cosmic plurality, and more than twenty further books were published on the topic in light of *Plurality.*[72] By searching on

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[68] Ibid., p. v.
[69] J.B. Morrell, 'Brewster and the early British Association for the Advancement of Science', in *Martyr Of Science: Sir David Brewster 1781-1868,* pp. 25-29 (p.25).
[70] Google ngrams search for 'plurality of worlds' over date range 1800-1900, <http://tinyurl.com/pluralitycentury> [last accessed 5th September 2016].
[71] Google ngrams search for 'plurality of worlds' over date range 1850-1960, <http://tinyurl.com/pluralitydecade> [last accessed 5th September 2016].
[72] Crowe, 300.

Google ngrams for both 'plurality of worlds', the concept, and 'Plurality of Worlds', with the capitals suggesting a title, it is possible to see that although the latter has a much more marked peak in the 1850s than the former, the trends do echo each other.[73] In short, the increased use of the phrase 'plurality of worlds' indicates a generally rising interest in the subject of cosmic plurality, and while *Plurality* did play an important role in opening up debate, discussion of the topic ranged beyond the clash between Whewell and Brewster. The increased use of the term 'plurality of worlds' indicates that the topic is being discussed, not agreement with the text itself. Indeed, over two thirds of the reviews in journals of *Plurality* also included *More Worlds*, so even if someone had not read both texts, the two would certainly be closely associated in a reader's mind.

In his preface, Brewster relates that he was invited to review *Plurality* for the *North British Review*, a publication to which he contributed frequently. Brewster describes his shock at discovering that 'under a title calculated to mislead the public, the author had made an elaborate attack upon opinions consecrated, as I had thought, by Reason and Revelation' and that Whewell's view against cosmic plurality was 'calculated to disparage the science of Astronomy, and to throw a doubt over the noblest of its truths'.[74] In *More Worlds than One*, Brewster constructs a treatise which mostly echoes the structure of *Plurality*, beginning with a tour of the solar system and ending with a discussion of the future, and with most chapters directly addressing the same themes as were covered in *Plurality*. The exception which Brewster takes to *Plurality* comes more from its general conclusion rather than the minutiae of Whewell's argument.

Reviews of *Plurality* were mixed, and many, such as the writer for *The Edinburgh Review* were fairly equivocal about *Plurality*. When reviewers did venture a definite opinion, they tended towards a belief in plurality rather than unity. Two examples of very definite opinions appear in the *North British Review*, in which the

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[73] Google ngrams search for 'plurality of worlds' and 'Plurality of Worlds' in comparison, over date range 1800-1900 <http://tinyurl.com/pluralitycomparison> [last accessed 5th September 2016].
[74] Brewster, *More Worlds,* p. v.

reviewer, David Brewster, praised the 'highly gifted' writer's ability, but condemned his conclusions as 'foolish' and spends some forty-four pages refuting Whewell's argument point by point.[75] Similarly, *The Scottish Review*, concludes 'that there is a high balance of probability […] in favour of a plurality of worlds.[76] However, all were in agreement that the treatise was an important one, or at least that it was an integral part of a significant intellectual debate. The *Examiner*, for example, states that *Plurality* 'is a book that by this time [December 1855] most people have heard something about'.[77] Several publications express surprise that this 'remarkable controversy' arose at all, with Whewell's opinion seeming unprecedented.[78] The *Journal of Sacred Literature and Biblical Record* describes Whewell as one of the 'most conspicuous' participants in an 'old' argument, but though they profess to find 'excellent' qualities in the work of both Brewster and Whewell, they 'are no more convinced by the argument of one than the other'.[79] Instead they recommend Robert Baden Powell's 1855 collection *Essays on the Spirit of Inductive Philosophy*, which provides a fairly balanced commentary on the debate but tends broadly in favour of plurality.[80]

The importance of *Plurality* can be seen not just in the volume of debate, but in the diversity of people who were captured by it. The periodicals which reviewed the book range from university publications like *Dublin University Magazine* to high-profile magazines such as the liberal *Tait's*, as well as Tory magazines like *Fraser's* and scholarly journals.[81] The book was commonly reviewed in general review

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[75] Unsigned review attributed to David Brewster, 'Of the Plurality of Worlds', *The North British Review*, 21.41 (1854), 1-44 (p.44; p. 12).
[76] Unsigned article, 'Is there a Plurality of Worlds?', *The Scottish Review*, 4.14 (1856), 175-190 (p.190).
[77] Unsigned article, 'The Master of Trinity's *Plurality of Worlds*'', *Examiner,* 2500 (1855), 818-818 (p. 818).
[78] 'The Plurality of Worlds and Sir David Brewster'. *Dublin University Magazine*, 44.260 (1854), 246-256 (p.246)
[79] Unsigned article, 'The Plurality of Worlds', *Journal of Sacred Literature and Biblical Record*, 1.2 (1855), 462-465 (p.462).
[80] Baden Powell, *Essays on the Spirit of Inductive Philosophy* (London: Longman, Brown, Green and Longmans, 1855).
[81] Unsigned article, 'THE UNITY OF THE WORLD, VERSUS THE PLURALITY OF WORLDS', *Tait's Edinburgh Magazine*, 21.250 (1854), 588-593; Unsigned article, 'The Plurality of Worlds'. *Fraser's Magazine for Town and Country*, 49.291 (1854), 247-256.

publications such as *The North British Review, The Edinburgh Review* and the *Eclectic Review*, the latter of which in particular was aimed at readers of all classes.[82] It was also addressed in Christian publications across the denominational spectrum, from the Catholic *Rambler* to the *Wesleyan-Methodist* and high-church *Christian Remembrancer*.[83] Here it is interesting to observe that the opinions of the various reviewers are not divided along religious lines, probably because Brewster and Whewell both position themselves in largely non-denominational Christian terms, each leaving it up to the individual's faith to decide whether their argument chimes with their understanding of God and scripture. It is plain that the debate excited the opinions of a broad spectrum of people, and that many of those without the means or inclination to read the book itself would be likely to be exposed to its ideas. Neither book is necessarily written with a scientific novice in mind, as *Plurality* in particular assumes that the reader would be familiar with contemporary scientists and au fait with current scientific method and theory. However, the key arguments from each side of the debate were discussed and summarised in adequate detail in reviews and editorials that they would be readily available to anyone with access to these journals.

The debate was ultimately ended by Whewell's death in 1866, so Brewster gained the last word by dint of surviving his opponent. The stage of the extraterrestrial life debate represented by Whewell and Brewster's clash is remarkable for its ferocity, and for the interest it piqued across a wide variety of demographics. Ultimately, while *Plurality* did not necessarily win many converts, Whewell's argument challenged some important assumptions about humanity's place in the cosmos and ultimately proved Brewster correct in his assertion that 'there is no

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[82] Unsigned review, *The Edinburgh Review, 1802-1929*102.208 (1855), 435-70; Unsigned review, 'On the Plurality of Worlds', *The Eclectic Review* 7 (1854), 513-531; James E. Basker, '*The Eclectic Review*', *British Literary Magazines: The Romantic Age, 1789-1836*, ed. Alvin Sullivan (Westport: Greenwood Press), 124-157.

[83] Unsigned review, 'Of the Plurality of Worlds: An Essay', *The Christian Remembrancer,* 29.87 (1855), 50-82; Unsigned article, 'Modern Philosophy: The Plurality of Worlds'. *The Rambler*, 2.8 (1854), 129-137; Unsigned review of *Of the Plurality of Worlds*, *The Wesleyan-Methodist Magazine*, 10 (1854), 638-648.

subject within the whole range of knowledge so universally interesting as the Plurality of Worlds'.[84]

The relationship between science and religion

Both Brewster and Whewell are adamant that science – specifically geology and astronomy – are not at odds with Christianity, though characteristically their approach is at odds, though in this case their conclusion is the same. Whewell keeps the key issue of cosmic plurality or unity at the centre of his argument, he makes a point of laying out as early as the preface his conception of the relationship between science and religion. In the preface he positions himself as religiously devout yet scientifically rigorous in his arguments; he makes frequent references to God and 'Natural' and 'Revealed Religion', but attempts not to warp 'Philosophy into a conformity with Religion'.[85] Despite this, the boundaries between science and religion, and between science, religion and morality, are fraught with contradictions for Whewell. While it is true that he manages to construct a model of science and religion which is largely successful at avoiding direct conflict, science and religion are left more changed by each other than Whewell suggests is desirable. The two, far from remaining parallel and complementary as Whewell intends them to, become intertwined in his arguments. Brewster, meanwhile, makes no such division; unlike Whewell, who fears that trying to match 'Philosophy' with religion risks distorting one or the other, he maintains that on 'the subject of a plurality of worlds, there can be no collision between Reason and Revelation', and dismisses the suggestion of a conflict between science and religion as an 'unseemly controversy'.[86]

Plurality begins with the most material, scientific arguments, and moves toward the more religious and spiritual, using the scientific evidence from previous chapters to support the theological part of the argument against plurality, and usually with an attempt to keep the two types of argument somewhat separate. Whewell

[84] Brewster, p. 1.
[85] Whewell, p. 14.
[86] Brewster, p.138.

gives each chapter a title which indicates whether the content will be religious or scientific in nature – 'The Argument from the Microscope'; 'The Argument from Design'. This methodical approach is an effective one, and shows the earnestness of Whewell's attempts to treat both religion and science in this text without 'setting them at variance' or warping one to fit with the other.[87] Although he makes reference to mathematical formulae and complex scientific experiments, these allusions are mainly contained in footnotes and are not integral to the argument but rather are provided to allow the reader to engage in further research. The book itself is thus accessible to readers without extensive astronomical, geological or mathematical knowledge.

Whewell uses four key terms which can be grouped into two pairs: philosophy, paired with science, and morality, paired with religion. Within the pairs, particularly philosophy and science, the terms tend to be used interchangeably. While he does not explicitly characterise or unpack what he means by philosophy and morality, he does use them in a very specific way. Philosophy appears to be, to Whewell, the secular equivalent of religion – a mode of thought informing one's world view, but without the inclusion of a deity. Morality, meanwhile, belongs exclusively to religion, and a lack of morality is the greatest shortcoming of science for Whewell. He does state an attempt to give the book a 'scientific interest; by collecting his scientific facts from the best authorities and the most recent discoveries' and considers 'the view of the Nebulae and of the Solar System, which he [sic] has here given, may be not unworthy of some attention of the part of astronomers'.[88] However, ultimately this is secondary to Whewell's central argument that a universe in which 'man is left in the universe alone with God' is theologically likely, or at least no more unlikely than one with multiple inhabited worlds; the modified nebular hypothesis he puts forward, as well as his scientific tour of the solar system, are all the scientific or philosophical means to a moral, religious end.[89] This religious purpose can be seen in Whewell's use of sources; though he frequently refers to significant scientists both historical and

[87] Ibid.
[88] Ibid., p. 15.
[89] Ibid., p. 12.

contemporary, the majority of the direct quotations in the prefatory material and 'Dialogue' are religious or poetic in nature. The first chapter then opens with Psalm 8:3-4:

> When I consider the heavens, the work of thy fingers, the moon, and the stars, which thou has ordained ; What is man, that thou art mindful of him ? and the son of man, that thou visitest him?[90]

This question reaches the heart of Whewell's own questions about humanity's place in the universe, and as such he spends some two articles considering this quotation, and imagining the Psalmist who wrote these words.

As the question of the plurality of worlds is for Whewell essentially a theological one, God is naturally a central assumption of his argument. Crucial for our purposes is the fact that Whewell professes to keep science, or 'Philosophy', separate from religion without setting the two 'at variance' because the two provide very different types of wisdom.[91] Whewell considers one as reinforcing the other, so that 'man is not left to Philosophy for those blessings [of spiritual comfort], but has a fuller assurance of them, by a more direct communication from [God]'.[92] Whewell is clear that though science and religion may support one another, they should not intermingle. However, this claimed separation is almost immediately belied by the reliance in *Plurality* upon the existence of a creator, despite the book's largely scientific approach; although Whewell describes a scientific universe, his ideological ends are ultimately theological.

Until he wrote *Plurality*, all of Whewell's writing on the subject was in favour of cosmic plurality. In a sermon written for the University Church at Cambridge in

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[90] Ibid., p. 95.
[91] Ibid., p. 14.
[92] Ibid., p. 15.

1827, he states that 'the earth [which man inhabits] is one of a multitude of worlds'.[93] The theories and analogies which he later dismisses, he calls here 'truths collected by wise and patient men on evidence indisputable, from unwearied observation and thought'.[94] The cause of this change of heart is not entirely clear. His declaration of a belief in pluralism came quite early in his career, just a year after he was ordained in the Church of England, while *Plurality* was one of his later works. Although the precise reason for this change is unknown, a shift in opinion, even one as marked this, does not seem especially startling after a varied career spanning nearly thirty years.[95] The anonymity of *Plurality* may have further softened any shock regarding Whewell's change in opinion; the unusual opinion was safely separated from his reputation as Master of Trinity College at Cambridge and author of numerous works scientific, religious, and philosophical. Although Whewell could not necessarily rely upon this – by 1855 the *Examiner* was confidently reviewing the book under the title 'The Master of Trinity's *Plurality of Worlds*' – it at least gave the reading public a chance to digest and begin to accept the idea before Whewell became irreversibly associated with it.

Plurality sets up a relationship between science, religion and morality which defines Whewell's argument and relies upon Whewell's view that only life with the capacity to be moral creatures would count as inhabitants for the purposes of plurality. Whewell's understanding of God and mankind is based on a kind of modified ontological argument: Whewell knows that God exists because he can believe that God exists. We are moral beings and our morals derive from a belief in God, through religious teachings, so God is our moral governor. Whewell can imagine and thus believe in a God which exists only for us, but not in one which exists for non-humans; as he cannot conceive of intelligent nonhuman life it must not exist. For Whewell, if drawing analogies between the makeup and behaviour of the

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[93] Quoted in Todhunter, vol I, p. 326
[94] Ibid.
[95] Laura J. Snyder considers in more detail the possible reasons for Whewell's change of heart in "Lord only of the ruffians and fiends?' William Whewell and the plurality of worlds debate', *Studies in History and Philosophy of Science*, 38.3 (2007), 584-592.

other planets makes a compelling argument for life on other planets, then a religious analogy must necessarily follow, where God chooses to create a special intelligent and moral species on these other planets. The separation of science and religion which Whewell establishes in the preface means that only faith can provide many of the 'consolations, hopes, supports, and convictions' required by man for a whole and happy life', and without religion, science is morally bereft.[96] Thus the capacity for morality becomes one of the key qualities required within the text for extraterrestrial life. The thrust of Whewell's argument is that God created the universe, and created humans with rationality and most importantly, moral capacity. This last attribute, according to Whewell, is a necessary prerequisite for life; there would be no point in an inhabited planet, if its inhabitants lacked equal capability for morality and intelligence, or if they did not at least have the potential for this capacity. Therefore, the likelihood of extraterrestrial life is greatly reduced for Whewell. God would not create a planet which was capable only of harbouring lower life forms without the capacity for morality. Thus planets which might sustain life of some sort, but with no hope of intelligent, moral beings, are as good as barren, so the number of planets that might be inhabited is vastly reduced. Having set these tight criteria, which significantly lowers the probability of life on other planets, Whewell then uses scientific, religious and philosophical arguments to support and develop this hypothesis, to suggest that the Earth is the sole inhabited planet in the universe.

The stipulation that any life must be moral in order to be worthy of creation is one which has obvious problems. By Whewell's own admission, even Earth was uninhabited by intelligent life for a vast amount of time before humanity arose, though he leaves 'out of consideration any supposed progression, which may have taken place in the animal creation previous to man's existence', and he states that it is impossible to conceive of the ways in which any species, but particularly humanity, might develop.[97] This is a moment in which analogy might be usefully drawn between Earth and another planet, suggesting that even if a planet does not

[96] Whewell, p. 15.
[97] Ibid., p. 398.

currently host moral, intelligent life, there may at least be a possibility that such a thing may happen. However, Whewell disregards this idea, instead going to lengths to show why various planets are utterly without the potential for higher life even if less intelligent species might be possible.

There is little separation between science and religion in *More Worlds*; the first chapter title brings religion to the fore as it addresses the 'Religious Aspect of the Question' and the possibility of a divide or opposition between the two is completely ignored until the ninth chapter, 'Religious Difficulties'. Brewster repeatedly conflates Heaven (the future state) and the heavens (the cosmos), on the basis that both are 'created by God's fingers':[98]

> Before the birth of Astronomy, indeed, when our knowledge of space terminated with the ocean or mountain range that bounded our view, the philosopher could but place his Elysium in the sky; and even when revelation had unveiled the house of many mansions, the Christian sage could but place his future home in the new heavens and in the new earth of his creed.[99]

The phrase, 'house of many mansions' echoes John 14:2, which begins 'In my Father's house are many mansions'. The phrase is commonly found in descriptions of heaven but in this case seems to refer to a 'material home' upon which humanity will live corporeally after their life on earth has finished.[100] Brewster's view of the future life is crucial for his understanding of the possibility of plurality. He believes that Judgement Day will involve a physical rising of the dead, and as such humanity will need a new planetary home, leading him to posit that a 'future abode must be on some of the primary or secondary planets of the Solar system [...] which have long been in a state of preparation, as our earth was, for the advent of intellectual life'.[101]

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[98] Ibid., p. 12.
[99] Ibid., p. 8.
[100] Colleen McDannell and Bernhard Lang, *Heaven: A History*, 2nd edition (New Haven: Yale University Press, 2001), p. 196; Brewster, p. 262.
[101] Brewster, p. 15-16.

Thus the cosmos is the site of the next life. In his conclusion, Brewster reiterates the idea that space is in fact the physical home of the future life: 'the material body, which is to be raised, must […] reside in a material home – in a system of many planets – a house of many mansions, though not made with many hands'.[102]

Brewster's view of the physical universe as the home of humankind in the present and future life, with no separate realm for the human spirit, doubtless exerts a strong influence on his view that there is no separation between 'Reason and Revelation'. This idea of 'preparation' is a common one in *More Worlds*. It is both one of the strongest criticisms Brewster makes of *Plurality* and, by its overextension, one of the most problematic of his claims. Brewster objects to Whewell's rejection of the idea of life on other planets on the basis of their apparent unsuitability according to current observations, without clearly addressing the fact that there was a long period during which Earth itself was not hospitable to human life. Brewster does account for this gap, accounting for it by calling it preparation. He associates it with the five days of Creation prior to the creation of Man – the increasingly immense span of time before Man's existence represents for Brewster the time when 'the seas were gathered into one place, and the dry land appeared', and 'the waters above the firmament were separated from the waters below it'.[103] This is quite a common way to reconcile revealed truth of Genesis with scientific truth of geology, but it is significant that, unlike Whewell or other scientists discussing science and religion, Brewster does not position as a key issue in his argument the possibility that religious and scientific understandings of the worlds might be separate or at odds. Brewster's criteria for allowing the possibility of extraterrestrial life are as broad as Whewell's are tight. Brewster proposes that cosmic plurality does not mean only that life currently exists on other planets, but also that planets may once have sustained species that have since 'ceased to exist' or that 'planets which have long been in a state of preparation' might at some point harbour life.[104] Indeed, as his reviewer in

[102] Ibid., p. 259.
[103] Ibid., p. 58.
[104] Ibid., p. 16.

the *Athenaeum* notes, 'against an assertion so elastic it is not easy to make head', and the difficulty of denying Brewster's claim ultimately weakens it.[105]

Brewster's general lack of a real divide between empirical and revealed knowledge contributes to what Crowe identifies as an ironic advocacy of 'an extreme empiricism while championing pluralism', a very 'speculative' position.[106] It also fuels some of the ire he holds towards Whewell. Without inhabitants to show that they have been blessed and acknowledged by God, the other planets in the solar system 'are but colossal blocks of lifeless mud and clay encumbering the Earth as a drag, and mocking the creative majesty of heaven'.[107] Without the separation which Whewell attempts between the empirically observable and the religiously understood, the scarcity of life proposed by Whewell becomes a slight upon God's power. In his conclusion, Brewster stages an explicit defence of the unity science and religion as understood by his version of natural theology. While Whewell attempts to separate science from religion, for Brewster, the plurality debate is primarily a theological one, and science simply a weapon in a faithful Christian's arsenal to help settle this discussion.

Analogy

Style and attitude to poetry, analogy and figurative language are a key point of difference between the two authors. In *Plurality*, Whewell's tone is strictly factual, with minimal imaginative speculation. A key piece of Whewell's argument for cosmic unity is highlighting the shortcomings of analogy when judging whether other planets might be inhabited, while much of Brewster's argument is based on an arguable over-reliance upon the same figure. Mary Hesse and Gillian Beer in particular have contributed important research to the role of analogy in nineteenth century literature and science. Hesse's *Models and Analogies in Science* (1966) is an important early work on the role and function of analogy and metaphor in scientific

[105] Unsigned review of *More Worlds than One*, *Athenaeum*, 1839 (1854), 709-710 (p. 710).
[106] Crowe, p. 302.
[107] Brewster, 135.

models. Her argument insists on the importance of metaphor as a device with 'cognitive implications whose nature is a proper subject of philosophic discussion', and not merely 'a decorative literary device', and on recognising analogy and metaphor as specific, named types of scientific model.[108] She argues that scientific models were vital for the development of scientific knowledge, as they show 'theories in the process of growth'.[109] By working out where an analogy matches or fails to match the scientific theory the model is meant to be describing, one is able to better describe and better understand the theory in question.

Importantly, Hesse identifies 'positive', 'negative' and 'neutral' analogies. A positive analogy is a pertinent similarity which enhances our understanding of a particular theory. The example Hesse uses is an analogy which likens billiard balls and atoms: a property they might share is that the balls collide, and so do atoms. From observing the colliding behaviour of the former, scientists might be able to make predictions about the same behaviour in the latter. A negative analogy is a dissimilarity which does not help construct the model, for example billiard balls are visible to the naked eye and atoms are not; negative analogies are '*subtracted'* from positive analogies to create a model: if one ignores the fact that billiard balls are large and atoms miniscule, the positive analogy that suggests atoms collide in a similar way to billiard balls has useful predictive properties. Neutral analogies do not affect the model either way; there are lots of atoms and lots of billiard balls, but their number doesn't affect whether or not their collision patterns are similar. Hesse argues that the primary function of positive analogy is predictive.[110]

In the context of cosmic plurality, to use a comparison between Earth and Jupiter, a positive analogy might be that they both have atmospheres, evidenced by the observation of winds on Jupiter's surface. This could allow some Victorians to predict that Jupiter could sustain life, just as the atmosphere on Earth does for

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[108] Mary Hesse, *Models and Analogies in Science* (Notre Dame: University of Notre Dame Press,1966), p. 158.
[109] Ibid., p. 10.
[110] Ibid., p. 8-10.

humanity. A negative analogy is that Earth is rocky, and Jupiter was, as far as Whewell and Brewster knew, of a density akin to liquid. A neutral analogy might be that Earth and Jupiter are both spherical. Importantly, a faulty analogy is one where the expected positive models do not accurately predict outcome. An example might be: humans live on this planet orbiting the sun, so humans live on Jupiter, another planet orbiting the sun. The positive analogies, that they are both planets orbiting the sun, are negated by the negative analogies. Humans are land-dwelling, so they would not be able to survive on a planet that is primarily liquid or gas. Thus, this analogy is the wrong model for predicting what celestial bodies human can live on. This kind of categorisation of analogy, and analogy's shortcomings, contributes to a better understanding of Whewell's discomfort with reductive analogies, though he did not have access to this theory of scientific models in his lifetime, and helps to better understand the faults in Brewster's use of the device.

Gillian Beer's study of Darwin's use of analogy, *Darwin's Plots*, draws literary insights from Hesse's argument. In particular, she extends Hesse's emphasis on the predictive aim of positive metaphor to claim that 'major scientific theories have the function of prophecy – a function much claimed by the novel'.[111] While she uses the basis of Hesse's theory of scientific models to inform her own argument, Beer softens the distinction which Hesse makes between 'striking' poetic metaphor and 'explanatory' scientific metaphor, arguing instead arguing that 'metaphors become part of a continuous truth-discovering process'.[112] Beer distinguishes allegory from analogy by arguing that they are each a metaphor which serves a different function: where 'allegory is narrative metaphor, analogy is predictive metaphor'.[113] Ultimately, Beer argues, analogy still has narrative elements whether it is literary or scientific; scientific analogy is a '*precarious'* plot in which the 'power and pleasure' comes from the possibility that it may, ultimately, collapse.[114] Beer powerfully summarises the capabilities of metaphor. She says: 'Space, expansion,

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[111] Gillian Beer, *Darwin's Plots,* p. 91.
[112] Hesse, p. 168-170; p. 176-7; Beer, p. 92.
[113] Beer, p. 92.
[114] Beer, p. 80.

forecast; these are powers offered by metaphor, whether scientific or literary – and they are powers as important as the correspondence, similitude and exactness of measure, which we habitually look for.'[115] Beer uses 'space' in a metaphorical sense; using language in a figurative way helps to extend meaning and understanding, providing more intellectual space to consider a particular idea. In the context of Whewell and Brewster, this particular 'power' of metaphor takes on a literal meaning. Each writer's use of analogy allows them to characterise outer space in a way that suits their own outlook; Whewell's space is empty, while Brewster's is full of life or the potential for it.

The scientific imagination, particularly with regard to analogy, has an uncomfortable place within *Plurality*. Whewell repeatedly dismisses analogy, particularly the analogy that 'The planets are like the earth. The stars are like the sun' which he addresses several times within the Dialogue, at which point he also directs the reader to the multiple instances of discussion within the text proper:[116]

> In Chap. Viii, art. 9 &c., I have considered this likeness, as regards the stars ; and as to the evidence of analogy, I have remarked, Art. 29, that the question is, whether there *is* an analogy. It appears to me probable that there is not. The likeness of the planets to the earth, I have considered at length in Chapters ix. and x.[117]

This detailed signposting and frequent return to the subject shows a high level of patience with, as far as Whewell is concerned, a faulty analogy, perhaps with the hope that enough repetition will result in the idea being wiped out. The planets are not 'like the earth', for, as Whewell notes repeatedly and in several different ways, some are rocky and others gaseous, some have an atmosphere while others lack it, and the temperatures to which other planets are subjected are at great variance with those of Earth.[118] Thus Whewell's

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[115] Ibid., p. 92.
[116] Whewell, p. 22; 31; 35; 38; 57.
[117] Ibid., p. 22.
[118] Most of the chapter 'The Planets' is devoted to highlighting these variations.

dismissal of certain analogies, and the warnings he issues when deploying others, is fairly understandable, though his obvious uncertainty about the usefulness of analogy makes the fairly frequent occasions when he does use it seem faintly contradictory. Beyond the scientific imagination as expressed through analogy, Whewell excoriates imaginative or creative interpretation of the solar system; his most florid prose is deployed when constructing criticisms of himself in the Dialogue, in contrast to his very prosaic, matter-of-fact tone in his own argument.

Whewell gently patronises Brewster's wistful projection of an extra-terrestrial being who, in Brewster's words:

> may have his home in subterranean cities, warmed by central fires, -- or in crystal caves, cooled by ocean tides, or he may float with the Nereids upon the deep, -- or mount upon wings as eagles, or have the pinions of the dove that he may flee away and be at rest[119]

Whewell dismisses this flight of imagination as 'very pretty', and swiftly reduces it to the level of a fairy tale, as the critic's creature is as likely as 'Gnomes, Naiads, and Sylphs of the Rosicrucians'.[120] This passage of Brewster's, and its response from Whewell, exemplifies the core of the difference in attitude which each writer had towards imaginative writing. Brewster's view of the cosmos is not as reductive as Whewell suggests when he scorns the analogy 'the planets are like the earth'.[121] However, he does often fall into the trap of overemphasis on what Hesse terms 'positive' analogies, or misidentifying 'neutral' analogies as positive ones, for example the existence of 'trade winds' on Earth and Jupiter, without taking into account the dissimilarities which might render the comparison between Earth and other planets void.[122] Whewell's response to Brewster's type of optimistic vision of life on other planets is threefold. First, he undermines the scientific validity of the statement by likening it to a belief in fairies, and suggests that the types of adaptation which Brewster supposes does not properly account

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[119] Brewster, p. 74-75
[120] Whewell, p. 85.
[121] Ibid., p. 22.
[122] Brewster, p. 64.

for the variations in planets. Second, he suggests that, far from being open-minded, Brewster's vision of eagle or dove-winged extraterrestrials is not alien enough: 'we know how difficult the poets have found it to describe […] a world of angels, or of evil spirits, souls or shades' in a way that shows what these creatures look like but 'not subject to the laws of human bodies'.[123] Thus to Whewell, Brewster's vision of extraterrestrial life is based too much upon creatures, both mythical and real, that already exist upon earth. Third, with this exhortation against being limited by earthly forms in mind, he proposes a counter-image to the majestic one conjured by Brewster.

When Whewell takes his reader on an imaginative tour of the solar system, he explains in detail the expected conditions of each planet. Drawing comparisons between these conditions and their closest equivalent on earth, he describes the type of animal that might live there. The creatures which are imagined to live on each planet are invariably unsuited to the type of intelligence and moral capacity, or potential for such, which Whewell has established as a prerequisite for existence. For example, Whewell devotes some seven articles to exploring Jupiter. He first gives the reader a brief lesson in relative densities, in order that he can explain the likely nature of the surface of Jupiter. Personifying and vividly describing Jupiter's '(probably) bottomless waters; his light, if any, solid materials; the strong hand with which gravity presses down such materials as there are; the small amount of light and heat which reaches him', Whewell makes it clear that a human would not be able to live there.[124] The only creatures he can conceive of inhabiting such a planet are 'boneless, watery, pulpy creatures', qualities which he clearly deems unsuited to housing any higher intelligence.[125]

Whewell's somewhat conflicted relationship with analogy in *Plurality* may seem surprising given his earlier commitment to ideas regarding natural theology. While he rejects analogy even as he uses it in *Plurality*, he uses it enthusiastically in his Bridgewater Treatise *Astronomy and General Physics* (1833). Historians including Jerry H Gill and Douglas Hedley have noted that natural theology relies to

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[123] Ibid., p. 353
[124] Ibid., 301.
[125] Ibid., 302.

a great extent upon analogy for its understanding.[126] Indeed in his *Bridgewater Treatise*, Whewell uses analogy frequently to explain his arguments. At one point in the *Treatise* he draws an analogy between the earth and similar celestial bodies to suppose that 'the rest of the "host of Heaven" may, by a like analogy, be conjectured to be the centre of similar systems of revolving worlds'.[127] In *Plurality,* Whewell repeats this analogy but turns it upon the pluralist reader, making the idea more worrying than comforting:

> So many planets about our sun ; so many suns, each perhaps with a family of planets ; and then, all these suns making but one group : and other groups coming into view, one after another, in seemingly endless succession : and all these planets being of the nature of our earth, as all these stars are of the nature of our sun:- all this, presents to us a spectacle of a world – of a countless host of worlds …[that] might also have inhabitants :- intelligent beings who can reckon these days and years ; who subsist on the fruits which the seasons bring forth, and have their daily and yearly occupations, according to their faculties.… When we take, as our plan of the universe, such a scheme as this, we may well be overwhelmed with the number of provinces … which the empire of the Lord all includes; and … we may say with a profundity of meaning immeasurably augmented –'lord, what is man?'[128]

Here the calm 'conjecture' of the earlier text is replaced with an alarming expansion – the run-on sentence of the first part leads the reader's imaginary eye out further and further until Earth itself is all but lost in similarity. Once the magnitude of the

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[126] Jerry H. Gill, 'Kant, Analogy and Natural Theology', *International Journal for Philosophy of Religion* (1984), 18-28 (p. 19); Douglas Hedly, 'Imagination and Natural Theology', *The Oxford Handbook of Natural Theology*, ed. by John Hedley Brooke, Russel Re Manning and Fraser Watts (Oxford: Oxford University Press, 2013), 539-553 (p. 541).
[127] William Whewell, *The Bridgewater Treatises on the Power Wisdom and Goodness of God As Manifested in the Creation: Treatise III: On Astronomy and General Physics* (Seventh edition, London: William Pickering, 1839), p. 280.
[128] Whewell*,* pp. 110-111.

universe has been sufficiently emphasised, Whewell populates it with creatures again similar to us. Rather than rejoicing over the power of God to love and nurture everything in the system, Whewell plays upon a fear of being forgotten, and on the idea in Christianity of man being a special, chosen creature. If God has dominion over other creatures like humans, then they, too, must be similarly blessed with His attention, and suddenly mankind's place as God's most precious creation falls flat, threatening an identity built on thousands of years of religious faith. The final phrase, which was asked once before in the preface, brings this sense of loss and confusion to a peak; the question 'Lord, what is man?'. The plaintive question, is left open for the readers to answer for themselves, though it is an echo of Psalm 144:3, which asks 'LORD, what *is* man, that thou takest knowledge of him! *or* the son of man, that thou makest account of him!'.[129] Within the psalm, like in *Plurality*, the question is about humanity's specialness, but where the psalm seems to ask why mankind was chosen by God, thus assuming humanity's supremacy, Whewell's question is less confident, asking not for a reason but for reassurance that humanity is indeed special and chosen. Given the dramatic lead up to the question, it might be preferable for the reader to decide that man is indeed 'in the universe alone with God' rather than risk being a forgotten middle child.

Whewell does not simply leave his destruction of the argument from analogy to emotional rhetoric. After creating this infinitely inhabited universe, he briskly depopulates it again, arguing that the similarities do not apply beyond a certain point, far before they might allow for another morally aware species. Throughout *Plurality*, Whewell acknowledges analogies and then dismisses them, in whole or in part; to take again the example of earth, 'alone of all the planetary harvest' as 'a fertile seed of creation', he uses the analogy only so far then derails it for fear of 'misleading' the reader.[130] Whewell's changing use of analogy through his career, from his enthusiastic reliance upon them in his Bridgewater Treatise to his more cautious relationship with them in *Plurality*, can be seen as a part of his developing as a writer

[129] The Bible, King James Version, psalm 144:3.
[130] Whewell, p. 347; p. 348.

and gaining an awareness of their limitations as a rhetorical device. Indeed, Yeo considers *Plurality* to be the culmination of Whewell's developing epistemology.

Whewell has two main preoccupations within *Plurality*: the moral nature of humanity and its vital role for ensuring mankind's uniqueness in the universe, and, related to that, laws and systems. It is here, where moral and scientific laws intermingle, that we find God in Whewell's theories. Throughout *Plurality*, Whewell deals with humanity largely in terms of their morality and religion, and nature in terms of systems, cycles and laws. This separation between the mechanical universe and god-chosen humanity echoes and reinforces the relationship between the scientific and the religious as being separate but parallel and interrelated. Indeed, he explicitly devalues the mechanical aspects of human inventiveness, stating that it 'is not found generally, that the improvement of machinery, and of means of locomotion, among men, produces an improvement in morality, nor even an improvement in intelligence, except as to particular points'.[131] The unique value of humanity it seems, is solely in its ability to have moral values and to connect with God; barren, mindless planets can display mechanical beauty, such as the mathematical grandeur of Saturn's rings, but only humans have the wherewithal to appreciate this splendour as well as produce it, and the God-given 'command over nature which might seem supernatural'.[132] However, laws, set by the creator, are one of the few things to which humanity and nature are both subject and thus a key point of synthesis for Whewell's ideas.

Whewell largely dismisses analogies, saying that though one may find 'strong analogies in favour' of 'proof of intelligent inhabitants' through astronomy, when one deals with astronomy in 'the ordinary and popular mode of comprehending them', which is to say in a manner based on literal observation and theory rather than analogy, then it becomes clear that 'the analogies in favour of 'other worlds,' are … greatly exaggerated'.[133] Whewell states he will 'attempt to reduce such "analogies"

[131] Ibid., p. 404.
[132] Ibid., p. 400.
[133] Ibid., p. 150.

to their true value'.[134] However, his critique of analogies does not prevent him from drawing several of his own, notably when he compares life on planets to the yield of a harvest, where even just one sprouting seed constitutes a success of sorts. It is worth quoting this intriguing passage at some length:

> [I]f the earth alone, of all the planetary harvest, has been a fertile seed of creation;—if the terrestrial embryo has alone been evolved into life, while all the other masses have remained barren and dead:—we have, in this, nothing which we need regard as an unprecedented waste, an improbable prodigality, an unusual failure in the operations of nature: but on the contrary, such a single case of success among many of failure, is exactly the order of nature in the production of life. It is quite agreeable to analogy, that the Solar System, of which the *flowers* are not many, should have borne but one *fertile* flower. One in eight, or in twice eight, reared into such wondrous fertility as belongs to the Earth, is an abundant produce, compared with the result in the most fertile provinces of Nature. […] One such fertile result as the Earth, with all its hosts of plants and animals, and especially with Man, an intelligent being, to stand at the head of those hosts, is a worthy and sufficient produce, so far as we can judge of the Creator's ways by analogy, of all the Universal Scheme.[135]

This is the most extended figurative moment in the treatise, and given that Whewell's opinion and use of analogy and figurative language is complex, that he uses it at such length here is of interest. In some ways, it may act as a kind of example from Whewell for readers on how analogy can work without obstructing or confusing scientific fact. The passage describes Earth and the universe in terms of fertility in order to reassure the reader that the simple abundance of other planetary bodies does not necessarily guarantee unlimited fecundity and nor does cosmic singularity imply a failing in the power of God. Whewell states: 'if the terrestrial embryo has alone been evolved into life…we have, in this, nothing which we need regard as an unprecedented waste', but is rather 'exactly the

[134] Ibid.
[135] Ibid., p. 347-348.

order of *nature*'. In earlier passages Whewell makes the cosmos seem as dizzyingly huge as possible, describing multitudes of planets and galaxies, but here he deftly minimises the size of the universe, referring to a 'Universal Scheme' but narrowing the scope of life to the solar system rather than the entire universe.[136] It is much easier to accept 'One in eight, or in twice eight, reared into such wondrous fertility', than one life-bearing planet in the 'seemingly endless succession' of planets and suns which he invokes earlier in the text.[137]

While the planet Earth is not gendered, it is constantly referred to as something delicate and cherished – in this passage it is variously an 'embryo', a 'seed', and a singularly rare species of harvest. In other passages it is towards the bottom of the chain of the greater caring for the smaller, a single planet forming the 'domestic hearth' of the solar system.[138] The use of natural and domestic imagery, in contrast to the depictions of Jupiter's inhospitable, gaseous oceans full of gelatinous monstrosities eking out an existence below the notice of God, makes Earth's solitude seem, if less miraculous, at least more appealing. The emphasis on the wondrous fertility of Earth as well as the placement of humanity, 'an intelligent being', in charge of this exuberant prolificacy, rounds off the passage as a kind of consolation for reader as to the barrenness of other planets.[139] While the rest of the solar system or even the universe may be without life, Earth is overflowing, and as Earth is the only physical realm of immediate relevance to humanity, this should be enough. The reminder that humanity has dominion over, and owes stewardship to, an exquisitely fecund planet, is perhaps calculated to return the reader's gaze away from the cold glow of distant possible worlds, and into the warmth of the 'domestic hearth'.[140]

Brewster joins the debate from the side of the majority view, a fact of which he takes full advantage; each chapter begins with a review of the history of the argument for plurality which he intends to address, often including multiple citations and extensive quotes. Though it is important for informing a potentially less educated

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[136] Ibid., p. 110-111.
[137] Ibid., p. 250-251; 110.
[138] Ibid., p. 324.
[139] Ibid., p. 347.
[140] Ibid., p. 324.

reader of relevant scientific history, a crucial effect of these literature reviews is that Brewster asserts himself as the champion of scientific tradition, with the weight of great minds such as Newton and Herschel behind him. This is in contrast to Whewell, whose views are marginal and who, though he uses the ideas of many of the same scientists, cannot claim the same precedent for his argument. This appeal to authority also explains to some extent Brewster's reliance upon analogy to argue for plurality. *More Worlds* begins with an argument of analogy, stating that increased knowledge of the planets 'compelled us to believe that these planets must be inhabited like our own', and quotes from the pluralist work of Isaac Newton, immediately establishing calibre of the scientists upon whose shoulders he purports to stand.[141]

Imagining the solar system

An important point of equivalence between *Plurality* and *More Worlds* is the imaginative tour of the solar system on which each author takes their reader. On this tour, the reader is given much of the same information in each text, but, as always, taken to different conclusions. Whewell and Brewster are both preoccupied with purpose, and both of them agree that this purpose is sustaining life. However, Brewster's idea of a useful cosmos is one which is replete with life, while the success of Whewell's argument depends upon him dealing satisfactorily with the question of waste, and convincing the reader that a single intelligent species is life enough to give the rest of the universe purpose.

Whewell's argument is necessarily anthropocentric. Every planet in the solar system is described in terms relative to earth – Jupiter is '5 times the Earth's distance from the sun', while the light and heat which reaches Saturn is 'only one ninetieth' of that which reaches Earth.[142] Whewell asserts that the Earth might 'be the centre of the moral and religious universe'.[143] He suggests that the purpose of Saturn's ring is

[141] Brewster, p. 2.
[142] Ibid., 304.
[143] Ibid., 116.

that it 'is a glorious object for man's view, and his contemplation'.[144] This assertion provides two key insights into Whewell's outlook. First, he views every body in the universe as having 'its use', speaking to a view of the universe which sees it as being governed by laws of utility and with a specific, presumably God-given purpose.[145] Second, he is comfortable to the point of complacency with a universe created entirely for humanity's benefit. Whewell attempts to justify what he admits may be considered a 'quite extravagant and improbable' point of view by using his hypothetical explorations of the solar system, to theorise a system which allows the 'greater orbs…to minister to the less' in a kind of stewardship.[146] This perception of the solar system as having a very particular order, with each part having a mostly benevolent bearing on a smaller part, is an example of the kind of systems which Whewell sees across the universe, and which negates the need for there to be other inhabited planets. Because the universe for Whewell is not designed to beget life, yet all of the systems and structures work to help keep humanity alive, the fact that there may only be one intelligent, moral species does not constitute arrogance, or a waste. Rather, it is an unsurprising result of a universe built on physical laws which are not designed to cause the universe to overflow with life.

The language and devices which Whewell use to describe the solar system, and the universe as a whole, are relatively figurative and poetic given Whewell's general dismissal of such things elsewhere in the text. The personification of the planets, giving each a gender and describing the system of ministering as though the behaviour of the planets were a choice rather than a mindless following of set laws, makes the universe seem inhabited by more than the simply human. Concepts like Astronomy and Geology, who become females with a purpose and a sympathy toward humans, and the male Jupiter and Saturn, become intelligent entities in themselves and can be imagined to have lives and allegiances even as Whewell rejects the idea of there being literal rather than figurative life elsewhere in the

[144] Ibid., 305.
[145] Ibid.
[146] Ibid., p. 342.

universe.[147] The personification of Astronomy and Geology is of particular interest because it reinforces a number of Whewell's arguments and places the two sciences into a hierarchy which seems to be perceived by Whewell as somewhat controversial or at least in need of defence. In fifteen of fifty-four uses of 'astronomy', and nine in forty of 'geology', the disciplines are given the status of a proper noun. The capitalisation tends to indicate that they are being personified, though this is not always the case, and they can slip between being a female and an object from sentence to sentence. For example, 'the antiquity of astronomy as a science had no share in such speculations as we are discussing … The vigorous youth of Geology makes her fearless of the age of Astronomy.'[148] The characteristics associated with the female personification of astronomy are that she 'claims a sort of dignity over all other sciences, from her *antiquity*, her *certainty* and the *vastness* of her discoveries', yet Whewell argues that the assumption that astronomy has these attributes are the very things which make it untrustworthy and places it in opposition to geology.[149]

Geology is portrayed as astronomy's superior, with her 'vigorous' and 'fearless' approach refuting the ancient, even moribund practices associated with astronomy.[150] The crux of Whewell's preference for geology is that it is more immediate and is based upon inductive reasoning, relying upon evidence which is relatively easy to access and to verify, such as fossil and stone records. In contrast, astronomy requires deduction, analogy, and a number of processes which rely upon assumption and, in Whewell's view, faulty logic which undermine the conclusions which allow for there to be life on other planets. The difference between the two, and some of the bearing the comparison has upon science and religion, is summarised most clearly in the concluding chapter of the book.

> And that there may be such a plan of creation,—one in which the moral and intelligent race of man is the climax and central point to which

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[147] Female sciences, ibid., p. 208; male Jupiter p. 301; male Saturn p. 304.
[148] Ibid., p. 208.
[149] Ibid.
[150] Ibid.

> innumerable races of mere unintelligent species tend,—we have the most striking evidence, in the history of our own earth, as disclosed by geology. We are left, therefore, with nothing to cling to, on one side, but the bare possibility that some of the stars are the centres of systems like the Solar System;—an opinion founded upon the single fact, shown to be highly ambiguous, of those stars being self-luminous; and to this possibility, we oppose all the considerations, flowing from moral, historical, and religious views, which represent the human race as unique and peculiar.[151]

Geology, with its necessary connectedness to the human home planet, which is described consistently as 'fertile', 'domestic' and in positive, nurturing terms, is a comforting and reliable force against the dizzying expanses and uncertainties of astronomy.[152] In the passage quoted above, Whewell connects 'the history of our own earth, as disclosed by geology' with 'a plan of creation', and confirms the enviable status of humanity as the 'climax and central point' of life in the universe, the moral and god-chosen crux of the cosmos. The next sentence creates an immediate contrast to a world view dictated by reliance upon astronomy; rather than the 'striking evidence' and solid domesticity of Earth, humanity is offered a 'bare possibility' and 'nothing to cling onto' for comfort. It is counterintuitive of Whewell to connect the barren and comfortless option with the possibility of a plenitude of life on other planets, and comfort and superiority with what is essentially isolation. However, it is neither surprising nor inconsistent, and is a persuasive device which undermines the assumed benefits of a populated universe. For Whewell, being the sole 'moral and intelligent race' means being God's cherished only children, a far more convincing and comforting prospect than the possibility of distant life, a possibility which is based upon analogy, scientific theory and empty necessities of probability.

While Whewell portrays without question geology as astronomy's superior, neither personification is an unsympathetic character, and both provide comfort and, after a fashion, allow for humanity to be the moral centre of the universe. Astronomy is venerable,

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[151] Ibid., p. 390.
[152] Ibid., p. 347; p. 324.

benign., 'wise and cautious', if a little too permissive of the fancy of men, providing evidence of a hierarchy of celestial bodies which each tend to one another.[153] Geology, while more reliable and possessing the vigour of youth, is not cruel to astronomy – the two can coexist peacefully. Whewell simply believes that astronomy has been misused by men of science to speculate beyond the discipline's remit.[154]

While it is not without problems, the personification of planets and of branches of science is by and large an effective rhetorical device. By turning astronomy and geology temporarily into real, conflicting people, the two approaches and the benefits and disadvantages of each according to Whewell are brought into sharp contrast and gives a more personal, immediate experience of the two sciences at odds than if they were reported through the actions of scientists. Even as they contradict Whewell's commitment to a description of the solar system based on facts alone, these characterisations give a persuasive and comforting view of an essentially benign universe, where 'the greater orbs…minister to the less', and 'Astronomy herself' inclines 'in favour of the condition of man'.[155] While the chances of extra-terrestrial life are nil according to Whewell, he instead populates the universe with inanimate objects all bent on validating human supremacy. Interestingly, while he gives all of the other planets in the solar system gendered pronouns, Whewell does not gender Earth, always referring to it by name. This may be for a number of reasons: as the planet is already populated by intelligent life, it no longer needs to have an identity of its own. It moves from an object, with its place in the grander system of stewardship, to a subject of its own inhabitants and therefore does not need a gender – it is simply Earth. The gendering of the other planets also gives them a mythological feel; they become mere concepts, like the personified female Astronomy, rather than real places with potentially viable environments for life. This rhetorical strategy helps to further distance the possibility of other planets being inhabited from the mind of the reader.

Brewster's equivalent chapter to Whewell's tour of the cosmos in 'Astronomical Discoveries', is 'Description of the Solar System'. Without the same constraints as

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[153] Ibid., p. 208; 209.
[154] Ibid., p. 209.
[155] Ibid., p. 342; p. 223.

Whewell regarding speculation and florid language, his tour is often far more emotive, and his optimistic view of the solar system's life-sustaining capabilities lends itself to a generally very vibrant view of the cosmos. Each chapter, and especially this one, begins with an expository section full of lively, figurative language, followed by the drier descriptive part, full of quotations and scientific statistics, which returns to a more imaginative overview. This statistics sandwich is an effective device for maintaining interest despite repetition. The first description of the sun is a multisensory barrage of descriptions of the sun's various functions:

> [T]he centre and soul of our system,-the lamp that lights it, the fire that heats it,-the magnet that guides and controls it,-the fountain of color which gives its azure to the sky, its verdure to the fields, its rainbow hues to the gay world of flowers, and the "purple light of love" to the marble cheek of youth and beauty.[156]

The sun is subjected to four different images describing its functions – it is variously a lamp, a fire, a magnet, and a fountain, each image presented in quick succession. Each of the functions of the sun according to Brewster are represented by an earthly object which most readers will be familiar with, and the whole garnished with a quotation from Thomas Gray's well-known poem 'The Progress of Poesy' (1757).[157] The sun is thus swiftly introduced in all its glory ahead of its second description which is, by contrast, a brusque summary of its nature as observed by astronomers:

> This globe, probably of burning gas, enveloping a solid nucleus, is nearly 900,000 miles in diameter, above a hundred times the diameter of our globe, and five hundred times larger in bulk than all the planets put together! It revolves upon its axis in twenty-five days, and throws off its light with the velocity of 192,000 miles in a second.[158]

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[156] Brewster, p. 20.
[157] Thomas Gray, 'The Progress of Poesy: A Pindaric Ode', (1757), University of Toronto Libraries: Representative Poetry Online, <http://rpo.library.utoronto.ca/poems/progress-poesy-pindaric-ode> [accessed 10/8/15].
[158] Ibid.

It is notable that unlike Whewell, who couches all of his descriptions in comparison to Earth, Brewster does not give Earth this centrality. The final reference to the sun in the chapter makes a return to the figurative: describing the journey upon which Brewster has taken the reader, he invites them to reflect upon it, 'from the effulgent orb of day, to that almost Cimmerian twilight where Phoebus could scarcely see to ride his steeds'.[159] This type of repetition has several effects: first, Brewster's intended audience requires him to balance his apparent desire to provide his readers with a basic grounding in astronomy with maintaining an interesting, lively narrative. Sandwiching the drier facts of bulk and composition between the dazzling array of images provided in the first description, with the majestic closing passage which calls upon classical mythology, helps to draw the reader through the less immediately engaging central portion. The sun is presented as being of use for all planets equally, not simply the benefit of Earth.

More Worlds argues only for the possibility, rather than the certainty, that every type of celestial body could be inhabited, including planets, suns, lunar satellites and nebulae. For Brewster the potential for life is what is important, because a current dearth of life on a given body does not preclude all life, but simply suggests that it is perhaps is still in a 'state of preparation for the reception of inhabitants', or has become extinct after long occupation.[160]. Any property of a celestial body that makes it less fit for the nurturing, life-sustaining purpose to which Brewster has assigned it must instead have a secondary role in the ultimate goal of sustaining life. In this way, Brewster claims that the sun's use is as 'the furnace which supplies the fuel without which every organic structure would be destroyed'; moons are 'the domestic lamps which light the primary planets in the absence of the sun, and [...]may[...]produc[e] the tides of their oceans'.[161] Planets meanwhile 'have no conceivable function to perform but that of supporting inhabitants' except perhaps to act reciprocally as

[159] Ibid., p. 30.
[160] Ibid., p. 65.
[161] Ibid., p. 94.

'lamps' for their own moons.[162] Conversely the moon, with its geological features such as 'lofty mountains and valleys and extinct volcanoes', is not an optimal lamp for the earth; Brewster notes '*it would have been a better lamp had it been a smooth sphere of lime or chalk*'.[163] These imperfections in its role as a lamp mean that it must therefore have a primary function which makes use of these properties, for example hosting life-forms which could make use of the varied surface.[164] Thus use for Brewster is a very well-organised business, with God giving individual purpose and properties to each celestial body, with scope for an appropriate lifeform to inhabit it. This stands in contrast to Whewell's natural imagery of crops and seeds, in which an amount of chance and waste is expected. While both ultimately see God as the creator, God's level of involvement in the vagaries of life differs, from painstaking architect for Brewster to Whewell's hopeful sower of seeds, of which only one germinated.

Whewell's estimation of the superiority of geology over astronomy is another topic of contention for Brewster. Brewster does not directly compare the two sciences, or declare on the superior of the other, but he does equate astronomy directly with God in a way which he does not with geology. Both are personified and feminine, as they are in *Plurality*: 'twin sisters of terrestrial and celestial physics'[165] Geology's most useful purpose in Brewster's argument is to provide expanses of extra time during which Earth was not inhabited: 'for millions of years there was not an intelligent creature in the vast dominions of the universal King', thus supporting his argument that it is impossible to rule out the idea that some planets are still being prepared to accept life.[166] Astronomy, meanwhile, is given the role of uniting 'in a remarkable degree, the interests of the past, the present and the future', unlike geology, which serves only to provide a past.

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[162] Ibid.
[163] Ibid., p. 113-114, italics Brewster's own.
[164] Ibid., p. 114.
[165] Ibid., p. 42.
[166] Ibid., p. 184.

Conclusion

William Whewell's *Of the Plurality of Worlds* went against the prevailing opinions of the time regarding plurality. Despite a stated aim to keep science and religion separate, Whewell uses religious and moral arguments to deal with essentially scientific questions. His argument for the unique position of Earth in the universe as the only inhabited planet, and humans as the only intelligent life living there, is based on his determination that morality is one of the key things that sets humanity apart, and relies upon a universe based on God-given laws and structures. While *Plurality of Worlds* was the first voice in the cosmic plurality debate, *More Worlds than One* is the text which opened the debate to the more general reader and took on the role of primary opposition which is vital in any debate. Brewster synthesises ideas of science and religion in a way which does not make room for a debate between them, envisioning a universe in which the destination of one's future life can be observed through a telescope.

The Victorian Afterlife of *Night Thoughts*

Introduction

Edward Young wrote *Night Thoughts* between 1742 and 1745. Initially published in nine parts over three years, it enjoyed extreme success in terms both of its critical reception, and of the sheer length of time for which it was held in esteem; new editions appeared and the poem was praised for over a century after initial publication. The text is a collection of nine poems, each describing the thoughts of a different night. Each night is a discrete poem with an individual focus: the first night focuses on 'Life, Death and Immortality', the second upon 'Time, Death, Friendship', and each other section likewise has its own title and theme. Though separate, the poems are linked in several ways. First, because together they constitute something of a fictionalised autobiography, second by the central conceit of a series of night time musings and, finally and mostly pertinently, thematically through the core ideas within the poems about the nature of God and humankind, and by Young's investigation through nine different angles the theme of '*the Subduing of our Fear of Death*'.[1]

Night Thoughts is unique within my thesis in that it was written nearly a century before the date range I have defined for my study. However, my interest in the poem is not in its eighteenth century context or necessarily its content per se, but in its afterlife in the nineteenth century. It was not written within my date range, but during my period of study, it was used and referenced extensively in a very wide range of contexts, and especially in scientific works; it is referenced by both of the treatises discussed in the previous chapter, and Edward Young is mentioned in *Festus,* discussed in the next chapter. I will show in this chapter that *Night Thoughts* came to act as a symbol for religious devotion in the nineteenth century, which made

[1] Edward Young, *Night Thoughts* ed. by Stephen Cornford (Cambridge: Cambridge University Press, 1989), p. 35.

it a useful tool in scientific discussions. My interest in this thesis is in conversation; in means and methods of communication between science, literature and religion in the mid- and later nineteenth century. While the scientific discussions I consider all reached their peaks within the period 1839-1889, it would be ahistorical to examine these debates without considering the significance of influences outside of this period.[2] The ubiquity of *Night Thoughts* in the nineteenth century and its quite specific connotations means that the poem was usually unhitched from its eighteenth-century origins, and attached to specifically nineteenth-century concerns. I use *Night Thoughts* as a case study to assess the movement of ideas, images and specific quotes between the disciplines of science, literature and religion.

First, I will give a general overview of *Night Thoughts* paying particular attention to images of light and dark, which I argue is an energetic trope akin to those described by Jude V. Nixon and used by Hopkins. I will then examine the Victorian afterlife of *Night Thoughts*, particularly in science writing. It will first examine the broad attitude of the Victorians towards the poem, challenging the modern critical understanding that *Night Thoughts* was all but forgotten after Eliot's essay 'Worldliness and Other-Worldliness'. I will then consider poem's presence in and influence upon Victorian scientific treatises. Having discussed the plurality debate in some detail in my last chapter, I will use the same treatises, *The Plurality of Worlds* and *More Worlds Than One* as case studies for how *Night Thoughts* was used to intervene in a specific scientific debate. I will then investigate the poem's more fragmented afterlife as a series of lines and proverbs, often divorced from the original poem in terms of attribution or meaning. This chapter seeks to demonstrate that the interplay between science, religion and literature, and the influence that each of them had on the other in the nineteenth century, is not limited to works that are contemporary with one another. The extended success of *Night Thoughts,* and its reputation as a text of high moral and spiritual value, means that it provides an

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[2] Useful studies on poetic influence and textual afterlives can be found in Harold Bloom, *The Anxiety of Influence: A Theory of Poetry* (2nd edition, Oxford: oxford University Press, 1997, first published 1973) and Robert Douglas-Fairhurst, *Victorian Afterlives: The Shaping of Influence in Nineteenth-Century Literature* (Oxford: Oxford University Press, 2004).

opportunity to trace the permeation of an eighteenth-century text into nineteenth century culture and scientific discourses, across a wide variety of texts and over a period of around forty years. The chapter will also provide close readings of sections of the poem. The final aim of the chapter is to draw attention back to *Night Thoughts* as a significant but now neglected text in eighteenth and nineteenth century literary studies.

Night Thoughts sits firmly within a canon of biblical poetry; Cornford notes that Young bucked a trend towards secular poetry in the eighteenth century. Each of the nine poems which constitute *Night Thoughts* addresses the central theme of mortality and judgement in the context of a night time thought. The poem is in blank verse. Young explains in his preface that this meter was '*rather* imposed, *by what spontaneously arose in the Author's Mind, on that Occasion, than* meditated or designed'. [3] It has the dual effect of expressing the hypnotic, almost formless regularity of the involuntary inspiration implied by the way in which Young claims to have received his ideas, while also conforming to the fashions connected with what Stephen Cornford calls 'secular, associative' poetry.[4] Thus the metre of the poem appealed to the tradition of the poet-prophet, and the fashion of the sublime poet. The nine poems collected in series provide at once a journey of consolation, and a range of points of view on mortality and judgement. The poems themselves change in style throughout the collection; from the deeply personal, introverted musings of 'Life, Death and Immortality' and 'Time, Death, Friendship' to the development of something approaching a narrative persona, Lorenzo, during the Third Night, 'Narcisa', and the establishment of a journey through the following chapters which culminates in 'Consolation' and a direct address to God from Lorenzo. Although the poems do form a sequential narrative – from the relative lack of direction in 'Life, Death and Immortality' to the joyful and sure journey towards God in 'Consolation' – the poems can also stand alone as individual points of view on the inevitability of death, fears of the afterlife, and God's relationship with mankind.

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[3] Ibid.
[4] Stephen Cornford, 'Introduction' in *Night Thoughts* ed. by Stephen Cornford (Cambridge: Cambridge University Press, 1989), 1-33 (p. 3).

The individual poems were each published multiple times before the ninth part appeared; the complete poem went through eleven editions between 1749 and 1762. This interest was sustained, as *Night Thoughts* was reprinted regularly up to a century after its first publication; four new critical editions of the work were published between 1834 and 1854 alone.[5] In addition to an active publishing history, *Night Thoughts* had a profound effect upon how long poetry was viewed: Edward Bulwer-Lytton saw 'the solemn and stern majesty of *Night Thoughts*' as the measure to which to hold Thomson, Pope and Wordsworth.[6] It also found praise from esteemed eighteenth century figures such as Samuel Johnson, who deemed Young 'a man of genius and a poet', and Alexander Pope.[7] The poem was described by Young's contemporaries as 'having a merit which no productions but those of real genius ever proffer', with the further observations on its success that that 'No composition can...boast a greater number of readers', and 'the applause he has received is unbounded'.[8] In addition to this praise in its own century, it found similar commendation in the first half of the nineteenth century, and a prominent place in nineteenth century science writing.

That the poem was read and appreciated in its own century is certain; all manner of English readers across boundaries of class and profession expressed admiration for the poem around the time of its publication. However, despite the poem's distinguished status in the eighteenth and early nineteenth centuries, new ideas about artistic authenticity in the mid-nineteenth century caused new doubts about how genuine or profound the religious feeling expressed in *Night Thoughts*

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[5] Stephen N. Brown, 'Review: *Night Thoughts*', *Modern Philology* (1992) 89.4, pp. 579-583 (p. 579).
[6] Edward Bulwer-Lytton, *The Student*; *A Series of Papers,* V.II, (London: Saunders and Otley, 1835), p. 319.
[7] Samuel Johnson, *Lives of the Poets* vol. 2, In *The Works of Samuel Johnson, LL.D in Nine Volumes*, vol. 8 (Oxford: Talboys and Wheeler, 1825), p. 462; William Shenstone, *The Letters of William Shenstone*, ed. by Marjorie Williams (Oxford: Basil Blackwell, 1939), p. 59.
[8] Unsigned article, 'Anecdotes of Dr Edward Young', *The Town and Country Magazine, or, Universal Repository of Knowledge, Instruction and Entertainment*, 25 (1793), 274-276 (p. 275); Courtney Melmoth, *Observations on the Night Thoughts of Dr Young, with Occasional Remarks on the Beauties of Poetical Composition* (London: Richardson and Urquhart, 1776), p. 3; Unsigned article, 'The Life of the Celebrated Dr Edward Young'. *The British Magazine, or, Monthly Repository for Gentlemen & Ladies*, 6 (1765), 296-300, (p. 299).

really was. These concerns coloured the prevailing opinion on the poem, and interest in the text waned in the middle of the nineteenth century. George Eliot's 1857 essay 'Worldliness and Other-Worldliness' condemned *Night Thoughts* as 'low and false' in 'religious and moral spirit', and this opinion appears to be one of the last authoritative words on *Night Thoughts* for over a century, until interest briefly peaked again in the late twentieth century. [9] In the nineteenth century, *Night Thoughts* was reviewed and referred to with regularity in journals, excerpted in anthologies, and certain lines could be found quoted and adapted in a wide variety of texts, notably science writing but also sermons, philosophical treatises, histories, and literary criticism.

Although Eliot's essay was among the last significant scholarly opinions upon the text, there is evidence of occasional attempts to revive interest in Young's poem. For example, the religious family magazine *The Sunday at Home* published an article in 1888 bemoaning the fact that 'one of the most massive and majestic pieces of work' in the English language 'has now fallen into something more than mere obscurity and neglect'.[10] *The Sunday at Home* was published by the Religious Tract Society, who aimed their texts and magazines at 'all readers, for all prices', and sold the weekly magazine for a penny.[11] Thus this was an attempt to frame the poem as a worthy text to be read by the general public rather than reintroduce it in lofty academic or critical circles. Indeed, the poem's popularity among labouring class and self-educated readers may have been an important part of its continued popularity throughout the nineteenth century. As well as its continuing afterlife in magazines such as *The Sunday at Home*, one of the most notable self-educated *Night Thoughts* enthusiasts was Robert Burns, who often quoted his favourite lines from the poem:

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[9] George Eliot, 'Worldliness and Other-Worldliness: The Poet Young', *The Westminster Review*) (1857) 67.131, 1-42 (p. 19).
[10] Edwin Paxton Hood, 'Young's "Night Thoughts"', *The Sunday at Home: A Family Magazine for Sabbath Reading*, 1784 (1888), 421-424, (p. 421).
[11] Advertisement, 'The Religious Tract Society's List of Books: *For Presentation*', *Religious Tract Society Catalogue – 1889* (London: Religious Tract Society), p. 4.

'On reason build resolve! / That column of true majesty in man' in his letters and papers.[12]

In terms of more modern research on the poem, *Night Thoughts* enjoyed limited but sustained attention from around the middle of the twentieth century; although the interest was not nearly as effusive or regular as it was in the first century after the poem's publication, the poem was not quite forgotten in the critical world. Harold Forster's 1986 biography of Edward Young, and Stephen Cornford's 1989 edition of the *Night Thoughts*, the first such in 135 years, were both widely reviewed.[13] These two books constitute the most recent significant studies of Young and his work. Other articles on the poem since the mid-twentieth century show the breadth of interest which the poem excited. Daniel W. Odell's article in *Studies in English Literature 1500-1900* places *Night Thoughts* in conversation with Pope's *Essay on Man*, while Nelson F. Adkins' article in *Modern Language Notes* considers it in relation to Emerson's 1851 poem 'Days'.[14] There have been several books and articles on Blake's illustrations of the poem including 'Blake's "Night-Thoughts": Interpretations of Young' by Thomas Helmstadter and *William Blake's Designs for Edward Young's "Night Thoughts"* by David V. Erdman, John E. Grant et al. Cornford's edition of the poem and Forster's biography of Young, and *William Blake's Designs* each received multiple reviews.[15] Little has been written in recent

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[12] Robert Burns, *The Works of Robert Burns, With Life by Alan Cunningham, and Notes by Robert Burns, Lord Byron* [et al], ed. by Alan Cunningham (London: Thomas Tegg and Charles Daly, 1840), p. 81; p. 627; p. 668; p. 709; p. 763; p. 765.

[13] Edward Young, *Night Thoughts*, ed. by Stephen Cornford (Cambridge: Cambridge University Press, 1989); Harold Forster, *Edward Young: The Poet of the 'Night Thoughts'* (Norfolk: Erskine Press, 1968).

[14] Daniel W. Odell, 'Young's Night Thoughts as an Answer to Pope's Essay on Man', *Studies in English Literature 1500-1900*, 5.17 (1954), 47-54; Nelson F. Adkins, 'Emerson's "Days" and Edward Young', *Modern Language Notes*, 63.4 (1948), pp. 269-271.

[15] Thomas Helmstadter, 'Blake's "Night-Thoughts": Interpretations of Young', *Texas Studies in Language and Literature*, 12.1 (1970), 27-54; David V Erdman, John E. Grant, Edward J. Rose, Michael J Tolley. *William Blake's Designs for Edward Young's "Night Thoughts"* (Oxford: Clarendon Press, 1980); Harriet Guest, '*Night Thoughts* by Edward Young, Stephen Cornford', *The Review of English Studies*, 42.167 (1991), 443-444; James E May, 'Edward Young: The Poet of 'The Night-Thoughts', 1683-1765', *Eighteenth Century Studies*, 21.4 (1988), 518-521; Robert Halsband, Review of *William Blake's Designs for Edward Young's Night Thoughts: A Complete Edition* by David V. Erdman, John E. Grant, Edward J. Rose, Michael J. Tolley, Edward Young, *Modern Philology*, 80.2 (1982), 198-205.

decades, however, on its cultural influence upon the nineteenth century beyond poetry.

Light and dark in *Night Thoughts*

The appeal of *Night Thoughts* to a nineteenth century audience is understandable. Although Young's writing precedes the scientific discoveries that provoked Victorian anxieties about the universe and their place in it, he certainly provides an early glimpse of the angst and tropes of energy that can be seen in the writing of later poets who engage with questions of science, religion and religious doubt such as Tennyson and Hopkins. Many Victorian poets and science writers worked to find religious consolation in a universe where science threatened to preclude God's power. While *Night Thoughts* was written well in advance of these anxieties, the themes with which it grappled, and the language and imagery Young used, nonetheless resonated with nineteenth century anxieties. I argued in Chapter One that Hopkins, among other poets, used energetic tropes, imagery of light, heat and other forms of energy, to express concerns and anxieties relating to possibility of an eternal afterlife in a universe which conforms with the laws of thermodynamics. In Hopkins' poetry, imagery of energy and entropy helped to express Hopkins' anxieties and his suggestions for a solution to the quandary. While poetic use of light and darkness as a metaphor for God's presence or absence is trope with a very long tradition, and Young often uses light and dark imagery in the expected way, he also undermines this trope.[16] It is this subversion of usual energetic tropes which may have enabled the anxieties expressed by Young to be relatable to Victorian readers, albeit in a rather different context. An example of these tropes occurs early in the first 'Night':

Silence, and *Darkness!* solemn Sisters! Twins

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[16] Hugh Magennis, 'Imagery of Light in Old English Poetry: Traditions and Apparitions', *Anglia: Zeitschrift für englische Philologie,* 125.2 (2007), 181-204 (p. 181); a useful general survey of light and darkness in literature can be found in Folkert Degering and Susanne Bach, 'Introduction: Dark Nights, Bright Lights', in *Dark Nights, Bright Lights: Night, Darkness and Illumination in Literature*, ed. by Susanne Bach and Folkert Degering (Berlin/Boston: Walter de Gruyter GmBH, 2015), 1-15.

> From ancient *Night*, who nurse the tender Thought
> To *Reason*, and on reason build *Resolve*
> (That column of true Majesty in man!)
> Assist me: I will thank you in the Grave;
> The grave, your Kingdom: *There* this Frame shall fall
> A victim sacred to your dreary shrine:
> But what are Ye? *Thou*, who didst put to flight
> Primaeval *Silence*, when the Morning Stars
> Exulting, shouted o'er the rising Ball;
> O thou! Whose Word from solid *Darkness* struck
> That spark, the Sun; strike Wisdom from my soul;
> My soul which flies to thee, her trust, her Treasure;
> As misers to their Gold, while others rest.[17]

This verse paragraph from the early part of 'Night the First: The Complaint: or, Night-thoughts on Life, Death and Immortality' shows an ambivalent relationship with darkness, and immediately complicates the binary of divine light and comfort versus earthly darkness and pain. The metre provides a strong rhythm, but here, in a poem of time, death and insomnia, without rhyme, the iambs act to remind the reader of the relentless death-ward ticking of a clock. On the whole, 'Night the First' is overwhelmingly depressed and pessimistic about night, equating it with depression, a 'double night' in the second line of the verse paragraph which follows this one, but this section is more uncertain, and gives elements of night the potential for some redeeming qualities.[18]

Silence and darkness are emphasised as much as possible; they are the first words of the verse paragraph and they are italicised, made into proper nouns, and followed by an exclamation point. Silence and darkness are distinguished from night

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[17] Edward Young, 'Night the First: The Complaint: or, Night-Thoughts on Life, Death and Immortality', *Night Thoughts* ed. by Stephen Cornford (Cambridge: Cambridge University Press, 1989), ll: 28-41.
[18] Ibid., ll: 43.

– being 'twins from it' – which gives them the potential to escape from the connotations of death and despair with which night is associated, despite the fact that they are technically of it, as its children. However, rather than being the agents of night-time despair, they 'nurse the tender Thought', a surprisingly gentle action for two such emphatically introduced figures. Although Silence and Darkness are both conducive to 'reason' and 'resolve', they do not help the poet to remove himself from the night in which he is trapped, and his thoughts quickly return to death. Despite the benefits of some of Night's qualities, they ultimately act as limiters upon the speaker's ability to function both spiritually and mentally. Although the verse paragraph is ostensibly in praise of silence and darkness, the image Young conjures of being trapped eternally in reflective, meditative gratitude to Silence and Darkness is an oppressive one. The descent into death is emphasised by enjambment when the narrator predicts that his body 'shall fall / a victim', giving a visual sense of the weight of the corpse and the weight of earthly concerns such as reason and resolve. The heaviness of the sestet is lifted when the poet shifts his attention from his initial subjects, and instead addresses God; reason and resolve are leavened by faith and curiosity, breaking the spell of night-time with a question for God. At this point light is finally introduced, the first instance in the poem, bringing relief to the solemnity of the grave; Young's soul is permitted liberty from the body to which it had been pinned by silence and darkness, and it takes eager flight to God. This is the first glimmer of light in the poem, but rather than the relief and comfort that might be expected of a sunrise after unremitting night, the connotations of light are quite violent.

The relationship between light and darkness here is not a simple binary of darkness/light and corresponding pain/comfort. Young critiques the trope in religious poetry which comforts with the idea that shade is a relief or nurturing ground away from God's implacable glory; rather he fantasises about the light and heat of the act of creation itself, with the extravagance of one who has been starved of what he craves. This light and heat are not gentle. The word 'strike' is a peculiarly violent choice for an act of divine reunion, calling to mind both a physical impact and the striking of a fire. Further, the relief and release are struck off balance by an unflattering comparison to a miser – although the release from an earthly grave is a

relief, it is not necessarily a good thing. Throughout *Night Thoughts,* Young scorns those who wish to grow old and here the light represents in itself another kind of physical death; although this one leads to eternal life, being consumed by the divine spark is a welcome return to God after the trials and tragedies of mortal life. This violent, ungentle light and fire shows the extent to which despair permeates the poet's attitude; rather than seeking peace, he seems to simply crave a contrast or alternative to his current pain, regardless of what it might entail. 'Night the First' examines the issue of 'the Subduing of Our Fear of Death' from the point of view of someone who is in an immediate and fraught battle with the concept of their own mortality. The darkness which permeates this section is multi-layered: the metaphorical darkness of a night time of the soul, the literal darkness of the middle of the night, and the spiritual darkness of a world without God's love or presence. These three darknesses can be seen working simultaneously early in the poem. Although Young uses tropes of energy – powerful imagery of heat, light, and sound – to represent God and to relieve the night, at this point in the poem even the light of divinely summoned suns serve only to further depress the speaker.[19] *Night Thoughts* can thus be read in a way that provided fuel for contemporary Victorian concerns, and even seems to pre-emptively critique some Victorian poetic solutions to the question of energy and eternal life.

As well as resonating with Victorian concerns with mortality and the afterlife, though, Young also provides a solution, the 'Consolation' of the ninth and final Night. It of course does not provide any of the thermodynamic loopholes that can be seen in similar Victorian consolations, but it does engage with scientific language and tropes to achieve its aim:

> Tho' blind of heart, still open is thine Eye:
> Why such Magnificence in All thou seest?
> Of *Matter's* Grandeur, know, One End is This,

[19] John Powell Ward has written in detail on the topic of light and darkness in religion in 'Darkness and Light: Poetry, Religion and the Environment', *Scintilla*, 7 (2003), 73-86.

To tell the *Rational,* who gazes on it—
"Tho' *That* immensely Great, still Greater *He,*
"Whose breast, capacious, can embrace, and lodge,
"Unburden'd, Nature's Universal Scheme;
"Can grasp *Creation* with a *single* Thought;
Creation grasp; and not exclude its SIRE"—
To tell him farther—"It behoves him much
To *guard* the important, yet-depending, Fate
Of Being, brighter than a Thousand Suns:
One single Ray of *Thought* outshines them all."—
And if Man hears obedient, soon he'll soar
Superior Heights, and on his purple Wing,
His purple Wing bedropp'd with Eyes of Gold,
Rising, where *Thought* is *now* denied to rise,
Look down triumphant on these dazzling Spheres.[20]

For Young, consolation and true contentment can be found by simple submission to God's will. '*Matter's* Grandeur' has its place in helping humankind to find enlightenment, but ultimately religious faith is the only way to transcend to where God is, and '*Thought* is *now* denied to rise'.

The eponymous consolation of this 'Night' is that the questions about immortality, judgement day and the afterlife that have plagued the speaker throughout the poem can be allayed by faith, and offers various reassurance that Heaven can and will be accessed by the righteous. This passage provides encouragement to 'the blind of Heart', and a hope that even those concerned purely with the 'Magnificence' they see will find out its 'One End'. Where often *Night Thoughts* is fragmented, and the flow of the poem is broken with caesuras, asides and exclamations as the speaker is caught either in the throes of mortal misery or religious awe, the poem here is confident and assured. The verse paragraph opens

[20] Young, 'Night the Ninth', ll: 1984-2002.

with a question, but it is not a plaintive, rhetorical question like the 'What are ye?' of 'Night the First'. Instead, the question serves only to emphasise the assurance of the purpose of '*Material* Grandeur', as the answer comes back with such force.[21] Enjambment is rare, allowing each line to be self-contained and adding to the sense of composure. The only moments where the lines flow into each other are when the speaker is describing directly the possibilities and responsibilities of the future life, the point at which someone might 'soar / Superior Heights'. The regular iambic pentameter confidently carries the reader through the passage and above the 'dazzling spheres' without giving them a chance to stumble. The use of italicised and capitalised words serves to reinforce the rhythm; all the monosyllabic italicised words fall on the expected syllable for iambic metre to further enforce the sense of certainty.

Young's depiction of the night-time changes and develops over the course of the previous eight 'Nights', and by 'The Consolation', night has become a time for intellectual growth: 'Thus, *Darkness* aiding Intellectual Light / And Sacred *Silence* whispering Truths divine, and *Truths Divine* converting Pain to Peace'.[22] The complicated, tormented relationship that the speaker has with the 'Solemn Sisters' silence and darkness, has since transformed into one of acceptance, even reverence.[23] Throughout 'The Consolation', the night is associated with learning; each of those who have also experienced the sleepless contemplation that the speaker describes are called a 'student of the night' and the night-time is called a 'school' and, twice, 'intellectual'.[24] Thus it is significant to note that in the passage quoted above, which is concerned with what knowledge of '*Matter's* Grandeur' can provide, darkness is conspicuously absent, and instead the 'dazzling' light of faith in the 'Fate of Being' 'outshines' any cerebral, earthly endeavours. Knowledge gleaned in the night time can help one understand creation, but, this passage suggests, material understanding is simply a means to a relationship with God and ultimately irrelevant in the face of

[21] Young, 'Night the First', ll: 35.
[22] Young, 'Night the Ninth', ll:2411-2413
[23] Young, 'Night the First' ll: 28.
[24] Young, 'Night the Ninth'. ll:645; 651; 720; 2411.

divine light. God or a desire for closeness to God is often accompanied in *Night Thoughts* with an overabundance of light, but here, despite the exceeding brightness of the light described of the 'Fate Of Being, brighter than a Thousand Suns: / One single Ray of *Thought* outshines them all'. 'The Consolation' provides Victorian readers with an authoritative, energetic reassurance that God's plan has allowed for all the permutations of 'Nature's Universal Scheme'. No attempt to reconcile scientific discovery with religious faith is made because, for Young, none is required.

Reception

The afterlife of *Night Thoughts* is a long one; although the poem suffered a dip in popularity towards the end of the nineteenth century and entirely disappeared from general awareness over the latter half of the twentieth century, it has never been completely forgotten. The accepted narrative of the poem's history, as described by Stephen Cornford, Harriet Guest and Robert Halsband, among others, suggests that George Eliot's disparaging 1857 essay 'Worldliness and Otherworldliness' constituted what Stephen Brown calls 'the death knell for the fortunes of *Night Thoughts*'.[25] Eliot's charge of 'radical insincerity', which seems to be the most damning charge against the poem for mid-Victorian readers, may have been representative of a general trend in sensibility among the Victorian readership.[26] Readers drew away from Young's sublime, 'neoclassical religious voice' and towards realism and a different kind of authenticity from that which *Night Thoughts* supplied.[27] Rather than some signal to abandon the poem, almost instantly obeyed, which seems to be what some critics such as Cornford and Brown imply, 'Worldliness' came towards the beginning of, and was a significant part but not necessarily the cause of, a much slower and less complete decline than might be supposed.

[25] Brown, 'Review: Night Thoughts', p. 580.
[26] Eliot, p. 239.
[27] Cornford, p. 22.

As I have indicated, *Night Thoughts* was generally highly praised during its first century in print, and accepted as an important, powerful and highly moral poem. It was praised by influential contemporaries such as Alexander Pope and Samuel Johnson, as well as later readers such as Edward Bulwer-Lytton and Robert Burns, echoed by poets such as Wordsworth and cited in the nineteenth century across a wide variety of genres, from poetry to history to popular science. The poem found an eminent place in the early Victorian mindset as a poem of high religious and moral value, despite a general impression that the whole was rarely read; George Eliot expressed doubt that many people read more than the first three books, and many readers may have known *Night Thoughts* via selections in anthologies. Only a handful of fragments of the poem circulated widely, in some cases becoming entirely divorced from the poem itself. Certain lines often took on the tone of epigrams or proverbs, such as 'Procrastination is the thief of time', 'Men think all men mortal but themselves', and 'an *undevout* astronomer is *mad*', to name a few. These quotations can be found in a wide variety of nineteenth century texts, such as sermons, science writing, and books of quotations.[28]

The general, if not always well-researched, acceptance of the status of *Night Thoughts* as a great work of theological weight and moral height meant that it became a symbol for which other writer could reach to display their own credentials. For some writers, this was simply a reaching for literary or theological authority, demonstrating both that the author is sufficiently well-read to quote Young, and that their own work can be connected to a respected text, thus borrowing some of the poem's light. Sections of *Night Thoughts* were particularly often used in science writing, where they bore a particular significance. For example, the line 'an *undevout* astronomer is *mad*',[29] was especially popular in astronomy textbooks, where it was generally used as shorthand to show that the writer believed in a non-combative or

[28] Charles Kingsley, 'Thou Art Worthy', *All Saints Day and Other Sermons* (London: Macmillan and Co., 1895), p. 145; James Ferguson, *Astronomy, Explained Upon Sir Isaac Newton's Principles: with Notes and Supplementary Chapters by David Brewster* (2nd edition, Edinburgh: Stirling & Slade, 1821), p. vi; Vicesemus Knox, *Elegant Extracts in Poetry: Selected for the Improvement of Young Persons* (London: S. Hamilton, 1816), pp. 104-144.
[29] Edward Young, 'Night The Ninth' ll: 773.

intertwined relationship between astronomy and religion, although the precise construction of this relationship varied from text to text.

There is a sense among nineteenth century references to *Night Thoughts* that the poem had become something of a metonym for highly moral devotional poetry, and was accepted as such without many fresh readings to confirm its reputation. George Eliot refers to the poem as something 'every one knows', and suggests that readers might only have read the first three sections which give an impression of 'genuine sublimity and genuine sadness' that causes 'too favourable a judgement of them as a whole'.[30] Three decades into the poem's lull in popularity, the religious family magazine *The Sunday at Home* published an article reminding readers of a certain age about the poem, describing it as having been, a few decades previously, 'a favourite in all serious circles, and an index for most frequent quotation in the pulpit'.[31] The article acknowledged that it was a poem of which key passages might have been recognised, but not necessarily read, by the lower middle and working class evangelical Christians which constituted the audience of *The Sunday At Home*, listing a few potentially familiar phrases.[32] In 1854, a new edition of *Night Thoughts* was published, and in the wake of this a writer in The *Eclectic Review* described the poem as 'much more frequently named than read'.[33] At nearly 10, 000 lines long, the sheer length of the poem offers one reason why only fragments of the whole reached mass popularity, and being over-long was one of the main complaints levelled at it throughout its published life. In 1828, John Wilson playfully described *Night Thoughts* as 'a Poem which will always be read by thoughtful people who have but few books, are poor, and live in the country'.[34] Even those who wholeheartedly believed in the worth of the poem, such as Young's anonymous biographer in the 1866 collection of his works, were forced to admit, albeit with characteristic tact on the biographer's part, that 'the excellence of this work is not exactness, but

[30] Eliot, 'Worldliness', pp. 3; 25.
[31] Paxton, 'Young's "Night Thoughts"', p. 421.
[32] Ibid., p. 424.
[33] Unsigned article, 'Young's Night Thoughts', *The Eclectic Review* (1854) 7 pp. 237-238 (p. 237).
[34] John Wilson, 'The Man of Ton. A Satire', *Blackwood's Edinburgh Magazine* (1828) 23.140 (p. 836).

copiousness'.[35] With this in mind, then, the frequency with which *Night Thoughts* was reissued until the 1880s is surprising, although the rate of new editions did slow after the middle of the nineteenth century.

One of the best-known readings of *Night Thoughts is* George Eliot's essay 'Worldliness and Other-worldliness'. The article appeared in the *Westminster Review* in 1857, though what prompted it, aside perhaps from the continual reissuing of *Night Thoughts,* is uncertain. There does not seem to be any commentary on what occasioned the article, either from Eliot, her contemporaries, or modern scholarship. However, differences in Eliot and Young's stylistic and theological sensibilities may certainly explain her general antipathy towards the poem, if not her exact rationale for writing the article. In terms of theological differences, Eliot's religious background was one of youthful evangelism, followed by a move towards secularism from around the time she wrote 'Worldliness'.[36] This shift in her faith matches Eliot's account of enjoying the poem in her youth, when her 'predilections and enthusiasm' better matched those of *Night Thoughts*, and then her more critical, if not cynical, view of the poem that she displays in 'Worldliness'.[37] Eliot summarises Young as a fairly mercenary man, and reflects upon him from her viewpoint as someone who once loved his poetry but later become disillusioned about it. She implies that Young began his clerical career only because he had failed to make any money by seeking patronage, choosing the church in his fifties as 'the second-best means of rising in the world'. Having thus called into doubt the characterisation of Young as an 'ornament to religion and morality',[38] Eliot declares that this is symptomatic of Young's '*radical insincerity as a poetic artist*'.[39] She highlights similarities in language between his poems in praise of prospective patrons, and those in praise of God. While she does find in *Night Thoughts* a brief 'outburst of

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[35] *The Complete Poetical Works of Edward Young. With Life,* (Edinburgh: Gall and Inglis, 1866), p. viii.
[36] Simon During, 'George Eliot and Secularism', *A Companion to George Eliot,* ed. by Amanda Anderson and Harry E. Shaw (Chichester: John Wiley and Sons, 2013), 428-441 (p. 433).
[37] Eliot, 'Worldliness', p. 19.
[38] Croft, Herbert and Johnson, 'The Life of Doctor Young', *Night Thoughts, and a Paraphrase on the Book of Job: With the Life of the Author* (London: The Chiswick Press,1812), i-lxvi, p. ix.
[39] Eliot, 'Worldliness', p. 26.

genius'[40] in the first three sections, she deems the final two thirds of the book grandiloquent and inauthentic.

Few of Eliot's criticisms of the poem are without basis, and generally echo those levelled *Night Thoughts* since its first publication – that it is overlong, overblown and occasionally tips from the sublime to the ludicrous with the weight of its own emotion. However, the charge of insincerity, which is the most influential criticism which Eliot makes of the poem, is one unique to the nineteenth century and representative of new ways of understanding non-fiction writing. Patricia Ball's history of 'sincerity' as a critical term, which Stephen Cornford echoes in his introduction to *Night Thoughts*, reveals the crux of the disjuncture between Eliot's accusation of 'radical insincerity' and Young's claim to emotional authenticity – that the 'occasion' related in his moral and religious poem was '*Real*, not *Fictitious*'.[41] According to Ball's summary of sincerity, prior to the nineteenth century the concept was mostly applied to demonstrate 'purity of belief, genuine doctrine, freedom from theological duplicity', which is indeed what Young seems to at least attempt to show in *Night Thoughts,* and is what the poem was largely lauded for.[42] However, the 'radical insincerity' which Eliot detects is the lack of a different, Victorian sincerity, which conflates 'man and artist' and sees richly and truly felt emotion as the main object and mark of quality of poetry.[43] It is therefore easy to see both why nineteenth century readers enjoyed what appears to be the heartfelt poetic and religious outpourings of a man at his most vulnerable, and why Eliot cannot equate this poetic persona with the mercenary man she judges Young to be, thus condemning him and his greatest work with the grave charge of insincerity.

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[40] Ibid., p. 25.
[41] Eliot, 'Worldliness', p. 26; Young, *Night Thoughts,* p. 35.
[42] Patricia M Ball, 'Sincerity: The Rise and Fall of a Critical Term', *The Modern Language Review*, 59.1 (1964), 1-11 (p. 1); a useful counterpoint to Ball's study of Victorian sincerity is Isabel Rivers' examination of eighteenth-century 'enthusiasm': Isabel Rivers, *Reason, Grace and Sentiment: A study of the Language of Religion and Ethics in England, 1660-1780. Vol II: Shaftesbury to Hume* (Cambridge: Cambridge University Press, 2000).
[43] Ibid., p. 2.

Although Eliot's opinion does seem to have caught the prevailing mood with regard to Young's poetry, it did not go completely unchallenged. The author, journalist and religious nonconformist Edwin Paxton Hood's article on *Night Thoughts* in *The Sunday at Home* alludes to 'Worldliness and Other-Worldliness', though not by name, stating that 'Some recent critics, especially one whom we need not mention, have treated this whole poem as a piece of mere unreality, and this is most unjust'.[44] He sees Young's late joining of the clergy, not as hypocritical and financially motivated as Eliot does, but as evidence of personal development; that he saw 'enough of folly and worldliness' in his early life to seek refuge from it in the church.[45] Another defence of Young's sincerity comes from his anonymous biographer in an 1866 collection of his works, who gently reminds the reader that although the poem is manifestly not the faithful autobiography many readers assumed it to be, it is 'the poet's office to create, not to copy'.[46] Thus, although Eliot's condemnation of the poem was undoubtedly influential, and contributed to its slow drop from the public view, it was by no means the last word on the poem in the nineteenth century.

Night Thoughts in the Plurality Debate

In science writing, Young and *Night Thoughts* were frequently quoted, both in attributed and unattributed quotations, throughout the first half of the nineteenth century. One of the most significant scientific discourses into which *Night Thoughts* was brought was William Whewell and David Brewster's debate on cosmic plurality, discussed in Chaper Three. This debate was much discussed at the time and a core part of each man's argument was his own relationship with religion, so *Night Thoughts,* with its reputation for spiritual and moral content, formed a key part of the battle ground on which they fought over the possibility and implications of life on other planets. Both Whewell and Brewster used the poem for their own ends, but

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[44] Edwin Paxton Hood, 'Young's "Night Thoughts"', *The Sunday at Home: A Family Magazine for Sabbath Reading*, 1784 (1888), 421-424 (p. 422).
[45] Ibid., p. 423
[46] *The Complete Poetical Works of Edward Young. With Life* (Edinburgh: Gall and Inglis, 1866), p. xvi.

took different parts of the poem and drew different conclusions from them. Young's use of celestial imagery, and his strongly religious themes, means that his poem is well suited to the discussion of cosmic plurality, a predisposition further emphasised by Whewell and Brewster's own motivations and agendas.

Young, typically of his time, supports pluralism; Crowe notes that 'whereas other pluralists of the period usually eschew the delicate dilemmas raised by pluralism for Christianity, Young commits himself'.[47] Despite Young's pluralist allegiances, it is Whewell who quotes from *Night Thoughts* more frequently than Brewster, using both attributed and unattributed passages. The epigraph to the US edition of Whewell's *Plurality of Worlds* is an extract from *Night Thoughts.* The selected passage asks the question, 'How shall man's curious spirit not inquire / What are the natives […] / of this distant, unterrestrial sphere, / Where mortal, untranslated, never strayed?'.[48] This quotation alone suggests an assumption of cosmic plurality from Young, and is characteristic of Whewell's use of pluralist sources to promote the idea of cosmic unity. By using an attributed quotation from a highly recognisable poem, considered a watchword for morality and piety for his epigraph, Whewell creates an expectation that his work will address the question of plurality of worlds in a similarly religious way, despite having very different opinions from those Young expresses in his poem. Thus Whewell exploits the reputation of *Night Thoughts* as established, traditional and highly moral to support or at least soften opinion towards his own unorthodox point of view. The use of the poem gives a sense of legitimacy to the originally anonymous author of *Plurality*; information on the book's authorship may have been limited, but the reader could be assured that he was familiar with the canon of religious poetry.

Whewell also uses *Night Thoughts* as a source for the history of science. When asserting that 'Stars may have been created when Man was created, and yet their light may not have reached him', he first reaches for a scientific source, mentioning

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[47] Crowe, *Extraterrestrial Life Debate*, p. 84.
[48] William Whewell, *Of the Plurality of Worlds: An Essay* (1st US edition, Boston: Gould and Lincoln, 1854), epigraph.

William Herschel's thoughts on the nature of light, but also provides, in a footnote, a few lines from Young.[49] The point of the footnote, according to Whewell, is to illustrate that the idea of starlight not reaching early man is not a modern one, but gives Young's report that 'the sage' says it is 'not absurd / To doubt if beams, set out at nature's birth / Are yet arrived at this so foreign world'.[50] It is odd that Whewell chooses a poet rather than an historian or an historical source to back up this assertion. One explanation is that, once again, he is using *Night Thoughts a*s a symbol for intense religious feeling, in order to contrast with and complement Herschel's relatively secular factual observations, with historical assertion associated with trustworthy piety.

Indeed, throughout the text, Whewell uses *Night Thoughts* as a means to reassert his construction of the relationship between science and religion. Despite Whewell's apparent distaste for the use of poetry and poetic language in scientific contexts, he tends to treat the extracts from *Night Thoughts* which he includes in *Plurality* as a significant source of knowledge on a par with his own work, reaching the same heights of religious devotion through poetry as Whewell seems to find in scientifically examining the universe. Whewell only once recognises *Night Thoughts* as a poem rather than as a sort of treatise which complements his own, when he uses the passage, 'Each of these stars is a religious house; / I saw their altars smoke, their incense rise, / And heard hosannas ring through every sphere.'[51] Even when acknowledging *Night Thoughts* as a poem, comparing Young to Shakespeare and judging him 'no less imaginative than the poet of that midsummer night's dream, which we have in the *Merchant of Venice*', Whewell seems to see Young's poetry as an aid to his own religious and scientific work.[52]

It is when quoting Young's assertion that 'Each of these stars is a religious house' that Whewell, a consummate natural theologian, notes that poetic 'thoughts

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[49] William Whewell, *Of the Plurality of Worlds: An Essay* (4th edition, London: John W. Parker and Son, 1855), p. 109.
[50] Ibid., p. 109.
[51] Ibid., p. 360.
[52] Ibid.

still prove the religious nature of man: they show how he is impelled to endeavour to elevate his mind to God by every part of the universe'.[53] This admission of a use for poetry shows that he holds Young in great esteem, to use him as an example of the 'endeavour to elevate his mind to God' – the same endeavour which Whewell himself undertakes. However, the association with poetry happens, crucially, when Young is using language that could imply that he thinks other planets might be inhabited. The image of a 'religious house' could easily be a metaphorical house, where the only inhabitant is faith, but equally it could be a church, convent or monastery, filled with extraterrestrial worshippers. It is therefore significant that it is at this point where *Night Thoughts* ceases to be a reliable source but is instead relegated to the realm of imagination and fantasy. Although Whewell and Young appear to differ on their view of extraterrestrial habitation, a distinctive characteristic of *Plurality* is Whewell's use and manipulation of traditional ideas or literature to strengthen his own more marginal opinions. Young is used in *Plurality* in an appeal to the traditional and to show how close-knit science and religion are in the area of astronomy in particular.

Whewell's antagonist Brewster uses *Night Thoughts* less frequently, which is perhaps surprising given that his style is generally more poetic than Whewell's, his attitude to poetry more charitable, and, while Whewell sees a divide between science and religion which must be reconciled, Brewster makes no such distinction between the two. Like Whewell, he uses the passage beginning with the line 'Each of these stars is a religious house', but he quotes much more extensively, using seven full lines of poetry:

> Each of these stars is a religious house;
> I saw their altar smoke, their incense rise,
> And heard hosannahs ring through every sphere.
> The great Proprietor's all-bounteous hand
> Leaves nothing waste, but sows these fiery fields

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[53] Ibid.

> With seeds of reason, which to virtues rise
> Beneath his genial ray.[54]

Whewell uses only the early part of this passage, which focuses on the house and the smoke, and does not necessarily suppose inhabitants. Altar smoke, suggesting sacrificial fires, could mean that stars are in themselves simply fires in praise of God, which gives them a specific purpose separate from that of maintaining life. Brewster meanwhile allows the sentence to complete, revealing that which Whewell obscured. The passage comes as the last word in a chapter, and in direct response to Whewell, using his own quotation against him. Thus the longer quotation gives Brewster something of a moral high ground, allowing readers to see the full quotation rather than Whewell's more selective one. The second half of the passage deals with the idea of waste, a key part of plurality; if God 'leaves nothing waste' then, for Brewster at least, every celestial body must serve the purpose of maintaining life. For Whewell, explaining why the vastness of space can be empty but for humankind and yet not a waste is a challenge which he pursues throughout the treatise.

'An undevout astronomer is mad'

The phrase 'An undevout astronomer is mad'[55] apparently captivated astronomy writers of the mid-nineteenth century. The line comes towards the middle of the ninth and final Night, at a climactic moment in a particularly long and passionate verse paragraph which exalts the night as a time when man has greater access to God. In its original context, 'An *undevout* Astronomer is *mad*' because anyone who witnesses space cannot fail to be moved to religious awe:

> Bright Legions swarm unseen, and sing, unheard
> By mortal Ear, the glorious Architect,
> In This His universal Temple, hung

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[54] David Brewster, *More Worlds than One* (London: J. Murray, 1854), p. 229.
[55] Young, 'Night the Ninth', ll: 773.

> With Lustres, with innumerable Lights,
> That shed Religion on the soul: At once,
> The *Temple,* and the *Preacher!* O how loud
> It calls Devotion? genuine Growth of *Night!*
> *Devotion!* Daughter of Astronomy!
> An *undevout* Astronomer is *mad.*[56]

This passage associates space with religious awe; throughout the poem and particularly this 'Night', Young describes space and celestial bodies in terms of churches and other places of worship.[57] This description, which makes the entire universe a temple, is one of the most effusive and expansive of such images. Religion and starlight are equated with one another – 'innumerable Lights', seemingly at once stars and the angelic, invisible 'Bright Legions', 'shed religion on the soul' even as they cast light upon the body, making the former seem as inevitable and commonplace as the latter.

The passage is rapturous in tone, emphasised by the liberal use of commas and other punctuation which gives an effect of breathlessness, as though one must pause at least once in every line to gasp anew at the divine glory of space. The peak of the passage comes in the three lines before the iconic final one: 'At once, / The *Temple*, and the *Preacher!* Oh how loud / it calls Devotion? genuine Growth of *Night! / Devotion!* Daughter of Astronomy!'. The exclamations, italics and fragmented sentences make the lines fervent and ecstatic. The choice to make devotion the daughter of astronomy, to have faith be born from science, is a reversal of the more common relationship between science and faith described by science writer, many of whom, such as Whewell, style themselves as researching the cosmos in order to better understand God's creation.[58] While for these science writers scientific interest comes from devotion, for Young the causality is apparently reversed. This is perhaps illustrative of the different roles of scientist and poet; for scientists, particularly in the

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[56] Young, 'Night the Ninth', ll:761-773.
[57] Young, 'Night the Third', ll:1881; 'Night the Ninth', ll:770; 932; 1350.
[58] Whewell, *Plurality*, p. vi.

nineteenth century, declaring a religious interest which inspired their scientific one was a common tactic in deflecting accusations of being ungodly or undermining accepted religious truths.[59] However, for Young, in addition to writing before the explosion of the science and religion debate, the fact that he was writing religious poetry means there is no such pressure. Thus astronomy as a science is in this passage simply a device for underlining the inherent divinity of the cosmos – the universe is at once space, 'Temple' – creation – and 'Preacher' – creator. After these climactic expressions of devotion, the final line, 'An *undevout* Astronomer is *mad*.' is striking in its simplicity. The fact that it is a single line sentence, with none of the fervour of the preceding lines, gives it a stronger impact than if it had been another exclamation. Further, it moves away from the imaginary or the unseen; the invisible lights and unheard, all-reaching songs of devotion, and resolves the paradoxical, shifting images into a simple declarative statement; a quiet epiphany after a moment of religious rapture. This unusual succinctness makes it one of the most memorable lines within *Night Thoughts*, as well as making it easy to remember and quote, which is perhaps one part of why this particular line is one of those quoted most frequently from the poem.

Direct quotations of or allusions to this line, attributed to Young or not, appeared frequently in astronomy textbooks – though the appeal of the line was by no means limited to this single topic. It appeared in an extremely wide range of texts. It was an example sentence in *Outlines of English Grammar* (1887), where the line is pulled into its constituent parts to demonstrate its mechanical workings: 'Undevout is an adjective, qualifying, positive; qualifies astronomer, attributive. Mad is an adjective, qualifying, positive. Predicative to is'.[60] Meanwhile, in the *Quarterly Journal of Agriculture (*1834), William Hawkins remembers the line in an article devising a pedagogy for the working classes.[61] Sentiments to the effect of 'if an undevout astronomer is mad, then what about an undevout [member of another

[59] Alice Jenkins, *Space and the 'March of Mind'* (Oxford: Oxford University Press, 2007), pp. 47-48.
[60] William George Williams, *Outlines of English Grammar* (Ohio: Aldine Printing Works, 1887), p. 56.
[61] William Hawkins, 'On the Education of the labouring Class', *Quarterly Journal of Agriculture*, 4 (1834), 443-456 (p. 450).

profession]?' were common, applied to subjects as diverse as geology, anatomy, philosophy and history.[62] When applied to other sciences, the line was used to draw attention to the potential divinity to be found in branches other than astronomy. Those emphasising the humanities used it for its literary merit, reaching for a well-known literary quotation in order to emphasise the writer's own familiarity with the canon of the time, and again to move into a discussion of the moral and religious worth of the philosopher or historian's endeavours. This variety of uses shows the degree of cultural saturation which the poem achieved, this line in particular; it always appears in a moment at which a writer wishes to give their topic theological or moral heft, regardless of the subject at hand. However, astronomical texts continued to make by far the most use of the line.

Astronomical titles which used this phrase include *Young Ladies' Astronomy* (1825)*; A Compendium of Astronomy* (1832); *First Book in Astronomy, Adapted to the Use of Common Schools* (1844); and *The World: Or, First Lessons in Astronomy and Geology* (1848).[63] Although instances of the quotation vary in terms of audience, style, and context, nearly all of the texts which use the line present astronomy for general readers or for beginners. Undoubtedly there are as many reasons for the quotation's inclusion in each book as there are books which use it, but the fact that they are generally popular or introductory suggests that one reason may be to do with the role of *Night Thoughts* as a kind of cultural touchstone. Readers may be new to astronomy, but they are assumed to have at least heard either of Young's *Night Thoughts,* or of this relatively well-used quotation, which gives a cultural starting

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[62] A undevout *Astronomer* is mad!' said our moral poet [. …] Had he lived to our days […] he might have said […] 'an undevout *Geologist* is mad!'': Granville Penn, *A Comparative Estimate of the Mineral and Mosaical Geologies, vol I* (James Duncan: London, 1825), p.120; 'Doctor Young was right, an undevout astronomer *is* mad. *But what shall we say to an undevout anatomist?*': William Hawkins, 'On the education of the Labouring Class', *The Quarterly Journal of Agriculture*, 4 (1834), 443-457, p. 450; ''An undevout astronomer is mad, and an undevout philosopher may justly be styled either a madman or a fool': M.A Stodart, *Hints on Reading: Addressed to a Young Lady,* (Seely and Burnside: London, 1834), p. 38; 'If an undevout astronomer is mad, then what shall be said of an undevout historian?': James Hough, *A History of Christianity in India* (Seely and Burnside: London, 1839), p. 22.

[63] M.R. Bartlett, *Young Ladies Astronomy* (Utica: Colwell and Wilson, 1825), p. 6.; John Lauris Blake, *First Book in Astronomy: Adapted to Use in Common Schools* (Boston: Gould, Keldall and Lincoln) p. iv; Harold Lanphere Smith, *The World: Or, First Lessons in Astronomy and Geology, in connection with the present and past condition of our globe* (Cleveland: M.C. Younglove & Co., 1848), p. vi.

point for the scientific elements of the text. Alternatively, if the audience cannot be expected to recognise it, then the inclusion of the line, when properly attributed, can act as a supplement to the reader's education, an exposure to well-known and acceptably highbrow poetry. While in some cases, such as *Astronomy, for the Million …. by an Observer in Sussex* (1861), the 'undevout astronomer' line is simply an epigraph,[64] more extended consideration of the quotation is more common.

For some texts, depending upon whether they are of a primarily scientific or religious bent, Young's line acts to bring religion and science back together if they threaten to stray too far from one another; others use it to establish that both must be considered together. For example, in *Ecce Coelum, or Parish Astronomy, in Six Letters* (1870), the quotation is used in the first section of the first chapter, which focuses on the divinely awesome state of the universe. Unattributed and described as an 'ancient sentiment', the line is followed by the assertion that if one can observe 'the star-sown fields of astronomy and no*t conceive a feeling* of religious awe […] he must be a rare man, a sinner above all the Galileans'.[65] Thus here it acts to set the tone for a text which seeks to assert the holiness of science before it embarks upon its practicalities, lending it what the author terms 'ancient' wisdom.

'An undevout astronomer is mad' is often used as shorthand for the importance of recognising and maintaining a relationship between science and religion, the tone of which can vary from a mild warning to a threat; *The World* uses 'an undevout astronomer is mad' in the early part of the preface after asserting that 'true philosophy and religion go hand in hand'.[66] More dire in tone is the use of the line in American astronomer O. M Mitchell's 1863 book *The Astronomy of the Bible,* an extract of which containing the quotation from Young was printed in England as the article 'Philosophy not Sceptical' in *The Astronomical Register: A Medium of Communication for Amateur Astronomers* (1872). Mitchell introduces, with great

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[64] Anonymous, *Astronomy for the Million. Stargazing: Or, Seeing is Believing, by an Observer in Sussex* (London: John Smith, 1861), Epigraph.
[65] Enoch Fitch Burr, *Ecce Coelum, or Parish Astronomy, in Six Letters* (Boston: Nichols and Noyes, 1870), p. 15.
[66] Smith, *The World*, p. iv.

disapproval, the concept that 'There are, doubtless, philosophers and astronomers who in their mathematical and astronomical investigations leave out of the great problem of nature the existence of God'.[67] He describes the greatly restricted view of the universe that comes as a result of practising science without including space for God.

The slippery slope of faithless science from some relatively innocuous effects to total catastrophe is shown through a paragraph which turns upon the assertion that 'The undevout astronomer is mad'. The first action in excluding God from science is shown in a concise, calm sentence: 'For the lawgiver we may substitute the laws', but this quickly builds to a long and complex sentence using apocalyptic language to demonstrate the potentially dire consequences of excluding God from science:

> The sun himself may be shorn of his effulgence: his light, and heat, and life may shrink and fade beneath the withering breath of philosophy, and this mighty and glorious orb become a material heavy point, and all the revolving planets and their moons other material heavy points, at definite distances and with determinate weights, and this the will of God, as manifested in His laws, and the very creations of God as exhibited in his suns, and systems, and moving worlds, become the mere hypotheses and material points in the diagram of the mathematician's slate,--and what then?[68]

Mitchell uses a device in this passage perhaps more familiar in poetry, most famously *In Memoriam*.[69] Similarly to the stars that that are doomed to 'blindly run'[70] and eventually die without divine guidance, Mitchell's idea of a universe without God is one which becomes physically as well as spiritually lacking. For

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[67] OM Mitchell, 'Philosophy Not Sceptical', *The Astronomical Register: A Medium of Communication for Amateur Observers*, 9-10 (1862), 295-296 (p. 295).
[68] Ibid.
[69] Gold discusses the significance of shared metaphors, using *In Memoriam* as a specific example, in *ThermoPoetics*, pp.15-16.
[70] Alfred Tennyson, *In Memoriam* (2nd Edition, London: W.W. Norton, 2004), ed. by Robert Hill Jr., section III, ll:5.

Mitchell, all the positive qualities of the sun – its 'light, heat and life' are dependent upon God having imbued these things; to remove God is to remove these attributes. Having established the folly of removing God from scientific thinking, Mitchell then slowly reintroduces Him, showing the power of God in the universe regardless of how some scientists treat Him, and completes this rhetorical reintroduction of God to the universe with the comment 'It has been truly sung: 'the undevout Astronomer is mad'. This structure is unusual for writers quoting Young. Where the majority of the writers who use line 773 do so to open discussion of the topic of religious and scientific compatibility, Mitchell's use of the quotation echoes more closely the use of the line within *Night Thoughts* itself, using it as a kind of grounding device to conclude a string of hectic and alarming images. This is in some ways perhaps a more confident use of the line: rather than using it immediately, he presents it in the midst of his argument, which shows less of a reliance upon it as a device to indicate authority, and highlights its use as a means to show the necessity of maintaining a connection between science and religion.

Conclusion

In this chapter, I took a different view to the conversation model than in other chapters. Rather than tracing discussion between contemporaneous texts, as in Chapter Three and Chapter One, here I consider *Night Thoughts* not as a participant in the conversation, but as a topic of discussion. I argued that its extended popularity as a devotional text meant that it became a symbol for intense piety and moral feeling over the nineteenth century. Despite a turn against the poem in higher literary circles around the middle of the century, the poem, or at least fragments of it, remained within the public consciousness for decades. One of the most notable things about its use in the nineteenth century was its ongoing use in popular science writing, where it was used as a suitably respectable and religious example of a necessarily amicable relationship between science and religion. Using *Night Thoughts* in science writing in general became a signal that the writers themselves, though science writers, were religiously devout and well-read, and the use in particular of the line 'an undevout astronomer is mad' was an indication that they were generally of the opinion that,

despite a potential perceived ‘conflict’ between science and religion, the writers felt that the two were inseparable.

Science in the Eschatological Epic

Introduction

In previous chapters, I have discussed poetry which dealt with the theological implications of scientific discoveries; three scientific treatises which used scientific arguments to consider ultimately theological questions; and one long poem whose reputation for being profoundly devotional granted it an extended nineteenth century afterlife in Victorian science writing. Now, I will turn my attention to scientific allusion in a genre I term eschatological epic, by which I mean devotional long-form poetry which considers in some capacity death, judgement, and the ultimate fate of humanity. This chapter will analyse two poems from this genre in terms of their use of scientific imagery and language. I will argue that eschatological epic provided an important discursive space to consider the ways in which religion and science could interrelate, and to synthesise a cohesive world view in which God and science each have a space. In earlier chapters I have considered poetry as an influencing force in the conversation model, used by science writers as a device to render more compatible scientific and religious points of view or as a means to otherwise make the arguments of science writers more, or in the case of Maxwell and Tyndall, less, palatable. In this chapter, I examine the other side of the conversation; religious poetry by non-scientists who integrate the latest discoveries into their world view.

I focus upon two eschatological epics in particular. One, *Yesterday, Today and Forever*, by Edward Henry Bickersteth, is a guided journey through the afterlife, in which a recently deceased man of religion, the Seer, is taken by his guardian angel, Oriel, to his final resting place. Through this journey, Oriel narrates to the Seer a spiritual history of the universe and the battle between God and Satan, from creation to the present day. The Seer visits each part of the future life, and is eventually deposited in Heaven until the Bridal of the Lamb signals the coming of Judgement Day and the Seer is finally granted access to the Heaven of Heavens, the House of Many Mansions, to live on in eternal peace with his family. The other epic, *Festus*,

by Philip James Bailey is a retelling of the Faust myth that expands from the traditional tale to encompass the apocalypse and judgement day. Lucifer's attempts to corrupt Festus involves a series of explorations of the universe and future life, mostly while Festus is still alive, unlike the Seer who only had access to this journey after death. Festus' guide is Lucifer as often as it is Festus' guardian angel, Luniel. The poem went through multiple revisions over an extended publication history. In early versions, judgement day results in the punishment of the wicked, including Lucifer, and Festus' redemption, and its eschatology broadly conforms with the Church of England position on the four last things. However, by the poem's fiftieth-anniversary edition in 1889, the poem had quintupled in length, its religious affiliations had become Universalist, and judgement day resulted in universal salvation, even for Lucifer.

Despite their profound differences in denominational and eschatological standpoints, *Festus* and *Yesterday* share some similarities which allow them to be read together here. Both poems enjoyed reasonably high readerships, but received mixed reviews from nineteenth century reviewers and very limited attention from modern scholarship. Both share similarities in their plot, to be expected from eschatological epics. Neither Bickersteth nor Bailey had a scientific background to speak of, but both included detailed references and allusions to contemporary astronomy and geology among other sciences. While the conclusions, cosmologies and eschatologies of the poems differ, they share a number of significant plot points and have the same central themes: apocalypse, salvation and the battle between God and Lucifer.

I have selected these two poems in particular for several reasons. First and foremost, both *Festus* and *Yesterday* deal explicitly with science and scientists, albeit in very different ways. Bickersteth bases his descriptions of creation and of the afterlife upon contemporary scientific theories, such as ether and the behaviour of light. Each of his allusions, to scientific works, other poems, and religious treatises, are carefully recorded and justified in extensive footnotes. Despite some unusual modifications to the creation myth and some potentially Millenarian leanings indicated in the poem, the eschatology expressed by Bickersteth, whose fifty-two-

year career in the Church of England culminated in being made Bishop of Exeter, is largely in line with the Anglican eschatology. Geology, astronomy and allusions to contemporary scientific discoveries are used to supplement and support the history and future recounted by the Seer and Oriel. Festus, on the other hand, includes science as yet another valid world-view to be included in Bailey's capacious Universalist explorations. Bailey's universe is filled with astronomical imagery and includes among other journeys an extended flight through the heaven of astronomers, geologists and physicists. Bailey does not keep records of his allusions in the manner of Bickersteth, but nevertheless science is woven intricately through both narratives of the future life. Second, neither work has been examined thoroughly in modern scholarship. The few notable analyses of the poems tend to be in the field of Victorian literature and religion, such as Wheeler's *Heaven, Hell and the Victorians*, or in more general studies of Victorian poetry, for example Tucker's *Epic* and Robert Birley's *Sunk Without Trace: Forgotten Masterpieces Reconsidered* (1964). I aim to show the wider relevance of these poems to the fields of literature and science, literature and religion and science and religion.

Eschatological epic includes a wide variety of poems across the nineteenth century. Some notable examples from the genre include Robert Pollok's very popular *The Course of Time* (1828), *The Year of the World: A Philosophical poem on "Redemption from the Fall"* (1846) by Pre-Raphaelite William Bell Scott, and John Henry Newman's narrative of a journey through the Catholic future state, *The Dream of Gerontius* (1865). *The Course of Time* considers all of human history, from Adam and Eve to the end of Creation, and the immortal destiny of humanity. A nameless newcomer arrives in Paradise long after judgement day, and meets a Bard of the Earth who relates to the narrator the history of the created universe. As well as a description of various sections of the future life, and a detailed human and biblical history, the newcomer and Bard discuss a variety of topics of interest to this thesis,

such as a comparative study of 'the man of science', 'the poet' and 'the divine' in pre- and post- apocalyptic states.[1]

The Year of the World is another journey narrative, this time one set in the classical world. It describes the year-long journey of Lyremmos, who eats fruit from the Tree of Knowledge, without negative consequence, and becomes aware of the unseen world of spirits around him. Lyremmos goes in search of greater spiritual and intellectual meaning and encounters characters representing Christianity and Pantheism. While Lyremmos does not actually go through a future life, he does consider the eschatologies of both Christianity and Pantheism. In something of a twist, Lyremmos decides that the future lies not in either religion, but in science, though science is connected with God, denomination unclear, in the rather vague concluding passages. Scott makes clear in his preface that his aim is 'the elucidation of the old problems with which ethics and metaphysics have always dealt', and that he takes advantage of the opportunity represented by the form to 'describe fully the view taken of history and science'.[2]

Tracing scientific and religious cosmological interplay in *The Course of Time* and *The Year of the World* would doubtless yield rewarding results in further study. However, the former's publication date places it too far outside of my primary period of interest to be included in this thesis; it did not engage in, and nor was it used in, the same conversations which this dissertation considers. *The Year of the World* could be of particular interest in examining the contribution of Eastern religions to this conversation as a whole. However, while the poem considers the themes of death, the afterlife and judgement enough that it can be considered an eschatological epic broadly, it lacks an actual apocalypse or the death of the protagonist, and thus does not suit my purposes here.

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[1] Robert Pollok, *The Course of Time: A Poem in Ten Books* (8th edition, Edinburgh: William Tait, 1826), p. 62.
[2] William Bell Scott, *The Year of the World: A Philosophical Poem on "Redemption from the Fall"* (Edinburgh: William Tait, 1846), p. vii; p. ix.

The Dream of Gerontius differs slightly from the other four eschatological epics mentioned in this chapter. Firstly, it does not depict a universal Judgement day, but rather considers a single soul's journey from death, through the afterlife and individual judgement in front of God, to the lake of Purgatory to await Judgement day. Secondly, Newman was a Catholic, and finally, he does not engage directly with contemporary scientific debates, discoveries or language. Like Hopkins's poetry, *Gerontius* makes heavy use tropes of energy and its absence, particularly with vivid imagery of fire, light, coolness and darkness, but there is none of the anxiety around energy in *Gerontius* that appears in much of Hopkins' poetry. Thus, while eschatological epic often provides poets an opportunity for poets to draw science into a devotional realm, this opportunity is not always taken. However, Newman appears to be the exception rather than the rule.

Herbert Tucker's history of epic poetry places the 'cultural moment' for the apocalypse in the 1820s. Tucker cites *The Course of Time*, George Swain's *Armageddon* (1815) and Edwin Atherton's *The Last Days of Herculaneum* (1821) among others to demonstrate the early nineteenth-century appetite for apocalypse, and usually by extension the four last things.[3] While Tucker's characterisations of each decade are naturally generalisations and not prescriptive, I argue that 'the call to write of last things' was one that continued throughout the century, though the source of this call varied.[4] The epic's particularly strong ties to the present 'cultural moment' means that, ultimately, it will reflect and respond to contemporary pressures, including concerns about scientific discoveries and their implications for religion.[5] Kirstie Blair argues in *Form and Faith* that devotional poetry often acted as a form of worship in itself, 'as a regulated and repetitive form capable of creating heightened emotional effects'.[6] This implicitly devotional form thus created a safe, unshakeably Christian foundation where religious poets could experiment with

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[3] Herbert Tucker, *Epic: Britain's Heroic Muse, 1790-1910* (Oxford: Oxford University Press, 2008), respectively: p. 252; p. 251; p.256.
[4] Ibid., p. 267.
[5] Ibid., p. 26.
[6] Kirstie Blair, *Form and Faith in Victorian Poetry and Religion* (Oxford: Oxford University Press, 2012), p. 87.

different relationships between science and religion and propose solutions to specific concerns raised by their interaction.

Yesterday, Today and Forever: Overview

Edward Henry Bickersteth's 1866 poem *Yesterday, Today and Forever: A Poem in Twelve Books,* explores the universe and its history through the Dante-esque journey through the afterlife of a wise, religious man known as 'the Seer'. The poem is a guided journey through the various stages of the afterlife as the Seer travels from his death bed to the eternal peace of Heaven after Judgement Day. The afterlife through which the Seer is guided is richly supplemented by scientific and poetic allusion. Each book of the poem focuses either on a part of the Seer's journey, or the stories that the Seer's guardian angel, Oriel, tells of biblical history and the ongoing battle between the forces of good and evil.

The author's preface briefly explains Bickersteth's poetic process and the inspiration for *Yesterday.* Bickersteth states in the preface that he considers his poem to be prophetic, and only the feeling that 'those solemn events, to which the latter books of this poem relate, were already beginning to cast their prophetic light and shadows on the world' prompted him to begin writing it.[7] This ominous statement probably refers to the popular Millenarian belief that the end times would occur between 1866 and 1873.[8] Perhaps to demonstrate the presence of these 'prophetic

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[7] Edward Henry Bickersteth, *Yesterday, Today and Forever: A Poem in Twelve Books* (London: Rivingtons, 1866).

[8] Although it is perhaps unusual that a man of Bickersteth's education and position would be millenarian, the plot of *Yesterday, Today and Forever* includes several elements common to such beliefs. Bickersteth's biographer describes a Sabbath in an early part of the poem as 'the type and pledge of the Millennial' and Bickersteth does seem to be widely accepted as a millenarian or at least Adventist by modern scholarship. Michael Wheeler, *Heaven, Hell and the Victorians* (Cambridge: Cambridge University Press, 1994), p. 92.; F.K. Aglionby, *The Life of Edward Henry Bickersteth*, (London: Longmans, Green and Co., 1907), p. 109; John O. Waller 'Christ's Second Coming: Christina Rossetti and the Premillenialist William Dodsworth', *Bulletin of the New York Public Library*, 73 (1969), 465-482 (p. 476-7). On Millenarian beliefs more generally: Michael Bentley, 'The Ripening of Robert Peel', in *Public Essays and Private Doctrine: Essays in British History presented to Maurice Cowling* (Cambridge: Cambridge University Press, 1993), 63-84 (p. 79); Alison Milbank, *Dante and the Victorians* (Manchester: Manchester University Press, 1998), p.170.

light and shadows', the poem is extensively cross-referenced, with some fifty pages of notes at the end of the book directing the reader to a variety of sources. The majority of the references are to the Bible, but the notes also cite literary, theological, and scientific sources, as well as brief explanations of his reasoning and poetic choices.

Yesterday tells the story of the Seer's journey from the death bed, where he provides his family with comfort from the Bible and reminds them that they will be reunited in heaven, through various levels of the afterlife, then to judgement day and the glory of the 'many mansions' where he and other worthy souls will spend eternity. During this journey, Oriel, the Seer's guardian angel, answers the Seer's many technical questions about the temporal and spatial qualities of the afterlife, and gives a history of the universe from creation to the modern day, including Lucifer's betrayal, Eve's temptation, and descriptions of Oriel's three journeys to Hades. Bickersteth's vision of the other-worldly is mostly reassuring and comforting, reaffirming popular ideas of being reunited with one's loved ones in the afterlife and broadly echoing the traditional Christian narratives of Dante, Milton and the Bible.

Reception

Yesterday saw significant success in terms of circulation; in 1880 the *Times* reported that it had sold 25,000 copies in England and a further 50,000 in the United States, across more than ten editions.[9] However, its high volume of sales did not necessarily equate to critical acclaim. Tucker suggests that its subtitle, 'A Poem in Twelve Books', was 'old-fashioned' and 'an invitation to ridicule'.[10] There were relatively few critical responses to the poem, and while contemporary reviews were broadly positive, they tended to be somewhat ambivalent about the poem's quality and sometimes bemused by its success, with the *Times* wondering if the 'work might seem to stand plainly condemned by its very popularity when it has not attained

[9] Unsigned review, ''Yesterday, To-day and For Ever'*', *The Times* (5th February 1880), 4-4 (p.4).
[10] Herbert Tucker, *Epic: Britain's Heroic Muse 1700-1910* (Oxford: Oxford University Press, 2008), p. 393.

purely literary distinction'.[11] An article in the *British Quarterly Review* reflects the general feeling of reviewers when it comments that Bickersteth 'does not soar very high, nor burn with great passion, even in the greatest scenes; but he describes smoothly and pleasantly, and with poetical afflatus enough to command many readers'.[12] The poem's reviewer in *The Contemporary Review* was similarly underwhelmed, but where the *British* generally came down in favour of the poem, here the criticism was more serious, stating that 'there is no concealing from ourselves or our readers that its merit is very great; at the same time it is equally impossible to conceal that, as a whole, it is a failure'.[13]

The wide circulation of *Yesterday* meant that it had a number of distinguished readers, including the Catholic poet and cardinal John Henry Newman, who, in a letter to Bickersteth, acknowledged their denominational differences but complimented 'the imagination, the powers of language and easy eloquence, and the beautiful spirit' of the poem.[14] The theologian and historian Geoffrey Rowell suggests that *Yesterday* informed the teachings of the influential Victorian theologian Thomas Rawson Birks, detecting similarities in the minutiae of hell that Bickersteth describes in *Yesterday* and that Birks seems to echo in *The Victory of Divine Goodness,* published the following year.[15] Thus although it did not cause a great stir in literary circles, it did have some influence in theologienergycal ones, in a variety of Christian denominations.

Yesterday has attracted only three relatively extended readings in modern criticism, in Alison Milbank's *Dante and the Victorians* (1994)*,* Michael Wheeler's *Heaven, Hell and the Victorians* and Tucker's *Epic.* Otherwise, even references to the poem are few, appearing in bibliographies of Victorian long poems and surveys of

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[11] Ibid.
[12] Unsigned review. '*Yesterday, To-Day and For Ever:* A Poem in Twelve Books*'*, *The British Quarterly Review* 59.117 (1874), 259-259 (p. 259).
[13] Unsigned review. *'Yesterday, To-day and For Ever: A Poem in Twelve Books'*, *The Contemporary Review* 5 (1867), 256-260 (p. 256).
[14] Aglionby, F.K. *The Life of Edward Henry Bickersteth* (London: Longmans, Green and Co., 1907), p. 112-113.
[15] Rowell, Geoffrey. *Hell and the Victorians* (Oxford: Clarendon Press, 1974), p. 127.

devotional poetry and attitudes to the afterlife. Wheeler uses *Yesterday* as a case study in his wider examination of 'the language of Christian consolation', and his examination of the text is broadly an introductory, restorative one, frequently using *Yesterday* as a 'point of reference' for prevailing views on eschatological controversies. [16] His work demonstrates the ways in which Bickersteth's writing contributed to and was influenced by Victorian theological debates and literary trends.

Milbank takes a more narrowly focused approach than Wheeler's argument about Victorian poetic strategies for building narratives of the journey to the afterlife. While she draws upon some of his conclusions, she examines the influence of Dante's attempts to do the same, focusing mostly on constructions of temporality in Victorian poetry of the afterlife. For Wheeler, Victorian narratives of the afterlife can be characterised as either proleptic of eternity, or an attempt to defer it; Milbank extends this reading by examining these strategies as 'continuations of temporal and spatial categories where they are both inappropriate and misleading'. Milbank places *Yesterday*, along with Robert Pollock's *The Course of Time,* Philip Bailey's *Festus* and Newman's *Dream of Gerontius* among others, in a group of nineteenth-century poems dealing with life after death and Hell in particular that are influenced by Dante. She argues that Dante's works 'were central to [Victorians'] understanding of the afterlife', but that the Reformation made key changes to how the afterlife was perceived by Protestants, including the removal of purgatory and 'a return to the central position of heaven', a centrality that acted as a secondary influence on Dante-esque Victorian poetry.[17] For example, Milbank is mostly concerned with the way in which Dante and Victorian poets such as Bickersteth construct the afterlife and its position relative to the mortal world in terms of temporal and spatial concerns, arguing that where Dante's 'weaning of the protagonist from the temporal to the eternal' was 'ingenious', Bickersteth and other poets like him used these categories

[16] Wheeler, p. 175.
[17] Alison Milbank, *Dante and the Victorians* (Manchester: Manchester University Press, 1998), pp. 164-165; p.165.

in 'inappropriate and misleading' ways.[18] As Milbank puts it, 'Bickersteth takes his blessed on excursions through new landscapes or skyscapes as on a celestial package tour. It is the scenery not the soul that is metamorphosed, and suggests a continuing temporal register'.[19] Bickersteth's afterlife does, as Milbank notes, leave the soul largely unchanged throughout its journey, and it never entirely breaks free from the temporal narrative suggested by its title, but this lends a stability to the narrative voice which allows Bickersteth to explore the afterlife in a way which was reassuring to the reader.

Tucker meanwhile considers *Yesterday* within the context of its form, and typifies the 1860s as a decade in which the epic was predominantly concerned with mythologies. He argues that *Yesterday* and other epics of its time expressed a nostalgia for the antique. Part of this nostalgia, gave rise to epic histories such as those of King Arthur, or the Bible, as well as 'stories about the traditional telling of such stories, by which the for better and worse a people is made'.[20] Like Milbank, Tucker notes the distinct lack of a transformation of the Seer's soul: 'Bickersteth saw fit […] to equip his faithful Christian's immortal soul after death not only with a pronounced Anglican perspective but the ordinary likes and dislikes of a middle-class English paterfamilias'.[21] Bickersteth's decision for the soul of the Seer to retain its earthly personality acts as a connection to the 'today', a firm vantage point from which one can understand 'yesterday' and 'forever'. My reading of *Yesterday* will take into consideration Milbank and Tucker's analysis of the Seer's failure to transform, and it will extend Wheeler's examination from theological and literary allusion to Bickersteth's use of scientific language and references to science writing.

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[18] Milbank, p. 170.
[19] Ibid., p. 169.
[20] Tucker, p.393.
[21] Ibid., p. 405.

Influences

Bickersteth was born into an Evangelical Anglican family, and maintained this faith throughout his life. After being tutored by the theologian Thomas Birks, he attended Trinity College in Cambridge, where he distinguished himself by winning the Chancellor's gold medal for poetry three years in a row. *Yesterday* was his third major publication, following two reasonably successful hymnals, and it preceded his other great success, *The Hymnal Companion to the Book of Common Prayer* (1870), which functioned in some ways as an evangelical equivalent to its contemporary, *Hymns Ancient and Modern* (1866) and was, according to Bickersteth's biographer Aglionby, 'adopted […] almost without exception' by the 'evangelical school'.[22] An anthology of Bickersteth's shorter poems and more popular hymns was published in 1883. In addition to his poems, hymns and sermons, Bickersteth wrote two religious works; one, his *Practical and Explanatory Commentary on the New Testament*, was written specifically for families, and the other, *The Master's Home-Call,* was written in memory of his daughter Alice Frances.[23] All of his work is marked by its evangelical leanings and it all found tolerable success. Apart from his writing, Bickersteth had a successful career as a member of the Anglican clergy, beginning in 1845 when he became a deacon and then a priest in 1849. Most of Bickersteth's career from 1855-1885 was spent in the Christ Church parish of Hampstead, and it was here that he wrote the majority of his published works. His later career was notable for two promotions in quick succession, to Dean of Gloucester and then to Bishop of Exeter, which was the position he held until he retired six years before his death in 1906. Bickersteth's life was focused mostly around his work and his evangelism; though he wrote poetry, he did not review that of others. While Bickersteth's endnotes to *Yesterday* show that he read and engaged with scientific treatises, he studied mathematics in Cambridge, and he was interested in contemporary scientific debates, he had no formal scientific background to speak of.

[22] Aglionby, p. 114.
[23] Ibid., p. 130.

Bickersteth's copious endnotes reveal a plethora of influences and pieces of information from a wide variety of sources. Bickersteth cross-references his work extensively with the Bible, often augmenting the chapter and verse number with instructions to his readers to 'compare' a passage to a specific line of scripture to substantiate his descriptions, or with a brief gloss on some point of interest such as different translations of a line from the Bible or an explanation of the behaviour of angels.[24] Bickersteth clearly intends to reinforce his narrative and thus his prediction of the nature of judgement day and the afterlife with the strength of scripture, sometimes leading to what Wheeler notes as unusual uses of extracts from the Bible, such as Revelation 7:17 and 21:4.[25] Bickersteth's references draw upon many theologians who were well-respected at the time, including several works by his friend Thomas Rawson Birks, George Stanley Faber's extensive discussion of the religious history and future of the universe *Many Mansions in the House of the Father* (1854), and Edward Bishop Elliott's in-depth eschatological study *Horae Apocalyptica* (1844).[26] Bickersteth places *Yesterday* firmly within a canon of Christian epic poetry by making frequent references to *Paradise Lost* and *The Divine Comedy.*[27] As well as these key poems, he makes reference less frequently to more contemporary works such as Keble's *The Christian Year* (1827).[28]

Although Bickersteth's notes do direct his reader to other works, the references, like those of many Victorian writers, are often abbreviated. For example, an editor's footnote by Thomas Scott in an 1832 edition of the Bible is quoted and attributed simply to 'Scott'.[29] He also tends to quote in the original Latin and Greek. Both these facts suggest that while the notes may help enrich the reading experience,

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[24] For several example a scriptural substantiation of a description: Bickersteth, p. 407; for a gloss on alternative translations, Ibid., p. 415; for a gloss on the behaviour of angels, p. 398.
[25] Wheeler, p. 96.
[26] Notes on Birks' *Difficulties of Belief* (1855): Bickersteth, p. 413; Birks' *The Bible and Modern Thought* (1861): Ibid., p. 412; to George Stanley Faber: Ibid., p. 416; to Edward Bishop Elliott: Ibid., p. 405.
[27] References to *Paradise Lost*: Bickersteth, p. 414; p. 416; p.418; p.433; p. 438 for notes to five examples; *Divine Comedy:* p. 397.
[28] Ibid., p. 397; p. 401.
[29] Ibid., p. 414.

they are not necessarily intended as a democratising device. Unlike the references in *The Unseen Universe* or *More Worlds than One*, the purpose of the notes is to direct appropriately educated readers to the relevant part of a book or poem they are assumed to already know, rather than act as a preliminary source on eschatological issues that might introduce an uninitiated audience to new works. The copious notes give an air of authority and of the poem being based on certain knowledge, thus strengthening the credibility of Bickersteth's vision.

The references to science writing reveal some key aspects of Bickersteth's attitude to a number of contemporary debates. His references include a number of prominent natural theologians, including William Whewell and Edward Hitchcock. The texts he uses all tend to have a theological underpinning and generally aim to minimise any perceived divide between science and religion, although a notable exception to this is John Herschel's *Outlines of Astronomy* (1849). *Yesterday* often emphasises the technical details of the universe and the afterlife, including their size, shape and relative position, and the exact stages of their creation. In doing so, Bickersteth intervenes in several popular contemporary discussions: for example, he joins William Whewell in his position that earth is the only inhabited planet in the cosmos. Further, the poem engages with the difficulties which the geological record pose to traditional, literal interpretations of Genesis, and proposes a modified version of the process of creation consisting of several stages over an extended period, so the that 'the first verse of Holy Scripture narrates the original creation of the heavens and earth; that the second verse describes the state of confusion to which our globe had been reduced by the last great terrestrial convulsion which preceded the history of our species'.[30] The six days of creation, he suggests, each represent some 'vast geological period'.[31] His key texts on the geological record are all by Christians and aim to reconcile incompatibilities between science and religion with similarly metaphorical interpretations of genesis. These sources include the works of the geologist Edward Hitchcock, geologist and evangelical Christian Hugh Miller's

[30] Ibid., p. 412, referencing Book IV, ll:625. The alternative creation myth constitutes most of Book IV.
[31] Ibid., p.412.

Testimony of the Rocks (1857), and Dominick McCausland's *Sermon in Stone: Or, Scripture Confirmed by Geology* (1858).

Space, time and the afterlife

The spatial and temporal relationship between the material and divine realms are given detailed attention. The title itself, *Yesterday, Today and Forever,* from Hebrews 13:8, 'Jesus Christ the same yesterday, and to-day, and for ever', suggests a preoccupation with and movement towards the eternal, away from the temporal. In the early stages of his afterlife, the Seer is eager to position the places to which he and Oriel travel in relation to Earth. Oriel's role as angelic guide is an unusually comprehensive one. As well as his expected knowledge of God's nature, divine and human history, and his message of piety and faith, Bickersteth gives Oriel the vocabulary of someone with a reasonable mid-Victorian scientific education throughout the poem. He makes allusions to contemporary inventions and theories such as the electric telegraph, luminiferous ether, and his descriptions of the stars align with the astronomical work of John Herschel[32] The angel speaks with equal authority on the purely divine, as well as the technical and scientific minutia of the created universe. This breadth of knowledge tacitly brings together the theological and the scientific; Bickersteth reminds us through Oriel that everything is ultimately either of or by God, and thus science is simply another way of understanding God. This first becomes evident when Oriel flies the Seer away from Earth, towards his future life. Some time into the flight, the Seer takes his last look back at Earth and notices that what the Oriel calls a 'precipitate descent' involves flying upwards. [33] Oriel's response to this observation is precise and full:

> Ascension and descension, height and depth,
> Are here not measured by a line through space
> From any spot on the revolving earth,

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[32] Ibid., Book I, ll:549; Book IV, ll:144-145; Book VI, ll:99-105, Herschel's influence referenced on p.418.
[33] Bickersteth, Book I, ll:600.

> Of which let it suffice thee to reflect
> Thy highest hitherto hath ever been
> The lowest to the other hemisphere.
> Not so our zenith and our nadir lie.
> But height with us is where the Eternal God,
> Though omnipresent in the universe,
> Reveals the lustre of His throne supreme,
> Through clouds of glory in the heaven of heavens:
> And depth is the remotest opposite.[34]

Earthly vocabulary is used to describe the spiritual, but the two are established to be separate, and beyond human experience. Height ceases to be spatial and is instead figurative, the place where God's throne is revealed. This early division between the material and spiritual world is one of a number which Bickersteth establishes, distinguishing between 'created' and 'Uncreated' energies and the temporal-spatial properties of each realm. Light in particular is sharply delineated, as 'Uncreated light' or similar is frequently used as a metonym for God or his power. Book IV, 'The Creation of Angels and of Men', gives an angel's-eye view of creation. It is notable that the angel's eye is one that is explicitly equated with scientific apparatus: the vision of spirits and angels is more acute than a human's, even if the human were equipped with 'A microscope and telescope in one.'[35] With Oriel's accuracy of vision thus established, even before Oriel relates his experiences of the universe it is understood that his observations are scientifically accurate. Oriel uses characteristically scientific and specifically Victorian language to describe the events comparable to Genesis 1:1, 'In the beginning God created the heaven and the earth':

> To measurable ages, Time began.
> And then, emerging out of nothingness,
> At God's behest commanding LET THEM BE,

[34] Ibid., Book I, ll: 681-690.
[35] Ibid., Book II, ll:71.

> The rude raw elements of nature WERE:
> Viewless and without form at first.
> But soon God will'd, and breathed His will; and lo, a sea
> Of subtle and elastic ether flow'd,
> Immense, imponderable, luminous,
> Which, while revealing other things, remains
> Itself invisible, impalpable,
> Pervading space. Thus Uncreated Light
> Created in the twinkling of an eye
> A tabernacle worthy of Himself,
> And saw that it was good, and dwelt therein.[36]

This passage shows the establishment of this divine/earthly divide – 'Time', or at least 'measurable' time, emerges from eternity, and 'the rude raw elements of nature' from nothingness. As well as echoing the traditional stages of creation: first light, then matter, and the seas and heavens of a sort, Bickersteth, in Oriel's exacting narrative style, introduces updates to the moment of creation. Rather than a sea of water, it is ether which 'pervades space'. 'Uncreated Light' suggests the presence of created light, tacitly drawing a distinction between the type of energy that is subject to mechanical laws of the universe, and that which is outside and beyond it, by keeping the two in separate categories, and this separation is maintained and explored throughout the poem. This exemption of God from the rules of the material universe was a common way to quell thermodynamic anxieties.

The metre of the passage gives a sense of the inexorable power of creation; the iambic pentameter is fairly regular except for lines 142-143. The description of the 'viewless', formless mass of 'rude raw elements', is relatively shapeless; to match the rest of the passage, the reader must force the line into uniform metre, imposing the stresses on the appropriate syllables, instead of allowing for the natural trochees and spondees in the line. Thus Bickersteth becomes a participant in the act of

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[36] Ibid., Book IV, ll:138-151.

creation, shaping form from void even as God does as he returns to iambs. The following line returns to iambic metre, describing the moment in which 'God Will'd, and breath'd his will', but it is in hexameter, reflecting God's unique capacity to break the rhythms of the created universe. Although Bickersteth establishes that God exists outside of the laws of nature, the passage is insistent that he does dwell within the created universe, as it is a 'tabernacle worthy of himself'. While referring to the universe as a place of Christian worship is not a surprising choice, terming it specifically a tabernacle is a significant choice within the context of *Yesterday.* The word is used eight times throughout the poem, and in six of those instances Bickersteth is referring to a human body or corpse, emphasising the purpose of the mortal form as simply a portable, temporary and fragile dwelling-place for an eternal spirit.[37] By referring to the universe and the human body both as tabernacles, parallels are drawn that underline the inevitability that, just as a fleshly body will eventually be sloughed, so the universe will eventually no longer be needed to house the divine spirit. Bickersteth does not by any means attempt in the poem to provide any reason to postpone Judgement day and thus, by implication, the death of the material universe; indeed, Wheeler repeatedly characterises the poem as 'anticipatory',[38] welcoming the end of temporal existence as necessary preparation for an eternal one.

Bickersteth's cosmology

Bickersteth goes to some lengths to separate 'created' and 'uncreated' energies in order to establish that energy is not subject to the same laws in the spiritual world. However, energies in *Yesterday* do seem to exhibit much of the same behaviour in either realm. The exact natures of the material and the divine do not seem to be different; the latter is simply infinitely more refined. For example, the following passage makes clear the relative properties of created and uncreated physics:

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[37] Bickersteth, Book I, ll:99; Book I, ll:407; Book I, ll:435; Book III, ll:332; Book IV, ll:150; Book VI, ll:499; Book VIII, ll:84.
[38] Wheeler, p. 92; p. 176.

Then first I ask'd myself
What made that heavenly Eden luminous
With glory, and look'd up instinctively
On the blue crystal of the firmament,
Blue only from intensity of clear,
As if expecting there some orb of light;
But there no lamp appear'd, no sun, no moon,
No star far glimmering in the azure vault;
And yet the islands in the southern seas,
Basking in light when rains have clear'd the sky,
Were never bathed in radiance pure as this:
And Oriel saw my wonder and replied:
"Brother, remember Paradise is heaven,
Heaven's portal, and the portal of God's house
Needs not the shining of created light;
For He, the Light of Light, is ever there,
And, where He is, there darkness can't exist;
Such virtue His eternal Presence sheds
Throughout the courts where He abides well pleased,
Rejoicing in the beauty' of holiness.
Far otherwise those realms of utter night,
Which lie beyond the mighty gulf thou seest,
Are darken'd with the shadow of His wrath.

[…]

The landscapes of those desolate regions lie
Within our range, and listening we might catch
(So subtle here the waves of light and sound)
Far off its cries and voices; and as spirits
Ourselves, with speed of lightnings, to and fro
Go and return; but that a spiritual law,
Akin to that magnetic force which binds

> The mortal habitants of earth to earth,
> Has laid its viewless interdict between,
> And bound the sons of darkness and of light
> Each to their proper home.[39]

The material world is portrayed as a crude analogy to the spiritual one. Light and sound exist as 'waves' in both, but in the spiritual world they are so 'subtle' that even distant things are clear, while magnetism is 'akin' to the 'spiritual law' that keeps the inhabitants of the different sections of the afterlife in their respective places. The differences in the terms used to describe spiritual and earthly analogues for gravity underscores how distinct the two are despite similar results. On earth, it is a 'magnetic force', in the divine realms a 'spiritual law'. The former is something created acting upon humans who are helplessly subject to it, while the latter is related to God without the intervention of created physics.

The afterlife is described with the same precision and attention to detail as a natural history of the living world, but natural law is replaced with divine will. This is an important distinction. The divine light which is often used in devotional texts as a metaphor for God's presence here becomes literal: there are no stars or other luminary bodies in heaven because God, 'the Light of Light, is ever there'. The use of analogy, comparing scientific concepts on earth to spiritual ones in heaven, is reassuring and appealing, as it gives an air of certainty about the afterlife that is rooted exact knowledge as well as faith. The comparison also gives credence to the usefulness of science; while any mortal endeavour would fall short of fully comprehending the afterlife, science allows for comparisons which permit a closer understanding of the future life than would otherwise be possible. Oriel's manner here is characteristic, replying with exacting fact and assurance. It is significant that as well as bearing messages pertaining to God's nature and will in a theological sense, the angel is also educated in matters of magnetism and the behaviour of light.

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[39] Bickersteth, Book III, ll:117-157.

In *Yesterday* science and religion are portrayed as equally important parts of the same design; rather, the divide is between the earthly and the divine.

As well as poetically presenting a world where science and religion intermingle and support one another, the sources which Bickersteth uses are a similar mixture of scientific, literary and theological, often with sources from each category being used in one reference. A notable example of this mixing of sources is his use of Whewell's *Of the Plurality of Worlds*. Bickersteth speaks admiringly of the treatise as a 'most convincing essay', thus siding with the minority opinion in the cosmic plurality debate, which, in 1866, had just been cut short by Whewell's death.[40] It is unclear whether Whewell and Bickersteth knew each other. Both men attended Trinity College, albeit thirty years apart. Furthermore, they clearly shared interests that would suggest they might be in similar networks, and they had mutual acquaintances (for example Bickersteth's cousin Joseph Bickersteth Mayor) but no evidence seems to exist of the two men writing to or about each other in correspondence.

Regardless of whether or not they were acquainted, Bickersteth clearly read and admired Whewell's work. He bases an illuminating passage of his poem on a quotation from *Plurality* which he provides in the notes, that describes the Earth as 'really the domestic hearth of this solar system'.[41] The section which is inspired in part by Whewell's 'most convincing essay' comes in Book IV, 'The Creation of Angels and of Men', and is part of a speech given by God to the angelic host, explaining humanity's nature and purpose. The other source for the passage is Birks' *Ways of God*. This use of scientific and religious sources in tandem is representative of Bickersteth's wider approach to the relationship between science and religion; for Bickersteth, the former supports the latter and both are a true and vital part of creation:

Made of the dust,

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[40] Ibid., p. 411.
[41] Ibid.

> And thus allied to all material worlds,
> Born of the Spirit, and thus allied to God,
> He during his probation's term shall walk
> His mother earth, unfledged to range the sky,
> But, if found faithful, shall at length ascend
> The highest heavens and share My home and yours.
> Nor shall his race, like angels, be defined
> In numbers, but expansive without end
> Shall propagate itself by diverse sex,
> And in its countless generations form
> An image of Divine infinitude.[42]

This passage presents humans as unique, 'Made of the dust' and 'Born of the Spirit', and thus a walking embodiment of the relationship between the spiritual and material. Bickersteth compensates for the necessary scarcity of life in a universe in which Earth is the only inhabited planet by emphasising the fecundity of the human race; nearly half of the passage is devoted to the 'expansive without end' reproduction of humanity, and its 'Divine infinitude'.

Bickersteth was firmly in alignment with Whewell over the cosmic plurality question; *Yesterday* and its notes suggest a familiarity with both John and William Herschel, the latter of whom theorised that the sun was inhabited. William Herschel suggested that the sun had a cool dark core, protected from its solar atmosphere by heavy cloud, upon which specially adapted creatures could live. He explained the dark spots that he observed on the sun's surface as breaks in the sun's outer atmosphere, offering glimpses into the sun's habitable centre.[43] On arriving at Eden, the Seer describes his surroundings in a manner comparable to this idea. He passes through the gates to heaven, walking on a 'pavement of transparent gold'. Looking up, he sees

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[42] Ibid., Book IV, ll:534-545.
[43] Quoted in Michael Crowe, *The Extra-Terrestrial Life Debate, 1750-1900* (Cambridge: Cambridge University Press, 1986), p. 63.

Such
A cincture, to compare great things with small,
Of waters and of vaporous clouds composed
Some hold the golden ring which circulates
Round Saturn's orb: or such, as others tell,
The lucid atmosphere enveloping
The central sun, whose solid globe opaque
Is only visible through rents which show
As spots to the inhabitants of earth.
But what might be the mantle, which enwrapt
The unseen world of spirits, I ask'd not.[44]

The use of astronomical imagery and analogy has the effect of adding to the wonder and majesty of the descriptions of Heaven, even as it grounds the poem in contemporary discourse and makes it more accessible or understandable to the reader. The idea that comparing Heaven to the sun is to 'compare great things with small' is a swift reminder of the scope of the unseen universe compared to the limited amount observable to living humans. The phrase 'to compare great things with small' is also a direct allusion to Virgil and Milton.[45] In this context, the phrase combines the three titular elements of the poem: 'yesterday', is represented by the allusion to canonical poets, 'today', is represented by the phrase's connection in this conversation with contemporary scientific methods, and 'forever' is connected with the phrase since the description is taking place on a journey to an eternal afterlife. Bickersteth repeatedly draws attention to Victorian scientific and particularly astronomical theories, here what people believed about the structure of Saturn's rings or the sun, and then he puts them in the infinitely broader perspective of God's wider creation. Thus science is shown as a valid and useful tool for helping mankind to understand the universe and God, and it can even, through analogy and extension, be

[44] Bickersteth, Book II, ll:31-41.
[45] Virgil, *Eclogues*, trans. Guy Lee (London: Penguin, 1984), Book I, ll:23; John Milton, *Paradise Lost* (originally printed 1667. London: Vintage, 2008), Book II, ll:921-922.

helpful for things beyond the observable universe. However, Bickersteth makes it clear that it is just one tool out of a huge array needed to understand God and his creation; no analogy is perfect, and for every discovery that furthers human understanding of the universe, there is much more that cannot even be perceived by the living, let alone understood or subjected to scientific method

Conclusion

Science in *Yesterday, Today and Forever* functions as a means of better understanding the divine, on two fronts; first, in the natural theological sense that discoveries about the workings of the cosmos are a kind of divine revelation, and second in an analogical sense, giving humans physical, familiar reference points by which to better understand that which is beyond their perception. Bickersteth's use of and clear engagement with contemporary thought on astronomy, geology and to a lesser extent optics and energy science, shown both through the copious notes and the content of the poem itself, grounds the poem firmly in the comprehensible, discoverable portions of the cosmos. This basis enables the poet to take the reader on a journey to an afterlife where the rules of the physical universe no longer apply, but can still be comprehensible to the living and whose properties make sense as a centre from which the visible universe was created.

Festus: Overview

Festus is a vast exploration of the universe and the afterlife which climaxes in universal redemption. The poem has a complex publication history, the particulars of which are related in Morse Peckham's detailed account of the sixty-two-year process of revision and re-publication.[46] It enjoyed over a hundred printings worldwide, some forty of which appeared in America.[47] The original poem, a relatively modest 8,000 lines long, was extensively rewritten, added to and republished, resulting in, by

[46] Morse Peckham, 'English Editions of Philip James Bailey's "Festus"', *The Papers of the Bibliographical Society of America*, 44 (1950), 55-58.
[47] Ibid., p. 55.

Peckham's reckoning, thirteen main British editions, including seven distinct 'versions' where the content was substantially altered or expanded.[48] These expansions were often long passages from Bailey's other, less successful poems. By the final edition, in 1901, the poem had quintupled in size from to 40, 000 lines. The bulk of this growth was introduced in the fiftieth anniversary edition, which is according to Peckham the first of the three editions that use the seventh and final version of the text. This 'Jubilee' edition is the one referred to in this chapter, unless otherwise stated.[49]

The poem is described in the preface as 'universalist',[50] and both Bailey and his protagonist Festus are self-described 'omnists', which is to say, they 'believe in all / Religions; fragments of one golden world'.[51] Accordingly, the poem includes elements of a wide variety of Christian denominations and non-Christian religions, as well as a notable influence from Spiritualism. It is overwhelmingly optimistic for what is essentially an eschatological poem, allowing everyone, including Festus and, eventually, Lucifer himself, access to the eternal paradise of the final section of the poem, entitled 'Heaven of Heavens'. This openness extends beyond the theological, sweeping science into its expansive cosmology. The poem treats science generally as one of any number of belief systems, simply another, equal, facet of universalist theology. While there is an acknowledgement in the poem that science might be viewed as a threat to religion, and this indeed informs the central plot point of the wager between God and Lucifer, the idea of a conflict is quickly dismissed. More specifically, astronomy is a key theme and motif in *Festus*, with systems that mimic galactic ones informing every level of the poem, from the arrangement of the various levels of Heaven to the structure of the sections of the poem itself. Festus himself is fascinated with stars, and particularly with comparing people to them, to the point

[48] Ibid., p. 55-56.
[49] Bailey used the term 'Jubilee' for the 1889 edition of the poem in a letter to the editor of *The Bookman*, 'A Letter from the Author of Festus', *The Bookman*, 4.20 (1893), 50-51 (p. 50).
[50] Philip James Bailey, *Festus* (Fiftieth-Anniversary Edition, London: George Routledge and Sons, 1889), p. 1.
[51] Bailey, p. 172

that Lucifer teases him for this idiosyncrasy.[52] Comparisons of various earthly things to stars or the sky constitute one of the most common types of imagery in the poem.

By the time of the Jubilee edition of 1888, *Festus* was largely a vehicle for Bailey's universalist philosophy and his wider world view. Bailey states in the preface that *Festus* is 'a sketch of world-life, and is a summary of its combined moral and philosophical conditions'.[53] It is also a deeply optimistic poem, explicitly intended to counter 'the partialist, pessimist and despairing sceptic, the belief of the misbeliever, so prevalent in our time'.[54] The plot of *Festus* follows the broad strokes of the Faust myth, and particularly Goethe's version, but Bailey adds many of his own flourishes. God reveals that the apocalypse is imminent, and Lucifer arrives to challenge God. Lucifer and God make a wager that Lucifer will be unable to corrupt a human soul. Lucifer thinks that he will succeed because science has almost usurped faith: it 'aims / thee [God] to dethrone' and 'thenceforth / Herself e'er deify'.[55] Without the protection of faith in God, Lucifer believes humanity is vulnerable to his temptations. However, God's view of humanity is both optimistic and meliorist. He maintains that Lucifer will fail because 'knowledge conciliates / With wisdom, both with faith', and he believes that although humans may sometimes sin, these transgressions are outweighed by their goodness. God feels that humans usually choose to be good on an individual level, and humanity overall tends toward a 'Goodwards' trajectory as 'all souls' ultimately belong to God.[56] Lucifer declares that he has a target, soon revealed to be Festus, in mind, and God agrees with this selection, though the rationale for the choice is not explained. After some further discussion of the terms of the wager, and a character reference for Festus from his guardian angel, Lucifer leaves Heaven and appears on earth to meet Festus. Lucifer explains the wager and Festus agrees to participate, already tempted by the power offered by Lucifer. The pair spend the following seven hundred pages exploring the universe together, interspersed with scenes on Earth in which Festus reflects upon his

[52] Ibid., p. 188.
[53] Ibid., p. 1.
[54] Ibid.
[55] Ibid., p. 23.
[56] Ibid., p. 24.

experiences and interacts with his friend the Student and an often-changing cast of love interests.

The vast scope of their travels leads to a diversity of settings that permits sections twenty to twenty-eight, respectively to take place in ‘A Lake Islet’, ‘Interstellar Space’, ‘The Central Sun’, ‘The World’s Outermost Orb’, ‘Heaven’, ‘The Martian Sphere’ and ‘Summer-House and Pleasure Grounds’. Festus meets a vast range of inhabitants of the universe; in the poem, stars and planets have spirits, and everything with a spirit has a guardian angel. Accordingly, Festus frequently meets with the spirits of inanimate objects, as well as a wide range of angels, guardian and otherwise, inhabitants of other planets, and deceased humans. These encounters usually inspire Festus to become more determined to not let Lucifer win. However, Lucifer eventually gives Festus his deepest desire, that of ultimate power. After a day in which Festus rules over Earth, God enacts the apocalypse and Festus, along with the rest of humanity, dies without ceremony. After Earth is destroyed, God remakes it anew as Millennial Earth, and Lucifer is sent to Hades for Earth’s safety. Festus and some angels go down to Hades and meet gods from non-Christian religions, such as Zeus. They speak with Lucifer. Eventually, Judgement day comes and every soul who had been in Hades and everyone on Paradisal Earth is permitted into the Heaven of Heavens. The narrative ends in praise of God, and is appended with a farewell from Bailey describing his experience of writing the poem.

Bailey’s universalist scheme

The poem showcases various models of salvation, as always presenting each equally and moving swiftly from one to the next with little concern for contradiction or internal consistency. Festus is a member of the elect, creating one of the tensions in the early sections of the book: if Festus fails the test, then he will, by the terms of Lucifer’s wager with God, be damned, but he is predestined to be saved, placing God in a potential predicament if Lucifer were to succeed. Ultimately, this quandary is rendered moot when the poem eventually settles upon universal salvation as the final model; every soul in the universe, including Lucifer and his cohort and regardless of predestination, is saved and permitted into the ‘Heaven of Heavens’. Between

predestination at the beginning of the poem and universal salvation in what Tucker terms 'the Big Hug of no-fault apocalypse'[57] at the end, multiple other ways to get to the Heaven of Heavens are suggested, exemplified and swiftly moved past, but never totally dismissed. This multiplicity of systems of salvation, including repentance, good works in life, and a scheme of spiritual refinement after death which Bailey terms 'probational purification',[58] are all treated equally, examined and accepted without any sense of awareness that they might contradict each other. This plurality, in which contradictions are not resolved so much as blithely ignored in order to more fully permit inclusiveness, illustrates Bailey's wider universalist scheme.

Bailey summarises his universalist philosophy, though not by name, at the conclusion of the preface. He explains that he favours:

> a simple creed, which comprises in its consecrated elements a belief in the benignant providence of God, in the immortality of the soul, in the harmonized gospel of reason and faith combined, in the just, discriminative and equitable judgement of the spirit after death by the Deity, and in the delightsome duty of aiding upon earth the peaceful, morally progressive and voluntary evolution of Humanity as one brotherhood[.][59]

Universalism as a religious philosophy left Bailey, and *Festus*, open to accusations of pantheism; although there is only one character named 'God' in the poem, there are multiple cameo appearances from other deities, as well as miscellaneous elemental and planetary spirits. Prior to the Jubilee edition, God's lines were divided between the three voices of the Holy Trinity – 'God', 'The Holy Ghost' and the 'Son of God' – giving the poem an apparently Christian outlook, but in the Jubilee and subsequent editions this division was removed, broadening the poem's theology to deism rather than specifically Christianity. In the preface, Bailey explains that ' all the utterances that are ascribed in previous editions of the poem are now assigned solely to one uni-

[57] Tucker, p. 341.
[58] Bailey, p. 5.
[59] Ibid., p. 6.

personal Deity'. He explains that he made the decision after feedback from readers that suggest that this 'is more congruous with the philosophic tendencies, at the present day, of religious thought, in which the unity and infinity, alike inseparable from each other, and in themselves indivisible even in conception, of the Divine Nature, is unquestionably, and for ever established'.[60]

The preface shows *Festus* as a responsive, changing thing as Bailey describes the various amendments made to this edition of the poem, and the comments and new view-points that prompted them. By responding to criticism in such an explicit way, Bailey demonstrated that *Festus* is a poem written and rewritten in conversation with the society around it. The emphasis in the reason for the change to unity from the trinity is that it brings the poem into 'congruity with the present day'. Keeping the poem current was a key part of attempting to maintain its popularity. Despite Bailey's clear efforts to address criticism and adapt the poem to tally with contemporary views, his attitude to criticism as a whole is sanguine. He closes the preface with a declaration that it is impossible to please all readers, and despite being 'in some quarters misunderstood', *Festus* was 'not inconsistently nor immethodically carried out', and Bailey 'has done his best'.[61]

Science is encompassed in *Festus'* capacious theology with the same generosity of acceptance that the poem shows to all belief systems. Although a conflict of a sort between science and religion is recognised, it is Lucifer who introduces the idea that a personified Science, with her daily 'vast advances through the world', 'aims / Thee [God] to dethrone'.[62] Although Lucifer's information proves to be largely trustworthy in *Festus,* he is still bent on corruption and destruction. This gives him something of a biased world view which undercuts the validity of his estimation of 'Science' and her aims; while Lucifer is rarely mendacious, he is sometimes incorrect due to his constant underestimation of the power of faith. God calmly dismisses Lucifer's assertion with a declaration that 'All things to know / Subordinate even to

[60] Ibid., p. 1.
[61] Ibid. p. 6.
[62] Ibid., p. 23.

law, precludes not faith / Towards one who every law first made, first willed'. This exchange echoes a common conciliatory approach, similar to natural theology, in which the sciences are recognised and reinforced as a creation of God's. Topham terms astronomy, the science to which *Festus* relates most, a 'safe' science, in that it can be studied and interpreted without threatening conservative Christian ideas of God's role in Creation and the cosmos as a whole.[63] While there are other factors leading to the wager over Festus between God and Lucifer, notably the impending apocalypse, it is significantly this exchange regarding science and faith in particular that catalyses the agreement.

Nineteenth century reception

Born in Nottingham in 1816, Bailey graduated from Glasgow University intending to become a Presbyterian minister, but instead began a career in law which he quickly neglected in favour of the pursuit of his poetic ambitions.[64] Published anonymously in the first edition, *Festus* was Bailey's first publication, and it enjoyed significant success. *Festus* appears to have consumed most of Bailey's adult life; he began writing it at age nineteen, and the last edition was published a year before his death in 1902, at the age of eighty-six. He wrote four other long poems: *The Angel World* (1850), *The Mystic* (1855), *The Age* (1858) and *The Universal Hymn* (1867), but none of them enjoyed the success of *Festus*; Bailey added extended portions of these poems to the 'Jubilee' edition of *Festus*. He became an occasional contributor to *The Gentleman's Magazine,* where he is referred to as 'The Author of FESTUS' long after Bailey had revealed himself as the poem's author. Bailey was a spasmodic poet, and Herbert Tucker views *Festus* as one of the first and most important examples of the spasmodic epic.[65]

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[63] Jonathan Topham, 'Science and popular education in the 1830s: the role of the *Bridgewater Treatises*', *The British Journal for the History of Science*, 25 (1992), 397-430 (p.404).
[64] James Ward, *Philip James Bailey: Author of Festus* (Private circulation, 1905).
[65] Tucker, p. 344.

Festus found immediate popularity in Britain, then even more success in the United States, and Bailey worked to maintain the poem's acclaim for the rest of his life. Greta Black observes, and many modern scholars of the work seem to agree, that 'It is a book whose fame rather than its importance demands recognition'.[66] Its fame, in particular its popularity among now-canonical poets such as Robert Browning and Alfred Tennyson, is the aspect which draws the attention of most modern scholars of the poem. Its fame also contributed to the poem's extravagant expansion and bagginess; the pursuit of continued success or at least continued improvement that drove Bailey's stream of new editions meant that Bailey used feedback from reviews to inform changes, so its fame created a loop of new editions and fresh feedback. The second and later editions featured a double page of excerpts from the most enthusiastic reviews, and he promoted all of his other volumes as "by the author of "Festus". [67] A number of well-known poets of the time read and enjoyed the poem, including Alfred Tennyson, Edward Bulwer-Lytton, Ebeneezer Elliott, Robert Browning, Matthew Arnold, and Arthur Hugh Clough, to whom Arnold gave a copy.[68] R.H. Horne, Bailey's fellow spasmodist and author of 'Orion', included Bailey in his overview of significant contemporary literary figures, entitled *A New Spirit of the Age* (1844). He wrote of *Festus* that it 'abounds with […] fine passages', and that nearly every page shows 'the passion of true poetry'.[69]

Notices at the back of *Festus* inform the reader that Bulwer-Lytton considered the poem 'most remarkable and magnificent production', and that Elliott declared that 'It contains enough poetry to set up fifty poets'.[70] This second comment, though, when taken in context, may have been faint praise. Elliott's biographer, George Searle, recounts that Elliott did indeed express this opinion, and admired the poem's 'glorious passages and wild flights of imagination'. However, Elliot is quoted further

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[66] Greta A. Black, 'P.J. Bailey's Debt to Goethe's 'Faust' in his 'Festus', *The Modern Language Review*, 28.2 (1933), 166-175 (p.168).
[67] Philip James Bailey, *The Mystic and Other Poems* (London: Chapman and Hall, 1855), cover page; Bailey, *The Angel World and Other Poems* (Boston: Ticknor, Reed and Fields, 1850), cover page.
[68] Tucker, p. 344.
[69] Richard H. Horne, *A New Spirit of the Age* (London: Smith, Elder & Co, 1844), p. 294.
[70] Quoted in Philip James Bailey, *Festus* (2nd Edition, Boston: Benjamin B. Mussey, 1845), end papers.

by Searle as saying that *Festus* 'wanted cutting down before in the first edition, and now it sprawls its unwieldy length to such appalling extent, that its many and manifest beauties will hardly save it from perishing', a statement which makes the quotation used in the notices seem more accusation than praise.[71] Tennyson equivocally recommended it to Edward Fitzgerald, saying: 'I have just got Festus; order it and read. You will most likely find it a great bore, but there are really *very grand* things in Festus.'[72] Why he thought Fitzgerald might find *Festus* a 'bore' is unclear. Hoxie Fairchild suggests that it is a reflection on Fitzgerald's 'literary tastes, which were famously fastidious and crotchety' rather than the objective tedium of the poem, though, as John O. Waller observes, Tennyson's assessment is a pithy summary of quality of the poem in general.[73] Certainly, Tennyson's attachment to the poem was more sustained than any Fitzgerald may have had. Some thirty years after the initial recommendation, Fitzgerald wrote to his friend, the scholar Edward Byles Cowell, and mentioned that Tennyson 'keeps true to his old Loves, even Bailey's Festus […] though [he is] not displeased, I think, that I do not'.[74] As well as impressing Bailey's peers when first published, the poem was reviewed and often-read throughout the rest of the century. Suzette Henke proposes that James Joyce, who owned a copy of *Festus*, 'consciously or unconsciously made use of the poem in writing *Ulysses*', and she finds several thematic and linguistic connections between the texts.[75]

As well as gaining the attention of poets and authors, *Festus* was frequently reviewed throughout its sixty-year development, mentioned hundreds of times in diverse publications, but garnering around one hundred relatively substantial reviews

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[71] George Searle, *Memoirs of Ebeneezer Elliott, the Corn Law Rhymer, with Criticisms upon his Writings* (London: Whittaker and Co., 1852), p. 160-161.
[72] Quoted in Hallam Tennyson, *Alfred Lord Tennyson: A Memoir by his Son,* Vol.1 (London: Macmillan, 1898), p. 234.
[73] Hoxie Fairchild, '"Wild Bells" in Bailey's *Festus?*', *Modern Language Notes*, 64.4 (1949), 256-258 (p. 256); John O. Waller. 'Tennyson and Philip James Bailey's Festus', *Bulletin of Research in the Humanities*, 82.2 (1979), 105-123 (p. 107).
[74] Edward Fitzgerald, Letters and Literary Remains of Edward Fitzgerald vol 3. ed. William Aldis Wright (London: Macmillan, 1903), p. 252.
[75] Suzette Henke, 'James Joyce and Philip James Bailey's "Festus"', *James Joyce Quarterly*, 9.4 (1972), 445-451 (p. 445).

or discussions over its thirteen editions. The general view of the poem across its published life was that it was overly long, entirely characteristic of the middle of the nineteenth century, and possessed of moments of brilliance and religious zeal; the emphasis shifts from its exquisiteness to its length over the course of the century. *Tait's Edinburgh Magazine* writes in brief, in 1840, what many readers echoed over the following six decades: the poem 'displays the germ of considerable poetic power. His faults are those of exuberance; his failure far beyond the comparative success of tame, barren mediocrity'.[76] Some forty of the reviews of *Festus* were written in reception of the first and second editions. Although extended attention trailed off in later years, it was never quite forgotten, and dwindling reviews were replaced in part by letters from stalwart readers, protesting that the poem was truly still read and loved; *The Academy* in particular received letters in defence of Bailey until as late as 1910.[77]

The Athenaeum in particular followed the development of the poem through the years, publishing six separate articles on the poem: to review the first, second and tenth editions; in comparison with both *The Mystic* and *The Angel World;* and to acknowledge Bailey's death. The magazine was also host to a brief debate between the reviewer W.M. Rossetti, who wrote in *Macmillan's Magazine* that the poem was 'at the present day, but little read', and a reader, Theodore Watts, who vehemently disagreed and wrote to *The Athenaeum* to insist that the poem still had a substantial readership, made up of a 'large section of the public'.[78] The magazine's estimation of the poem is useful as it represents a longitudinal view of the poem's critical trajectory, although the earliest review was unusually unfavourable in comparison with other reviewers' opinions of the same edition.[79] The review of the second edition was much warmer, at the same time as the poem as finding a wider

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[76] Unsigned review of *Festus, Tait's Edinburgh Magazine*, 7.77 (1840), 339-339 (p. 339).
[77] William Mercer, '"Festus" Bailey', *The Academy*, 1514 (1901), 411-411 (p. 411); J.B. "Festus", *The Academy*, 1517 (1901), 470-470 (p..470); E. Wake Cooke, 'A Colossus of Poetry (?)', *The Academy,* 1990 (1910), 618-618 (p. 618).
[78] W.M. Rossetti, 'William Bell Scott and Modern British Poetry'. *Macmillan's Magazine*, 33.197 (1876), 418-429 (p. 425); Theodore Watts, '"Festus" and Recent Poetry', *The Athenaeum*, 2527 (1876), 465-465 (p. 465).
[79] Unsigned review of *Festus*, *The Athenaeum*, 671 (1839), 699-700.

audience.[80] The review of the tenth edition emphasises the influence which the earlier editions had, and praises the poet's early work on *Festus*, but expresses dismay that by the tenth edition, at around 35,000 lines, Bailey had 'attached so many new weights to the original, it can no longer swim or fly.'[81]

In 1872, a review of the eighth edition of *Festus* in *The Illustrated Review* likens the poem in an extended metaphor to a Gothic cathedral, huge and much added-to, which 'points with its every pinnacle to Heaven'.[82] By the end of Bailey's life, it was the poem's extraordinary length and erstwhile popularity that made it notable rather than its 'minster-like' majesty, and the consensus was that it had become dated, despite the latest edition being published only a year previous to the poet's death. The metaphor of the moment for the poem changed, with some bathos, from a 'cathedral' to a 'snowball', losing any of the dignity or spiritual weight that the poem commanded in the nineteenth century, and maintaining only the sense of accretion. A review of *Festus* in light of Bailey's death described it as a 'snowball poem', but a 'snowball only in its aggregations, for it is full of heat and passion, not without sound and fury, signifying *much* to the middle of the nineteenth century.'[83]

Modern reception

One of the earliest treatments of *Festus* outside of Bailey's own lifetime, beyond obituaries and memorial articles, is R.B. Steele's 1909 review both of the poem and its contemporary reception, which is almost entirely unfavourable towards *Festus* and sceptical of positive contemporary reviews, concluding that 'time must do for the poem what the author did, eliminate the parts which are poor and keep but a little for the enjoyment of men.'[84] This sense of, at least temporarily, laying the poem

[80] Unsigned article, 'Festus. A Poem', *The Athenaeum*, 1001 (1847), 14-15.
[81] Unsigned article, 'Festus, A Poem', The Athenaeum, 2598 (1877), 169-170 (p. 170).
[82] Unsigned article. 'Philip James Bailey', *The Illustrated Review: A Fortnightly Journal of Literature, Science and Art*, 4.48 (1872), 193-198 (p. 198).
[83] R.F. McC. 'Philip James Bailey', *The Speaker: The Liberal Review* (September 27th 1902), 671-671 (p. 671).
[84] R.B. Steele, 'Bailey's "Festus", *The Sewanee Review*, 17.1 (1909), 26-31 (p. 26).

to rest seems to have been shared by Steele's contemporaries and beyond, as only a handful of examinations of the poem were published in the century following Bailey's death, and those tend to be relatively brief. Morse Peckham's articles illuminated the publication history of the poem in England and America, and his doctoral thesis, 'Guilt and Glory: A Study of the 1839 Festus, a Poem of Synthesis', represents one of the most extended readings of the poem until Robert Birley included it in *Sunk Without Trace: Forgotten Masterpieces Reconsidered* in 1964. Birley's chapter on the poem is an act of rehabilitation and reintroduction, providing a brief history of *Festus*' reception and publication and a longer, slightly irreverent synopsis furnished with a selection of excerpts to illuminate Bailey's philosophy, as well as his poetic strengths and weaknesses. A sketch of the influences upon the poem is in accordance with Alan D. McKillop and Greta Black's estimations that *Festus* owes more to Byron than Goethe.

McKillop and Black both read *Festus* in relation to the wider Faust legend. McKillop explores the influence of the myth upon Bailey quite broadly. It offers a sustained comparison between *Festus* and Goethe's *Faust* and proposes Byron as a more significant influence upon the poem than was at the time recognised. Black's study, 'P.J. Bailey's Debt to Goethe's 'Faust' in his 'Festus' specifically challenges the assumption among Bailey's contemporary reviewers that *Festus* had been particularly influenced by Goethe's *Faust*, much less that it was a 'mere plagiarism' as the *Athenaeum* asserted in 1839.[85] Though she acknowledges an undeniable, fashionable influence in the first edition, Black finds less to relate the two than McKillop does, and argues that the poem swiftly moves away from *Faust* as Bailey used the poem to explore and refine his own philosophies.

A significant area of scholarly interest since the middle of the twentieth century is in tracing the connections between *Festus* and other poets, particularly Tennyson and the poets influenced by the spasmodic movement. Though others, such as Henke's study of *Festus'* influence upon James Joyce, and McKillop's reading of

[85] Black, p. 166.

Festus' influence upon D.G. Rossetti's 'The Blessed Damozel', exist on the edges of these nexuses of connective work. Both Hoxie Fairchild (1949) and John O. Waller (1979) draw attention to the relationship between Bailey's poetry and Tennyson. Fairchild's compact close reading of the phrase 'wild bells' in *Festus* and *In Memoriam*, suggests at least a significant parallel between the two poems. Fairchild proposes that the parallel is in fact an influence, and that Bailey's 'wild bells' are the source of Tennyson's. Waller's more extended examination of the relationship focuses less on establishing parallels or lines of influence, and instead has the purpose of 'determining the boundaries of Tennyson' admiration' of *Festus*, and understanding 'some aspects of *Festus* in both theme and treatment that predisposed Tennyson to forgiving its artistic and logical flaws', with particular attention to Tennyson's annotated copy of the second edition (1845).[86]

Mostly due to Bailey's involvement with the spasmodic movement, attention to *Festus* has never entirely disappeared in academic circles, though interest subsided enough over the twentieth century that Birley considered it 'sunk without trace'.[87] Bailey has frequently been identified in more recent years as a key spasmodic poet, and discussed in those terms, for example in Jason Rudy's article 'On Cultural Neoformalism, Spasmodic Poetry, and the Victorian Ballad' (2003), Charles LaPorte's 'Spasmodic Poets and Clough's apostasies' (2004), Herbert Tucker's 'Glandular Omnism and Beyond: The Victorian Spasmodic Epic' (2004), Kirstie Blair's *Victorian Poetry and the Culture of the Heart* (2006) and Heather Morton's 'The "Spasmodic" hoaxes of W.E Aytoun and A.C. Swinburne' (2008), in which Morton asserts *Festus* as the 'first recognisably spasmodic poem'.[88] However, despite the recognition of Bailey's role at the heart of spasmody, most of these articles and books mention Bailey only in relation to other poets, and offer scant readings of *Festus* in its own right. The most notable of the few extended

[86] Waller, p. 107.
[87] Robert Birley, *Sunk Without Trace: Some Forgotten Masterpieces Reconsidered* (London: Rupert Hart-Davis, 1962), see title.
[88] Heather Morton, 'The "Spasmodic" Hoaxes of W.E. Aytoun and A.C. Swinburne', *Studies in English Literature*, 48.4 (2008), 849-860 (p. 850).

examinations of the poem in recent years can be found in Wheeler's *Heaven, Hell and the Victorians* (1994) and Herbert Tucker's *Epic* (2008).

Wheeler examines *Festus* in terms of its attitude to judgement, and contrasts its optimistic, universalist theology with the more conventional, less inclusive narratives of Bickersteth and Pollock. He considers judgement in *Festus* and *Yesterday, Today and For Ever*, among other eschatological epics, to be 'integral to their grandiose cosmological explanations of God's whole providential scheme, before, during and after the course of *time*'.[89] In showing how Bailey's and Bickersteth's schemes differ, he highlights key points at which Bailey subverts the more conventional religious narrative. Tucker's work on *Festus* introduces the poem as a significant early example of the spasmodic epic. He argues that no other poem 'so fully heralded the era's manic overdrive'; that *Festus* captures the burgeoning and undiscriminating expansion of industry, empire, and ideology of the nineteenth century.[90] Tucker identifies the poem's open-mindedness and hopeful message of universal salvation as a necessary characteristic of spasmodic poetry. Milbank and Wheeler both identify a temporally-oriented narrative as a characteristic part of the Dante-esque style adopted by Bickersteth among others: yesterday, then today, and finally forever. Tucker argues that this temporal culmination is missing in spasmody and thus in *Festus*: 'Where there is no guilt and the only error is inhibition, time has no plotted significance beyond the steady accrual of experience as a uniform good'.[91] Tucker's view of the progress of the poem being based around 'accrual' rather than the advance of time captures and helps to explain the poem's sprawling structure.

Festus' metre

Festus is very loosely in blank verse; while it tends towards unrhymed iambic pentameter, line lengths frequently vary, usually to anything between tetrameter and heptameter, there are several rhyming sections, and Bailey tends to prioritise

[89] Wheeler, p. 101.
[90] Tucker, p. 348.
[91] Ibid., p. 341.

conveying information, and the right word for the line, over keeping iambic rhythm. Part of this irregularity might be explained by the sheer length of *Festus,* as well as the long time-span over which it was written and the accretive process by which it was formed, as keeping a consistent metre over eight hundred pages, fifty years, and seven significant expansions is likely to have been technically challenging or artistically unappealing.

The poem seems to contradict Kirstie Blair's preliminary premise in *Form and Faith in Victorian Poetry and Religion* that 'when Victorian poetry speaks of faith, it tends to do so in steady and regular rhythms; when it speaks of doubt, it is correspondingly more likely to deploy irregular, unsteady, unbalanced rhythms'.[92] With the exception of the choruses of Seraphim and Cherubim, who speak consistently in hymnal meter, all of the voices in the poem, including angels apart from the choruses, use the same irregular blank verse. God and Lucifer are metrically indistinguishable; similarly, the rhythms of Festus's throes of doubt and professions of faith tend to be equally irregular in form. There are, however, some faint trends to be found in the poem, though they do not correspond necessarily to faith in the ways that Blair suggests. In terms of rhyme, stories related to listeners by a single character are more likely to rhyme, such as when Festus describes his 'starflight' with Luniel in Section Twenty, and frequently when the various spirits and angels they meet introduce themselves. Those passages included later in the poem's development are also more likely to rhyme. However, these trends are not without exceptions; the sections of *The Angel World* that are added to the poem, which are a single speaker telling a story, do not rhyme, while Festus and Lucifer's high-speed tour around the world in Section Ten is conducted in intermittently rhyming dialogue. In terms of metre, shorter, declarative passages such as the Proem and God's final missive are more regular, while particularly exciting or emotionally intense moments are less so; form usually reflects the intensity of a speaker's emotion or experiences rather than the strength or otherwise of their religious feeling.

[92] Blair, p. 1.

Festus' 'Star-flight'

Typically of *Festus*, and similarly to Bailey's manifold modes of salvation, the poet attempts multiple, sometimes conflicting, considerations and conceptualisations of science at various points through the poem. One of the most arresting scientific episodes is related by Festus in section twenty, 'A Lake Islet', when he describes being taken to heaven by the angel Luniel, a journey termed 'the Star-flight of Festus and Luniel'.[93] In heaven, which is arrayed across stars and planets that are apparently in the observable universe, Festus and Luniel come across a plethora of famous historical figures. Each person they see is engaged in a higher form of the work they were engaged in while living, and in some cases, are shown with crimes expiated; for example Brutus and Caesar are shown together, 'firm friends' once more.[94] The figures are arranged roughly in order of eminence and spiritual purity as the pair move to more refined parts of heaven, and are presented in small groups organised generally by their significant work in life, for example there are various groups of classical politicians, historians, poets, philosophers and scientists. Four groups of scientists are depicted at various points through the journey; classical natural philosophers, then men who made significant discoveries concerned with the natural world, followed by physicists and astronomers, who get the most extended viewing, and finally six lines featuring three geologists.

The journey takes Festus and Luniel from outer to inner sections of heaven, and the groups of historical figures are accordingly encountered roughly in ascending order of their contribution to God's work. It is therefore a favourable comment on the importance of scientific pursuits to *Festus'* conception of Creation that even the first, and therefore apparently least, group of mathematicians and scientists are seen after historians, philosophers and spiritual leaders, and that the astronomers and geologists are both placed above even poets. The areas of Heaven where the sciences are pursued are 'Where demi-gods of science faith befriend; / And seek, their theories

[93] Bailey, p. 2.
[94] Ibid., p. 288.

proved, God's purpose to commend'.[95] In his descriptions of the scientific celebrities, Bailey takes one of the chief principles of natural theology, gaining knowledge or understanding of God through observation of the natural world, to a more literal level, where the figures he describes are often interacting directly with the divine, rather than interpreting God through nature and creation. Earthly boundaries between God and humanity have been lifted so that what is for Bailey the ultimate aim of science, connecting with God, becomes a directly communicative rather than an interpretive exercise.

Featured are scientific figures from throughout history, starting with the likes of Euclid and Archimedes. The work of each person is summarised in terms of how their discoveries contribute to God's work. Indeed, it seems that those who made discoveries in life now take an active part in maintaining and improving the principles they discovered, continuing their earthly work in the afterlife. For example, they see Lavoisier on a star, working hard:

> Lavoisier, there, the elements of all things
> Solves, and at will compacts, and their constituent springs
> From form crystalline and unmattered force,
> With delicacy divine tracks to its parent source.[96]

This quatrain is the entire description of Lavoisier in the afterlife. It is a typical treatment of all the scientific figures featured in this section, in that it offers a lavishly flattering snapshot of the scientist, and it directly connects the scientific work to a divine purpose before any question of conflict between the work and religion can be raised. Here, Bailey quickly reveals that Lavoisier does not just continue his life's research, but 'solves' it. This knowledge extends in the afterlife into an unearthly power to manipulate the elements, and ultimately to trace matter to its divine beginnings. The structure of this quatrain is typical of the scientific

[95] Ibid., p. 292.
[96] Ibid., p. 297.

snapshots, though the lengths of such descriptions vary: Bailey first identifies the person and their contribution to their field, then shows them continuing their life's research in Heaven, and finally gives their activity a clear devotional connection to show how it connects to God and His work.

Much as all schemes of salvation can exist at once in *Festus*, so too apparently can the theories of scientists 'all be proved' even when they directly oppose one other. This is clearest in the depiction of the geologists:

> Hutton, De Luc, there, Werner, many a globe
> Fire cored, rock-girdered, search; bent reverently to probe,
> In emulous love of sacred knowledge, all
> The secrets God hath shrined in every heavenly ball;
> And primary elements sought no more, all teach,
> God's plastic hand imparts virtue no natures reach.[97]

The geologists here, James Hutton, Jean-Andre Deluc and Abraham Gottlob Werner, were all influential, but Hutton and Werner in particular were directly opposed, as their respective views of the how the earth's crust was formed informed an ongoing debate. The controversy between Plutonism, theorised by Hutton, and Werner's Neptunism formed a debate which was dying out in favour of Plutonism around the time that *Festus* was first written. Plutonists and Neptunists held that the earth's surface was shaped by fire and water respectively, and the debate at the time did not allow for a compromise or synthesis of views.[98] Bailey acknowledges this controversy in describing their research as 'emulous', but he shows the two as equals, without making any comment upon the validity or other wise of either geologist's work. Rather, it is the passion of each man for his work that is important

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[97] Bailey, p. 310.
[98] Michael Allaby, *Earth Science: A Scientific History of the Solid Earth* (New York: Facts on File, 2009), 144-149; Rachel Laudan, 'Neptunism and Plutonism', in *The Oxford Guide to the History of Physics and Astronomy* (Oxford: Oxford University Press, 2005), 226-226 (p.226); Roy Porter, *The Making of Geology: Earth Science in Britain, 1660-1815* (Cambridge: Cambridge University Press, 1977).

in this passage, and Bailey diffuses any potential tension by emphasising that they are ultimately searching for the same thing, understanding of the 'secrets God hath shrined in every heavenly ball', rather than the 'primary elements' they sought in life. In doing this, Bailey removes the actual contention: how different types of rocks are structured and what that means for how Earth's surface was shaped, and instead shows the value of each geologist's work in their intentions rather than their theories. Rather than engaging with this scientific debate in any direct way, Bailey seems content to consider any theory formed in the search for more knowledge of Creation a good one, regardless of its accuracy or whether it conflicts with other scientific theories.

The metre of the above passage is typical of this episode as a whole; it is mostly iambic, but varying from five to seven feet. As discussed earlier, metre tends to indicate strength of emotion; in this context the irregularity reflects both Festus' excited emotions, and those of the inhabitants of the stars. As the new discoveries of the scientific figures expand the boundaries of human knowledge, so Bailey's descriptions of them push at the lengths of the lines, stretching the pentameter and using more, and unpredictable, feet. While these lines are chiefly iambic, only the final line is perfectly regular. The rest of the section, which is focused on the geologists, their task and motivations, has at least one anapaest on each line, for example:

x / x x / x / x / x /
In em | ulous love | of sa | cred knowl | edge, all,

The last line is the one in which God is most active and currently present, and accordingly the rivalry and drive to discover the secrets of Creation that pushed the other lines out of iambic rhythm are replaced by a much steadier, but still not totally regular, assurance of divine intervention:

x / x / x / x / x / x /
God's plast | ic hand | imparts | virtue | no nat | ures reach.

The presence of God's hand gives the rhythm of the line a stability that is not present in the rest of the passage, but still does not conform to iambic pentameter. In this case though, the long line suggests not a pushing of boundaries, but divine privilege, as the hand of God 'reaches' that which nature cannot. Similarly, the trochee, rather than setting the line off-balance as 'emulous' does in the previous passage, forces the reader to focus upon the key word 'virtue', as the unexpected long first syllable causes the rhythm to shift and slow. This metrical emphasis on God's 'virtue' reinforces its thematic centrality as a key part of the geologists' posthumous quest.

The passage with the most sustained focus on the sciences, comprising description of twelve people over seventy-four lines, begins by invoking a fictional character and a possibly mythical ancient logographer: 'Cadmus here, Faustus there, new modes devise / of symbolling thought unfixed' is populated with more contemporary scientists and natural philosophers, and chiefly those with an interest in physical sciences. It finishes with a similarly literary bent, suggesting that the universe offers 'In God's minuted acts studies for vastest minds.'[99] The section expands upon the idea explored broadly in 'A Lake Islet' that science has an indisputable position as a part of God's 'one central truth'.[100] The passage specifically considers that acts of science are or can be in themselves acts of worship and in some sense 'true', regardless of apparently technical accuracy as observed on Earth. Bailey directly equates truth, in this passage always divine truth, for 'God is truth, lo!', with science: 'Now, this world shows how truth with science sides; / Now, that'.[101] However, he again allows for contradictions and inconsistencies by allowing for everyone to be right, giving each world a chance to demonstrate that God's truth 'sides' with science in turn – 'Now, this' and 'Now, that'. Science and scientific laws in Bailey's heaven is as multiple as the modes of salvation to be found there, since 'all heavenly systems men devise, / Hath each true archetype in God's eternal skies.'[102] Although there are some 'essential verities', these are moral rather than

[99] Ibid., p. 307.
[100] Ibid., p. 306.
[101] Ibid., p. 306; p. 307.
[102] Ibid., p. 306.

physical truths, 'attracting good, repulsive of all ill' which in effect allow all scientific endeavours to be in some sense 'true' if they are pursued in the name of God.[103] The message, repeated with every example and every experiment, is that science could not possibly be at odds with God's plan, because God is both the source of truth and an attractor of truth, so any pursuit of truth through science is necessarily a pursuit of God.

As part of his project of establishing the connection between divine truth and scientific discovery, Bailey celebrates the inclusiveness of heaven, which naturally has none of the 'chill / Pressure of want, drear lack of culture, or sage will' that might have stunted budding students of science on Earth or otherwise prevented proper scientific development.[104] As part of this demonstration of the breadth of opportunities available to the souls, scientists who experienced censure of their work or personal persecution are mentioned, with Galileo and Copernicus both receiving multiple references as they explore the possibilities of their discoveries in an environment where almost anything is possible.

Although Bailey firmly establishes that in *Festus* all 'Godward' science is equal, and that science can directly reveal divine truths in heaven through the same means that it could interpret them on earth, he does give special precedence to the work of Flamsteed and LaPlace. Their work gets the longest description of all the projects in the passage at eight lines, and its divine outcome is the most in keeping with the divine ideal of science in *Festus.* They are able to discern solar orbits, and 'adduce of mechanism divine', but most importantly 'from one chief truth made know, / Light-wise, all worship spreads concentric around God's throne'.[105]

The sense of reassurance and faith in divine truth is supported by the rhyme scheme. Couplets, almost always in masculine rhyme, bring a sense of structure to a typically irregular meter. The diverse metrical feet and line lengths, as well as the

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[103] Ibid.
[104] Ibid.
[105] Ibid., p. 307.

exuberant punctuation, are brought together by the final syllable of each line having a clear, simple rhyme which can be followed despite rhythmic differences and lends a sense of unity to the passage. This reflects Bailey's central point in the passage that the many projects that the scientific souls are engaged in, despite being varied and sometimes at odds, are brought together by the thread of God's single central truth, a clearly traceable pattern visible through the apparent, almost chaotic level of variety on show.

Festus' literary universe

Opening the star-flight passage with a fictional character. Faustus, and a figure associated with words, Cadmus, depicted as they 'new modes devise / Of symbolling thought unfixed' establishes language and knowledge as key themes of the ambitious passage discussed above.[106] Associating science directly with words and language suggests that science is not just a means of understanding, interpreting and gaining knowledge of God, but also of recording and praising Him. The final line from the passage refers to 'God's minuted acts', thus bookending the section with references to writing, and reinforcing the idea of science as an act of recording, 'minuting', creation.[107] That this work can continue into the afterlife, as evidenced by the scientific activities Festus witnessed on his star-flight, suggests that the visible and the invisible are direct continuations of one another. The chief difference is the distinct refinement of the tools and aims of the scientific endeavours. This way of understanding the seen and the unseen, that one is a more refined version of the other, is echoed in an earlier literary metaphor, where Luniel speaks of the past, present and future as 'time's trilogy / The mighty drama of the Lord'.[108] Here the text being written is not human recording, but godly creation, yet the type of connection between the visible and the invisible which each describe are very similar. 'The world' and 'heaven' are again seen as two parts of a synthesised whole; in this case

[106] Ibid.
[107] Ibid.
[108] Ibid., p. 228.

'The world is God's broad word, whose sense is heaven'.[109] Thus rather than being completely separate, the 'world' and 'heaven' are simply different levels of the same project, namely the 'mighty drama of the Lord', with the gist of God's word offered by the world, and the precise meaning available in heaven.

A use of literary metaphor that suggests a different relationship between the earthly and the divine can be found in one of Festus' frequent speeches outlining various cosmological models. In this particular iteration, the universe consists of 'Two books', one of material things, in which 'The elements exist as leaves [...]; worlds / as symbols', and the other of 'elements divine' that includes 'human heaven and the soul'.[110] This analogy represents a rare attempt at outlining a division between the mundane and divine, as elsewhere in the poem the dead and the living often mingle, and the afterlife seems to take place at least in part on real stars.[111] The 'two books' here appear to be separate companion pieces, rather than a series as 'time's trilogy' is; as the divide between the books is thematic rather than temporal, the means to traverse between the two is not as clear as in the two earlier literary images. Thus, an examination of literary metaphor alone offers at least two different versions of the relationship between the seen and the unseen as written by Bailey. The visible, scientifically understood portion of the universe can be a site from which to understand and record God's invisible work – to 'minute' it. Alternatively, or simultaneously, the visible and the invisible can be part of an increasingly finely developed journey in which science does not necessarily cease to be a useful tool. A final reading of the universe views the visible and the invisible as connected but divided.

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[109] Ibid.
[110] Ibid., p. 324.
[111] A discussion and history of the 'two books' and 'book of nature' can be found in Olaf Pedersen, *The Two Books: Historical Notes on Some Interactions Between Natural Science and Theology*, ed. by George V. Coyne, S. J., and Tadeusz Sierotowicz (Notre Dame: University of Notre Dame Press, 2007).

Conclusion

The scope offered by the eschatological epic, in terms of both physical length and the type of story epic permits, provided non-scientific Victorians with an important space in which to explore the relationship between science and religion. This space does not necessarily assume conflict between science and religion, but rather tends to treat them as having separate cosmologies that can be combined, separated, or allowed to run parallel. *Festus* and *Yesterday* each propose different interrelations between scientific and religious world views. For *Festus*, no permanent boundaries exist between any given world view; each is permitted to co-exist, regardless of contradiction or disagreement between any two ideas. Similarly, Bailey places no meaningful divide between physical and spiritual worlds, suggesting that science can assist the Victorians in understanding God in quite a literal way. Meanwhile, *Yesterday* does construct a distinction between the physical and spiritual, suggesting science as an analogical tool by which humans, not having the proper tools otherwise, begin to comprehend the divine.

Conclusion

I have considered here a range of scientific treatises and poems which engage with key moments of interaction between Christian and scientific cosmologies. Each chapter has been an act of recovery, returning to contemporary critical attention works which were generally extremely successful at their time of publication. *Of the Plurality of Worlds* and particularly *More Worlds than One* have received almost no academic attention in the last twenty-five years, while *Festus* and *Yesterday and Forever* have experienced similar, if less chronic, neglect. *The Unseen Universe* and the poetry of James Clerk Maxwell are both beginning to enjoy more consideration in the field of literature and science, but existing work is still relatively rare. While Gerard Manley Hopkins' work has enjoyed some thorough thermodynamic readings, his poetry has never been considered alongside that of a scientist, and Edward Young is read rarely within eighteenth century circles, and no attention has been paid to the afterlife of *Night Thoughts*. This group of works, despite their relative obscurity, demonstrate important connections between science, religion and literature which aid our understanding of how Victorians negotiated perceived challenges to Christian cosmologies from scientific developments.

I have aimed to demonstrate that although religious poetry has often been excluded from studies of Victorian poetry and science, this genre can offer crucial insights into the interpenetration of science, poetry and theology. The boundaries of these three disciplines were blurred for many Victorians, but have become more sharply delineated in modern scholarship. I argue that studying all three together and tracing their interrelation permits a more full and nuanced understanding of Victorian cosmologies. I have focused in my thesis upon three chief cosmological questions: the future of the universe in light of Victorian understandings of the laws of

thermodynamics; the presence, or not, of a divide between the spiritual and earthly realms, with or without the aid of ether; and the existence or otherwise of extraterrestrial life. Examination of each of these topics can benefit from the three-way approach I have taken, considering together literature, theology, and a science. Two of these topics have lost their scientific-theological urgency since the nineteenth century: entropic apocalypse and the existence of extraterrestrial life are no longer sites of much anxiety, especially not the simultaneously religious and scientific angst which characterised the Victorian reactions I have considered. The third, ether, is scientifically defunct. However, each topic is important for helping us to understand how Victorians positioned themselves in relation to God.

While epic poetry and scientific treatise are rarely, if ever, read together, I have demonstrated that the two genres share affinities which permit useful joint analysis. Both genres provide important discursive spaces to make connections between disparate topics, particularly of science and religion. Each genre explores similar weighty existential questions, and I have demonstrated at least some amount of mutual readership. The chief distinction is usually the backgrounds of the authors in each genre; poets, often without formal scientific education, write the eschatological epics, while the writers of scientific treatises do have such an education. However, what all of the writers I discuss share is a profound religious, normally Christian, belief. By offering similar opportunities but with different disciplinary priorities, study of each genre helps to illuminate the other.

My thesis suggests several routes for further work, some general and others more specific. Although I considered mainly astronomy in *Festus,* the sprawling nature of the work would lend itself well to further analysis of the poem in relation to other sciences, and particularly geology. Further study could be made of electricity and morality in *Yesterday, Today and Forever*, potentially in contrast to the same topic in *The Unseen Universe*. My approach could also usefully be applied to other eschatological epics, such as *The Course of Time* and *The Year of the World*. While I focused upon the two most prominent participants in the cosmic plurality debate, Whewell and Brewster, several other treatises were contributed to the debate, and a literary analysis of these further texts could provide useful insight into the cultural

impact of the debate. I hope that my thesis has made some contribution to helping this kind of work develop.

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