University of Chichester

Department of English and Creative Writing

Refracted Worlds:

Imagining Life on the Moon in the First Age of the Telescope

by

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Thesis for the Degree of Doctor of Philosophy

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UNIVERSITY OF CHICHESTER

ABSTRACT

DEPARTMENT OF ENGLISH AND CREATIVE WRITING

Thesis for the degree of Doctor of Philosophy

REFRACTED WORLDS: IMAGINING LIFE ON THE MOON IN THE FIRST AGE OF THE TELESCOPE

Nicola Jane Atkins

This thesis explores the relationship between seventeenth-century literary and philosophical representations of life on the moon, and the development of the telescope. Existing criticism has generally examined either the telescope or the literature. This thesis contributes to knowledge by, firstly, providing an in-depth textual comparison which proposes the publication of Galileo's *Sidereus Nuncius* (1610) as a point of significant change; and, secondly, by examining the complexity of the telescope's relationship with these moon-life representations.

Focusing initially on the characteristics of European depictions of life on the moon, this study draws a distinction between those published before *Sidereus Nuncius*, such as Plutarch's *Concerning the Face which Appears in the Orb of the Moon* (c. 1st century AD) and Lyly's *Endimion* (1591), and those published later, such as Godwin's *The Man in the Moone* (1638) and Huygens's *Cosmotheoros* (1698). The later texts present the moon as a material, geographical location, and lunar beings as increasingly human-like. Growing elements of exploration and empirical realism are also demonstrated. The focus then narrows to English representations in order to investigate the factors which contributed to their distinctive nature in this period. Aside from Godwin, texts by Donne, Jonson, Burton, Wilkins, Butler, Behn and Settle are examined. Potential influence from Galileo's telescopic work is considered alongside travel, literature, social change, and evolving attitudes to natural philosophy. The development of the telescope during the seventeenth century is then investigated by examining the influencing factors of exploration and conflict, the growth of experimentalism, astronomical practice, and the cultural imagination. This includes a study of the engagement of six natural philosophers, including Robert Hooke and Isaac Newton, with the concept of life on the moon.

The research concludes that depictions of life on the moon enjoyed a truly mutual relationship with the telescope between the publication of *Sidereus Nuncius* and the end of the seventeenth century. Despite the relatively short lifespan of this complex bond, both elements became deeply embedded within the English cultural imagination and were not only responsible for the ways in which they each developed during this period, but also instrumental in a changing perception of the universe.

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Declaration of Authorship

I, Nicola Jane Atkins, declare that the thesis entitled *Refracted Worlds: Imagining Life on the Moon in the First Age of the Telescope* and the work presented in the thesis are both my own, and have been generated by me as the result of my own original research. I confirm that:

- this work was done wholly or mainly while in candidature for a research degree at this University 2015-2017, and previously at the University of Gloucestershire 2010-2015;
- where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
- where I have consulted the published work of others, this is always clearly attributed;
- where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
- I have acknowledged all main sources of help;
- where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
- none of this work has been published before submission.

Signed: ……..

Date:…….

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Acknowledgements

This thesis is the result of a single light bulb moment in an undergraduate literature seminar, where I realised that science and literature are not two separate entities but parts of a complex and vital whole. That moment stayed with me for many years and formed the tiny seed at the centre of this research.

I would particularly like to thank Dr Rebecca Bailey and Professor Simon Barker for their help in refining my ideas and bringing this thesis to fruition. It has been a long, long road, with numerous bumps, and their unstinting guidance and endless encouragement has been nothing short of invaluable. I am also grateful to the University of Chichester, who welcomed me into the fold part-way through my PhD candidacy, allowing me to keep my fantastic supervisory team together in the closing stages of my research.

On a personal note, thank you to my friends and family who were persistent, but gentle, in asking how things were going. Thank you, Mum, for your support and translation. Thank you, Elliott, for your support, technical assistance, and bucket-loads of patience. Thank you, Colonel, for teaching me about the art of relaxation.

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Notes on the Text

For ease of reference, and to improve the flow of the text, the phrase 'moon literature' has been used as a shorthand replacement for 'seventeenth-century representations of life on the moon in literature and philosophy' in a number of places. If a subset of depictions is specifically being referred to, the phrase will be qualified appropriately, e.g. 'English moon literature'.

The terms 'Man' and 'Mankind' have been used deliberately in this thesis to draw a parallel with the usage of this term during the seventeenth century. The term as it was used then was inclusive of all genders and ages; nevertheless there were certain rules and structures in that society which are not the same in today's society. Usage is intended to reflect those differences and to avoid the use of anachronistic terms that imply different social conventions. Where any issues are discussed in terms of a society as we would understand it today, the more contemporarily acceptable terms 'human' and 'humankind' have been used.

The terms 'science', 'natural philosophy', and their derivatives, have been used equally throughout this thesis. Whilst recognising the difference between modern scientific activities, and the practices of seventeenth-century natural philosophers, this usage is intended as an acknowledgement that these both form points along the spectrum of knowledge creation through observation and experiment, as distinct from earlier rationalist and authority-based practices.

It is known that *Sidereus Nuncius* was first published on 13 March 1610.[1] However, the publication date is referred to throughout as simply 1610. None of the key texts analysed

[1] Maurice A. Finocchiaro, *The Essential Galileo* (Indianapolis: Hackett Publishing Company, 2008), p. 18.

by this research were published in the same year, so the potential for confusion is minimal.

Non-English works are referred to in the text by their original title, even if the English translation used for analysis has a substantially different title. For example, the modern edition of Cyrano de Bergerac's *L'Autre Monde, ou Les États et Empires de la Lune* that I have used has been given the title *Journey to the Moon*, which is not a direct translation of the original. Greek titles are an exception to this practice. In order to maintain the flow of the text for readers without a familiarity with Greek, an English translation is given at first point of citation and subsequent references will use this translation of the title. Christiaan Huygens's work will be referred to as *Cosmotheoros*, as this Latinised title appears in the first edition, following the preface 'To the Reader'. Wherever possible, Greek titles are given as they appear in the edition used for analysis; exceptions to this are stated on an individual basis.

The MHRA Style Guide (3rd edition, 2013) has been used for the footnotes in this thesis, with the exception of the following deviations:

1. All page and line references have been footnoted rather than being included in the main body of the text. This has been done to keep the text as clear and uninterrupted as possible.
2. Footnote numbers have been attached to Chapter headings to allow for clear and correct citation of the quotations used in this context.
3. As two editions of Francis Godwin's *The Man in the Moone* have been used, these are differentiated by date of publication rather than short title, in order to avoid confusion.

PART ONE

Introduction

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Introduction

Yet not forever do the Spirits tarry upon the moon

Plutarch, 1st century AD[1]

What if within the Moones fayre shining spheare
What if in every other starre unseen
Of other worlds he happily should heare

Spenser, *The Faerie Queene*, 1590[2]

Winston Churchill's Essay on Alien Life Found

Headline from *Nature*, 2017[3]

The moon has drawn the human gaze and been a focus of our speculation for centuries. From as early as the 1st century AD, there is written evidence that philosophers, poets, and even politicians, have pondered the possibility that we may not be alone in the universe. This interest in both the moon and extraterrestrial life has not faded with time. In the summer of 2017, news articles announced the discovery of Earth-like planets and the detection of large amounts of water under the surface of the moon.[4] The human race is still wondering with whom, or what, we may be sharing the cosmos.

[1] Plutarch, 'Concerning the Face Which Appears in the Orb of the Moon (De Facie Quae in Orbe Lunae Apparet)', in *Plutarch: Moralia*, ed. by Jeffrey Henderson and Harold Cherniss (Cambridge, Massachusetts: Harvard University Press, 1957), XII, 1–223 (p. 211).
[2] Edmund Spenser, *The Faerie Queene* (London: John Wolfe for William Ponsonbie, 1590), p. 186 (Opening to Book II).
[3] Mario Livio, 'Winston Churchill's Essay on Alien Life Found', *Nature*, 542.7641 (2017), 289–91 (p. 289).
[4] See, for example: 'Nasa's Kepler Telescope Finds 10 Earth-like Planets: "We Are Not Alone"', *The Guardian* (London, 20 June 2017) <https://www.theguardian.com/science/2017/jun/20/we-are-not-alone-nasa-telescope-finds-10-earth-like-planets> [accessed 13 August 2017]; Sarah Knapton, 'Lunar Colonies Take a Step Closer to Reality as Large Amounts of Water Are Found under the Moon's Surface', *The Telegraph* (London, 24 July 2017) <http://www.telegraph.co.uk/science/2017/07/24/moon-has-water-surface-could-extracted-colonists-scientists/> [accessed 13 August 2017]; Nicola Harley, 'Scientists Discover Two Potentially Habitable "Super-Earth" Planets Just 12 Light Years Away', *The Telegraph* (London, 10 August 2017) <http://www.telegraph.co.uk/news/2017/08/09/scientists-discover-two-habitable-planets-hailing-optimal-targets/> [accessed 13 August 2017].

Over time, the shape of human speculation about the moon has changed. The various cultures who have gazed up into the night sky have imagined a variety of spirits, goddesses, or monsters looking back at them. However, I would argue that the most significant change in English lunar imaginings took place in the early seventeenth century. Instead of the Man-in-the-Moon of folklore, or the romantic realm of fair Cynthia, this period saw the moon transformed into a place where societies of beings could live. A place where, perhaps, an adventurer could stake his claim on a new world. Just prior to this change, in 1610, a small book was published in Venice that described a number of amazing discoveries which had been made with a brand new piece of technology. The book was *Sidereus Nuncius*, and it had been written by Galileo Galilei about his recent work with the telescope. In this slim volume, Galileo described mountains on the moon, a multitude of stars in the Milky Way, and four new planets orbiting Jupiter: astounding ideas that, according to contemporary thinking, should have been impossible.

This thesis aims to explore the complex relationship between the development of the telescope and representations of life on the moon in the seventeenth century. It takes the publication of *Sidereus Nuncius* as a key point in the telescope's history: the first time that a report of astronomical observations made with a telescope were published and, effectively, made available to the world. I propose that, following this publication, and its popular introduction of the telescope for astronomical purposes, English literary and philosophical depictions of life on the moon fundamentally changed. Furthermore, this was inextricably linked to the development of the telescope: not only influenced by the use of the telescope, but also at least partially responsible for the direction in which this new instrument began to develop. Indeed, I would suggest that *Sidereus Nuncius* can be regarded as a prism at the centre of a cultural refraction of both the telescope, and the concept of life on the moon as depicted in seventeenth-century literature, drama, and philosophy, responsible for setting each of these onto a new path and altering their future development.

The very nature of this research pre-supposes an approach which considers the historical and cultural context of the material being explored. As such, this project will maintain the position that culture is complex and interconnected, simultaneously created by and feeding into multiple discourses. The implication of this is that scientists, as much as

writers, can be influenced by ideas that exist within their own culture's imagination.[5] Literature and science are just two of the discourses, amongst many, which make up the context of any particular cultural and historical moment. While the focus of this thesis is on just a single example from each of these two discourses during the seventeenth century, this approach allows a potentially fruitful exploration of their relationship to take place. Furthermore, this perspective is particularly appropriate for treating seventeenth-century material as it engages with the contemporary approach to different cultural discourses. Today's familiar disciplinary boundaries and priorities simply did not exist, meaning that there were no intellectual barriers to seeing potential relationships between different parts of the culture. Indeed, the very beginnings of an intellectual split in disciplines can be detected in one of the latest texts considered in this research, Christiaan Huygens's *ΚΟΣΜΟΘΕΩΡΟΣ* (*Cosmotheoros*), which will be discussed in Chapter 2.[6]

The critical approach that I use in this thesis does not fit entirely into existing schools of literary thought. The significance of cultural and historical context to my work demonstrates that I draw most strongly on the closely related critical perspectives of cultural materialism and new historicism. Both of these consider literature within its broadest cultural context, although while new historicism focuses on the historically related context of the text, cultural materialism also examines the way in which a text is received and critiqued today. However, I hesitate to label my approach as being precisely situated in either one of these theoretical practices for two reasons. Firstly, cultural materialism can be characterised by its overarching politicality: a desire to unpick the very construction of critical practices in order to surface previously hidden elements, the marginalised and the exploited, and to bring them into focus. This thesis makes no claims to such political motives. Secondly, although identifying most strongly with a new historicist approach, I have rejected the granular level of specificity with which it is usually associated. Although examining individual texts as the basis of my research, I have

[5] See, for example, Cheryl A Kerfeld, 'When Art, Science and Culture Commingle', *PLoS Biology*, 7.5 (2009), 1–3 (p. 1) and David Knight, 'Religion and the "new Philosophy"', *Renaissance and Modern Studies*, 26.1 (1982), 147–166 (pp. 148 and 163).

[6] Christiani Hugenii, *ΚΟΣΜΟΘΕΩΡΟΣ, Sive De Terris Cœlestibus, Earumque Ornatu, Conjecturæ* (Hagæ-Comitum: Adrianum Moetjens, 1698). The Greek title given in the text is taken from this edition, but the first English translation will be used for analysis throughout.

chosen to situate much of my analysis at the level of textual genre in order to identify commonalities, as well as differences, between the works as they appear in various periods of time: for example, before and after the publication of *Sidereus Nuncius*, or either side of the Interregnum. In turn, this has allowed me a wider view of the evolution of these texts through the seventeenth century, and provided the opportunity to scrutinise the telescope's development in parallel.

The origins of today's study of literature and science lie in division rather than unity. Famously, this division was expressed by C.P. Snow's 1959 Rede Lecture, ever after known as his 'Two Cultures' speech. His speech characterised scientists and literary scholars as two very different types of people, who had nothing in common, and could barely communicate.[7] In reality, Snow was simply articulating an academic paradigm that had been in place since the nineteenth century, and which, to a greater extent, still exists today in the choice that many schoolchildren are required to make between the sciences and the humanities.[8] However, even as Snow made his speech, the first wave of literature and science criticism was already underway. This was typified by the work of such critics as Marjorie Nicolson, who examined the impact of scientific ideas on seventeenth- and eighteenth-century literature.[9] More recent scholarship in the area has taken a less unidirectional, and therefore less restricted, approach, with literature no longer being seen as a mere reflector of scientific practices; rather, as Howard Marchitello has stated, 'science and literature are set in a creative dialectic with each other that [...] helps to offer a more powerful understanding of the dynamic between these two complexly related cultural practices'.[10] In the same article, Marchitello goes on to highlight a 'revolution in science studies', which took place throughout the 1950s culminating with Thomas S. Kuhn's publication of *The Structure of Scientific Revolutions* in 1962, as one of the major causes of this secondary wave of literature and science

[7] C. P. Snow, *The Two Cultures and the Scientific Revolution: The Rede Lecture 1959* (New York: Cambridge University Press, 1961).
[8] N. Katherine Hayles, 'Literature and Science', in *Encyclopedia of Literature and Criticism*, ed. by Martin Coyle (London: Routledge, 1991), pp. 1068–1081 (p. 1068).
[9] See, for example, Marjorie Nicolson, *Science and Imagination* (Ithaca: Great Seal Books, 1956) and Marjorie Hope Nicolson, *The Breaking of the Circle: Studies in the Effect of the 'New Science' on Seventeenth-Century Poetry* (Evanston: Northwestern University Press, 1950).
[10] Howard Marchitello, 'Science Studies and English Renaissance Literature', *Literature Compass*, 3.3 (2006), 341–365 (p. 341).

criticism.[11] Kuhn's seminal work introduced two particular ideas that are fundamental to the new historicist approach and, therefore, go some way to explaining the wide use of this perspective in second wave literature and science studies. Firstly Kuhn outlined the idea of progress taking place in a complex and incoherent way, rather than in a steady and cumulative manner. He concluded that the production of knowledge takes place in communities that 'implicitly provide the boundaries and the vocabularies within which investigation may take place and also condition the kinds of questions which might be posed'.[12] This paradigm thus controls how the communities seek knowledge until such time as it is no longer adequate and cannot account for new findings. At this point a paradigm shift takes place: not a continuation of the ordered, disciplined path of consolidating new data into accepted models and refining existing knowledge, but a chaotic process of uprooting the existing paradigm and devising a new one that can take its place. Secondly, Kuhn introduced the idea that everyone has their own bias which impacts the way in which they view and interpret the world around them. While exploring how paradigm shifts came about, Kuhn demonstrated that science could not be isolated from its place in history and society, just as it could not be separated from the individual scientists carrying out the work: '[a]n apparently arbitrary element, compounded of personal and historical accident, is always a formative ingredient of the beliefs espoused by a given scientific community at a given time'.[13] As Michael Crotty has stated in his work on social research: 'scientific endeavour, as Kuhn conceives it, is a very human affair. Human interests, human values, human fallibility, human foibles – all play a part'.[14] This is a position that this research will maintain throughout. However, it is particularly important in my discussion of natural philosophers' engagement with cultural imagination in Chapter 8. Furthermore, it contributes to the decision to explore personal ideas and influences in preference to formal, published, works, in order to connect more directly to the 'human' element of telescope development. In terms of the study of science and literature in the UK, both the development in approach, and the growing

[11] Ibid., p. 350.
[12] *Modern Literary Theory: A Reader*, ed. by Philip Rice and Patricia Waugh, 4th edn (London: Bloomsbury Academic, 2013), pp. 2-3.
[13] Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 50th anniversary edn (Chicago: University of Chicago Press, 2012), p. 4.
[14] Michael Crotty, *The Foundations of Social Research: Meaning and Perspective in the Research Process* (London: Sage publications, 1998), p. 36.

establishment of the field, have solidified in the last decade or so. 2006 saw the formation of the British Society for Literature and Science (BSLS) to promote 'interdisciplinary research into the relationships of science and literature in all periods'. The first inclusion of a chapter for 'Science and Medicine' in *The Year's Work in Critical and Cultural Theory* followed in 2012.[15]

In the more specific area of criticism in which this thesis is situated, a number of publications have dealt with either the history of the telescope, or depictions of life on the moon.[16] However, a substantial connection between these two bodies of work has been largely absent. The only work focused on the history of the telescope that I have come across which treats the instrument's cultural engagement is Richard Dunn's 2009 book, *The Telescope: A Short History*.[17] Dunn dedicates one chapter to the telescope's impact on the imagination, recognising that beyond practical applications of the technology, 'its influence extended deeper into seventeenth-century culture'.[18] The chapter touches on art, broader concepts of the universe, and literature. Dunn's very brief literary discussions include works by Donne, Kepler, Jonson, Godwin, Wilkins, Behn and Butler which are discussed in this thesis, but also mention others, such as Henry Power's *Experimental Philosophy* (1664) and John Vicars's *A Prospective Glasse to Look into Heaven* (1618) which do not deal with the concept of an inhabited moon. Within the restrictions of a single short chapter, there is little room for analysis of these texts. Dunn goes into no depth on the topic beyond an appreciation that 'the telescope and its discoveries accompanied a new realism in astronomical description and an awareness of the expanded universe. This included renewed speculations about the possibility of life on other planets'.[19]

The majority of scholarship on this topic, then, is to be found in works which do not use the telescope as a starting point. Frédérique Aït-Touati examines some of the same texts

[15] Statement taken from the BSLS website <https://www.bsls.ac.uk/> [accessed 15 June 2017]; Andrew Mangham, 'Science and Medicine', *The Year's Work in Critical and Cultural Theory*, 20.1 (2012), 320–33.
[16] For the history of the telescope, see in particular Albert Van Helden's body of work on the origins of the telescope and its seventeenth-century development, but also other authors including Isaac Asimov (1976), Silvio Bedini (1994), Henry C. King (1955) and Patrick Moore (1997).
[17] Richard Dunn, *The Telescope: A Short History* (Greenwich: National Maritime Museum, 2009).
[18] Ibid., p. 45. The chapter I refer to is 'Chapter Three: The Telescope and the Imagination 1608-1700', pp. 44-54.
[19] Ibid., p. 49.

as those discussed by this thesis, and highlights 'the interrelation between textual and material technologies' in her book *Fictions of the Cosmos*.[20] However, the telescope is only one of the instruments she alludes to amongst others, such as astrolabes, globes and armillary spheres, and she does not suggest that this tool, in particular, played a key role in those texts. Moreover, Aït-Touati specifically excludes Galileo's *Sidereus Nuncius* from her analysis, not only for reasons of chronology, but also because this text avoids 'the question of whether other planets might be inhabited'.[21] This is a key concept for my research, but the lack of the concept's appearance in *Sidereus Nuncius* does not reduce the significance of this text's impact on subsequent works which do consider this idea. Aït-Touati explains her decision to exclude Galileo's work by asserting that '[t]his avoidance is the sign of a refusal to make the imagination and fiction the tools of cosmological thinking and to focus instead on the telescope'.[22] In contrast, I consider that *Sidereus Nuncius*, and the telescope in its earliest form, were both heavily reliant on imagination, and the techniques of fiction, as a way to communicate their results and conclusions, which I discuss in Chapters 5 and 6.

Other critics have approached the seventeenth-century concept of life beyond Earth without referring to Galileo or the telescope at all, or merely remarking upon them in a reasonably minor way. A number of these works have approached the concept from the perspective of a particular theme. For example, Adam Roberts, in his history of science fiction, and David Cressy, in his article on early modern space travel, both focus tightly on the period's religious tensions as a way of examining its depictions of lunar habitation and multiple worlds.[23] Roberts particularly dwells on an opposition between 'competing cosmic discourses [...] separating themselves into rationalist Protestant and ritualist-

[20] Frédérique Aït-Touati, *Fictions of the Cosmos: Science and Literature in the Seventeenth Century*, trans. by Susan Emanuel (Chicago: University of Chicago Press, 2011), p. 7. The discussed texts which overlap with this research are Kepler's *Somnium* (1634), Francis Godwin's *The Man in the Moone* (1638), *The Discovery of a World in the Moone* by John Wilkins (1638), Cyrano de Bergerac's *L'Autre Monde, ou Les États et Empires de la Lune* (1657), Fontenelle's *Entretiens sur la Pluralité des Mondes* (1686), and *Cosmotheoros* by Christiaan Huygens (1698). Aït-Touati also examines texts which are less central in my work, such as Robert Hooke's *Micrographia* (1665), and texts which I do not discuss at all, such as Hooke's *An Attempt to Prove the Motion of the Earth* (1674).

[21] Ibid., p. 9.

[22] Ibid.

[23] Adam Roberts, *The History of Science Fiction* (Basingstoke: Palgrave Macmillan, 2005) and David Cressy, 'Early Modern Space Travel and the English Man in the Moon', *American Historical Review*, 111.4 (2006), 960–98. Cressy's article has also been reprinted in *Literature in the Age of Celestial Discovery: From Copernicus to Flamsteed*, ed. by Judy A. Hayden (Basingstoke: Palgrave Macmillan, 2016), pp. 45-73.

magical Catholic religious idioms', limiting himself to an analysis of only the religious implications of Copernicus's work.[24] Similarly, his brief discussions of Godwin's *The Man in the Moone* and Wilkins's *The Discovery of a World in the Moone*, both focus exclusively on religious moments: the Lunars' reaction to Gonsales's exclamation of 'Jesus Maria', and Wilkins's concern over the religious status of possible moon beings. While these moments, and the religious aspects of these two texts, are certainly significant, each work encompasses a greater complexity than Roberts allows for in his rapid treatment of them. I would also note that, despite stressing 'the importance of the development of the discourses of "science" through the seventeenth century', Roberts omits both Galileo and the telescope from his discussions.[25] In contrast, Cressy sets out deliberately to locate the seventeenth-century lunar texts he discusses 'within the cultural and religious context of Stuart and Revolutionary England', setting aside their potential places within the history of science.[26] Nevertheless, Cressy still references Galileo's work and the telescope as part of the wider cultural picture, although merely as part of a 'new stimulus' rather than having any greater central significance.[27] Similarly to Roberts, Cressy focuses on the works of Godwin and Wilkins, although he notes the subtle differences between the 1638 and 1640 editions of *The Discovery of a World in the* Moone. Despite a stated intention to situate these texts culturally, Cressy's work focuses on discussions of the soteriological status of moon inhabitants and the religious anxieties expressed through the texts on this issue. I discuss these anxieties further in Chapter 2. Other scholars, such as Philip Almond and Alexandre Vigne, have approached the topic from a theological perspective by discussing the parallel problems for Christian doctrine caused by potential non-Earth inhabitants, and by those real inhabitants recently discovered in the New World.[28] Nathaniel Wolloch has explored a variation on this theme by examining the connection between early modern attitudes towards animals and towards the possibility of

[24] Roberts, p. 42.
[25] Ibid., p. 59.
[26] Cressy, p. 962.
[27] Ibid., p. 963.
[28] Philip Almond, 'Adam, Pre-Adamites, and Extra-Terrestrial Beings in Early Modern Europe', *Journal of Religious History*, 30.2 (2006), 163–174, and Alexandre Vigne, 'Extraterrestrials of the New World', *Diogenes*, 48.1 (2000), 48–57.

extraterrestrial life from the perspective of 'development of an anthropocentric outlook in western culture'.[29]

Mary Baine Campbell examines three texts considered in my thesis in terms of the ethnography of the impossible voyage: Kepler's *Somnium*, Godwin's *The Man in the Moone* and, most particularly, Cyrano de Bergerac's *L'Autre Monde, ou Les États et Empires de la Lune*.[30] I would dispute some of Campbell's textual observations: for example, that Godwin's Lunars 'have institutionalized a biological or racial prejudice against the small inhabitants of the Moon, who are in fact changelings from "the North of America" [...] and who serve the native giants as slaves'.[31] However, she does make some interesting remarks on both the 'categories' used as a way to organise travel literature around this period, and on the advantages of using the moon as a destination, rather than any part of the terrestrial New World, both of which I discuss further in Chapter 3. It is worth noting that, again, Galileo is only mentioned in passing: Campbell makes two very minor references to Galileo's trial as a comparison with the trial scene in *L'Autre Monde*. Neither the telescope nor *Sidereus Nuncius* feature in her article.

The final theme I would like to draw out of existing criticism in this subject area is lunar cartography and nomenclature. My thesis touches on this briefly in Chapter 7 from the perspective of colonial ambition, but Scott L. Montgomery has used this theme as a central thread to bind together the arguments in his book, *The Moon and the Western Imagination*.[32] Although Montgomery posits the telescope as responsible for changing the way in which the moon was drawn and, therefore, how it was perceived in a geographical sense, he states that the telescope 'was not the absolute determining factor we often conceive it to have been'.[33] However, Montgomery also investigates 'literary explorations of lunar geography' and makes the significant connection between literature and the cultural imagination: 'literary impulse seems to have been a crucial means by which the new universe of Earth-like planets and countless stars was made part of the

[29] Nathaniel Wolloch, 'Animals, Extraterrestrial Life and Anthropocentrism in the Seventeenth Century', *Seventeenth Century*, 17.2 (2002), 235–253 (p. 235).
[30] Mary Baine Campbell, 'Impossible Voyages: Seventeenth-Century Space Travel and the Impulse of Ethnology', *Literature & History*, 6.2 (1997), 1–17.
[31] Ibid., p. 5.
[32] Scott L. Montgomery, *The Moon and the Western Imagination* (Tucson: The University of Arizona Press, 1999).
[33] Ibid., p. 115.

ambient culture'.[34] The texts explored here include works by Jonson, Kepler, Godwin, Cyrano de Bergerac and, rather more briefly, Wilkins. Montgomery surmises that such works borrowed 'generously' from three specific sources: *Sidereus Nuncius*, fantasy-utopian literature and accounts of New World travel. However, there is no in-depth analysis to test this statement further.[35] These are all sources which are investigated in this thesis, alongside a number of others, within the chapters contained in Part Three.

Two substantial surveys of the concept of extraterrestrial life and the related debate on the plurality of worlds, must be included here, despite their lack of engagement with literary texts. Grant McColley's 1936 article 'The Seventeenth Century Doctrine of a Plurality of Worlds' traces the history of this hypothesis from Greek thought through to its seventeenth-century manifestation, acknowledging the 'powerful impetus' of the telescope, particularly in terms of the apparent infinity of the universe.[36] In contrast, Steven Dick's investigation of the debate on extraterrestrial life focuses on a range of seventeenth-century natural philosophy texts, including those by Giordano Bruno, Kepler, Wilkins, Bernard le Bovier de Fontenelle, and Huygens.[37] Dick touches on the 'limitations of observation' in this area, discussing the huge influence of theology and metaphysics on interpretation of observed phenomena.[38] Observation during this period was also limited in ways other than subjective interpretation and this is considered in Chapter 6 as part of my exploration of *Sidereus Nuncius*. However, the influence of existing knowledge and experience on interpretation is a theme which is important in terms of an individual's creativity. I expand upon the significance of this in terms of both the composition of representations of life on the moon, and the development of the telescope, in Parts Three and Four of this thesis. More minor surveys of these debates have been produced by Tibor Herczeg (2000) and Frank Tipler (1981), both of whom also touch on seventeenth-century natural philosophy texts, such as those by Kepler and Fontenelle.[39] However,

[34] Ibid., p. 135.
[35] Ibid., p. 138.
[36] Grant McColley, 'The Seventeenth-Century Doctrine of a Plurality of Worlds', *Annals of Science*, 1.4 (1936), 385–430 (p. 415).
[37] Steven J. Dick, 'The Origins of the Extraterrestrial Life Debate and Its Relation to the Scientific Revolution', *Journal of the History of Ideas*, 41.1 (1980), 3–27.
[38] Ibid., p. 13.
[39] Tibor Herczeg, *The Habitability of the Moon*, ASP Conference Series: A New Era in Bioastronomy (Hawaii: Astronomical Society of the Pacific, 2000), and F. J. Tipler, 'A Brief History of the Extraterrestrial Intelligence Concept', *Quarterly Journal of the Royal Astronomical Society*, 22 (1981), 133–145.

neither of these makes any real connection with the impact of the telescope.

Despite neither McColley nor Dick engaging with literary texts themselves, they both gesture towards literary treatment of the concepts they are dealing with, by pointing their readers in the direction of Nicolson's extensive body of work on this subject, as does Montgomery despite his own brief literary exploration. Indeed, Nicolson's work can be considered an initial seed of this thesis. Her writing provided me with introductions to both the seventeenth-century rendering of the moon-world trope, and to a number of the texts that I examine in the course of my research. However, Nicolson's work belongs to the first wave of science and literature studies and, as such, can only ever provide a partial (although, within the constraints of her critical approach, insightful) picture of the relationship between the telescope and seventeenth-century depictions of life on the moon. Despite Dunn's more recent cursory acknowledgement of the telescope's cultural impact, it is only Nicolson who has considered the significant link between the telescope and life on the moon more deeply: 'Of all the ideas propounded by Galileo, none was so enthralling to lay imagination as that there was a world in the moon, and a world possibly inhabited by mortals'.[40] This important connection is fundamental to this research.

It is possible that critics may have been hesitant to correlate the telescope with the concept of lunar life because these representations were not new in the seventeenth century. The notion is ancient, familiar from the writings of Lucian and Plutarch, amongst others. And yet, it virtually vanished for hundreds of years, only to re-emerge with renewed vigour in the 1600s. While this disappearance has been attributed both to the increasing dominance of Christianity by Roberts, and to the 'massive influx of Greek-Muslim thought into Europe' around the twelfth century by Montgomery, the key question is why it revived so energetically at this particular moment.[41] It is clear that the ability to see the moon in an entirely new way was a major change that occurred in this period. With hindsight, the logical, mathematical work of Nicolaus Copernicus and Tycho Brahe was plainly crucial to the development of modern astronomy. Yet, it was the fact that 'Galileo *saw* it with his eyes' that really captured the imagination in, as Elizabeth

[40] Marjorie Hope Nicolson, *Voyages to the Moon* (New York: The Macmillan Company, 1960), p. 26.
[41] Montgomery, p. 68.

Spiller puts it in her article looking at the connection between the telescope and the act of reading in this period, the 'new visual culture of the seventeenth century'.[42]

More recently, Brycchan Carey has stated that 'when Galileo raised his telescope to the Moon and understood that it was a world similar to our own, literature about the Moon could not remain unchanged'.[43] However, I would suggest that, without a closer examination of the relationship between these two elements, this is a superficial assumption. Galileo was just one man, a mathematician with an interest in the physics of motion, and not an astronomer.[44] He used an amusing new toy, the first device to extend the human senses, and made reports that were not widely believed and in which he had to propose a new astronomical paradigm simply in order to share his results. From this perspective, such a connection between the telescope and literature about the moon appears rather less certain.

There are, however, two specific areas neglected by existing studies which this thesis seeks to redress, thereby making an original contribution to knowledge. Firstly, despite discussions of life on the moon in various contexts, there has been no in-depth critical comparison of the texts which proposes either the telescope, or the publication of *Sidereus Nuncius*, as a key turning point. Secondly, there has been no examination of the complexity of the telescope's relationship with these representations. Where a connection has been mooted, a traditional influence study model has been used to examine the telescope's impact on the text. There has been no attempt either to assess the significance of this impact against other factors, or to reverse the model, thereby examining the impact of the text on the telescope and providing a more holistic view of their relationship.

In examining the mutual impact of the telescope and depictions of life on the moon, it is important to recognise just how significant the telescope and *Sidereus Nuncius* were in

[42] Nicolson, *Voyages*, p. 24. Italics in all quotations are present in the original, unless otherwise specified. Elizabeth A. Spiller, 'Reading through Galileo's Telescope: Margaret Cavendish and the Experience of Reading', *Renaissance Quarterly*, 53.1 (2000), 192–221 (p. 195).
[43] Brycchan Carey, '"A New Discovery of a New World": The Moon and America in Seventeenth- and Eighteenth-Century European Literature', in *Literature in the Age of Celestial Discovery: From Copernicus to Flamsteed*, ed. by Judy A. Hayden, Palgrave Studies in Literature, Science and Medicine (Basingstoke: Palgrave Macmillan, 2016), pp. 167–82 (p.169).
[44] Finocchiaro, p. 3.

terms of a departure from existing models of cosmological knowledge. The perceptions of the universe which were current at the time Galileo made his observations began to form in antiquity, and were hugely different from the new ideas that began to take shape throughout the seventeenth century. Though earlier theories, such as Pythagoras's harmony of the spheres, filtered down through history, it was Aristotle's philosophy in the 1st century BC that was to form the core of cosmology for centuries. Three particular assumptions about the universe originating with Aristotle's philosophy became ingrained in Greek philosophy. Firstly, that all motion in the heavens was circular; secondly, that all heavenly objects were made of a perfect material, æther, and, therefore, did not change, decay or die; and finally, that the Earth was motionless at the centre of the universe, surrounded sequentially by the physical spheres of the planets, the fixed stars, and, lastly, the sphere of the Prime mover.[45] The problem with these assumptions was that simple observations showed some of the planets appeared to move backwards and change their levels of brightness as they proceeded through the night sky. In order to account for these apparent changes in a realm that should have been immutable, Apollonius of Perga introduced both the eccentric circle and the epicycle in approximately 200 BC. A circle eccentric to the Earth would allow a planet to appear to move faster when it was closer to Earth, and more slowly as the planet moved further away. Epicycles were extra circles within the sphere that a planet traced around the Earth, and were introduced to account for the periodic backwards motion that planets described.[46]

However, eccentrics and epicycles still could not account for every apparent deviation from perfection that was so obvious in planetary motion. Developing the system further in the 2nd century AD, Ptolemy introduced the equant point, placing the centre of a number of circles opposite the Earth.[47] The Ptolemaic system became so complicated that, by the time it was perfected, the sun, moon, five planets and the fixed stars needed forty 'wheels' to drive all their motion.[48] This level of departure from Aristotle's universal perfection was so great that the system was used merely as a calculator, carefully making

[45] Arthur Koestler, *The Sleepwalkers: A History of Man's Changing Vision of the Universe* (London: Arkana, 1989), pp. 61-62.
[46] Michael Hoskin, *The History of Astronomy: A Very Short Introduction* (Oxford: Oxford University Press, 2003), pp. 15-16.
[47] Ibid., pp. 18-19.
[48] Koestler, p. 71.

no claim to be describing any sort of reality. During the Middle Ages, Aristotle's concepts of the universe began to meld into Medieval theology, following the thinking of such philosopher-theologians as Thomas Aquinas.[49] In this new chapter of cosmology, Aristotle's Prime Mover became God, the Prime Mover's sphere became Heaven, and Earth, in its place at the centre of the universe, became the most appropriate location for Mankind to enjoy its special relationship with God. Dick has pointed out that Wilkins's technique of gathering opinions which both support and oppose his own view, in his *The Discovery of a World in the Moone*, 'demonstrates the important point that the Aristotelian terrestrial-celestial dichotomy was not the universal pre-Copernican opinion'.[50] However, I would suggest that Michael Hoskin's statement that Aquinas 'assimilated Aristotle into Christian teaching so successfully that the 17th century would find it hard to make a separation of the two' is correct, regardless of the existence of differing opinions.[51] The shape of the universe had become a religious issue to such an extent by this period that discussions on the topic simply could not take place without the question of religion being raised.

In 1543, Polish astronomer and mathematician Nicolaus Copernicus finally published his work *De Revolutionibus Orbium Cœlestium*.[52] What Copernicus proposed should have been revolutionary as his theory – almost literally – turned the universe upside down, placing the sun in the centre with the Earth revolving around it, amidst the other known planets. Copernicus was the first person to suggest such an order of the heavenly bodies in many hundreds of years, and certainly the first since the establishment of the Ptolemaic-Christian model of the universe, although his paradigm still depicted a 'closed' universe, as the title of his work suggests, full of heavenly spheres.[53] Yet, Copernicus's work did not have the impact that might have been expected. It contained a large amount of trigonometry and complicated mathematics, which was only really accessible to other mathematicians. Furthermore, it was published with an unauthorised forward claiming that Copernicus did not really believe his new model was factual and reflected

[49] Hoskin, p. 32.
[50] Dick, p. 13.
[51] Hoskin, p. 32.
[52] Nicolai Copernici Torinensis, *De Revolutionibus Orbium Cœlestium, Libri VI* (Norimbergæ: Ioh. Petreium, 1543).
[53] A heliocentric model had been proposed by Aristarchus of Samos in the late fourth/early third century BC. See Koestler, p. 50.

reality, but had put forward this proposal merely as a way to 'enable the motions to be computed correctly'.[54] Both of these factors worked against *De Revolutionibus* entering the popular consciousness, but it did not stop the text from coming to the notice of a number of astronomers and mathematicians, including Galileo.[55]

Therefore, it was Galileo's work with the telescope, as I argue in Chapter 6, that brought a completely different view of the universe to a wide audience. Not only did *Sidereus Nuncius* describe the roughness of what should have been a perfectly smooth celestial object, but Galileo's work also shattered the orderly and finite spheres of the universe by describing millions of previously unseen stars and new 'planets' orbiting Jupiter. This significant break with hundreds of years of cosmological understanding is a major factor in my proposal that *Sidereus Nuncius* was a key turning point in the representation of life on the moon and, indeed, on the way the moon itself was depicted in the literature, philosophy and drama of the seventeenth century.

In terms of the texts examined and the period of time under discussion, the scope of this thesis is extensive. It reaches across almost the entire seventeenth century, and discusses details of fourteen depictions of life on the moon published throughout Europe during this period. In order to accomplish an investigation on such a scale within the limits of a doctoral thesis, I have focused strictly on the relationship between the developing telescope and the texts at the heart of this research. In the course of my work, however, a number of other fascinating topics and areas for further investigation have been unearthed, which I discuss in more detail in my conclusion.

The historical focus of this thesis runs from 1610-1698, although for ease of reference the term seventeenth century is used throughout. These dates have been chosen specifically as they coincide with the publication of two particular texts. The first, which sits at the heart of this research, is Galileo's *Sidereus Nuncius*; the second is *Cosmotheoros* by Christiaan Huygens. This later work provides an end-point amongst seventeenth-century representations of life on the moon, as it moves the contemplation of extraterrestrial life away from the moon itself, and out into the wider universe. However, the textual

[54] Heather Couper and Nigel Henbest, *The Story of Astronomy: How the Universe Revealed Its Secrets* (London: Cassell Illustrated, 2007), p.81.
[55] Finocchiaro, p. 4.

landscape which this research draws upon is necessarily much wider than this specific focus, and reaches back as far as the 1st century AD in order to bring Plutarch's *ΠΕΡΙ ΤΟΥ ΕΜΦΑΙΝΟΜΕΝΟΥ ΠΡΟΣΩΠΟΥ ΤΩΙ ΚΥΚΛΩΙ ΤΗΣ ΣΕΛΗΝΗΣ* (*Concerning the Face which Appears in the Orb of the Moon*) into the discussion of literary and philosophical ideas on the habitability of the moon.

Geographically, the focus is on seventeenth-century England, both in terms of texts and the contemporary natural philosophy community. However, it would be impossible to explore the relationship between the developing telescope and depictions of life on the moon without a wider consideration of work being undertaken in the rest of Europe during the same period; specifically, texts have been selected from French, Dutch and (modern-day) German authors. Exchange of ideas was not limited to any single country and it was not uncommon for publications to circulate widely in Latin, or in multiple vernacular translations, although perhaps these translations were not always entirely accurate or faithful to the original. This thesis does not attempt to contemplate these questions on a global scale in any way, and analysis is limited to European evidence.

At the outset of this project, I surveyed and analysed a large number of texts with a view to selecting the most relevant as the basis for this research. While looking for a spread of texts created both before and after the publication of *Sidereus Nuncius* in 1610, the main criterion for selection was content. Texts were chosen for further research which either discussed or depicted life on, or habitability of, the moon, or which otherwise focused on a portrayal of the moon, which included some element of 'life'. Additionally, texts needed to be available for examination, if necessary in English translation. This meant that some texts which may have been relevant had to be discarded at an early stage: for example, I was only able to source a partial English translation of the Italian poem *L'Adone* by Giambattista Marino (1623) and was, therefore, unable to determine its precise relevance, despite some potentially interesting details.[56] Publication status of the texts I selected was also an important consideration. Examining texts for evidence of influence by the telescope and *Sidereus Nuncius* only needs those texts to have been created within my chosen period. However, an investigation of the texts' influence on

[56] Giambattista Marino, *Adonis: Selections from L'Adone*, trans. by Harold Martin Priest (Ithaca: Cornell University Press, 1967).

the development of the telescope requires that those texts were circulated, or otherwise available, within the community responsible for this undertaking. During the seventeenth-century, this level of availability equates, in general, to publication. As such, the eight English representations of life on the moon on which this thesis focuses were all published between 1611 and 1697, with the single exception of Samuel Butler's poem *The Elephant in the Moon* which was not published until 1759.[57] Before publication, the poem 'circulated only in manuscript', which is likely to have resulted in a restricted audience.[58] However, the date of the poem's composition has been estimated to be between 1666 and 1676 and its content is significant enough to warrant inclusion.[59] Conversely, *Selenographia: the Lunarian, or Newes from the World in the Moon to the Lunaticks of this World* is a manuscript held in the British Library, which has been excluded from this research.[60] Despite containing the story of a man who flies to the moon on a kite and the subsequent events, the lack of information on author, date of composition, potential circulation, and overall provenance, prevents analysis of this text for this particular piece of research. Although described as a seventeenth-century manuscript in the British Library catalogue record, the manuscript itself is undated. Further enquiries to the British Library Manuscript Reference Service revealed that the only information available about the manuscript not contained in the public catalogue is that it was acquired by the British Museum Library in 1841. Furthermore, although there are some date-related references in the text itself, such as to a new star appearing around 50 years before the story is set and to the narrator landing on the Monument, in London, on his return to Earth, it is not completely clear whether or not this was actually written in the seventeenth century.[61]

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[57] Samuel Butler, *The Genuine Remains in Verse and Prose of Mr Samuel Butler, Author of Hudibras*, ed. by Thyer, R., 2 vols (London: J. and R. Tonson, 1759). 'The Elephant in the Moon' appears in Volume 1, pp. 1-25.

[58] J. Ereck Jarvis, 'The Royal Society, Collective Vision and Samuel Butler's "Elephant in the Moon"', in *Literature in the Age of Celestial Discovery: From Copernicus to Flamsteed*, ed. by Judy A. Hayden, Palgrave Studies in Literature, Science and Medicine (Basingstoke: Palgrave Macmillan, 2016), pp. 133–47 (p. 139).

[59] See Marjorie Hope Nicolson, *Pepys' Diary and the New Science* (Charlottesville: University Press of Virginia, 1965), p. 152, and Sv. Bruun, 'The Date of Samuel Butler's The Elephant in the Moon', *English Studies*, 55.2 (1974), 133–139 for dating of this poem. At the latest, it was certainly completed prior to Butler's death in 1680.

[60] 'SELENO-GRAPHIA, or Newes from the World in the Moon to the Lunaticks of This World, Etc., by the Way of Romance' (London, n.d.), British Library, Add MS 11812.

[61] Ibid., p. 32, and p. 52.

The English texts which have been selected as the core of this research begin in 1611 with *Conclave Ignati* by John Donne. Originally published in Latin, but republished in English just four months later, the author of this text remained anonymous until the edition published in 1634.[62] This work is of particular interest to this research as it was published within a few months of *Sidereus Nuncius* and contains not only references to Galileo and his telescope, but also the idea of sending humans to the moon. A fuller representation of a moon-world is found in Ben Jonson's 1620 masque *News from the New World Discovered in the Moon*, which includes descriptions of different inhabitants and the society on the moon. The year after Jonson's work was first performed, Robert Burton published his *Anatomy of Melancholy*. Although a substantial work encompassing a broad range of topics, there is a portion of the 'Digression of the Aire', found in the second partition of the book, which not only explores cosmological theory and Burton's conclusions in that area, but also raises some of the religious implications of an inhabited moon. 1638 saw the publication of two significant texts: Francis Godwin's *The Man in the Moone* and John Wilkins's *The Discovery of a World in the Moone*. Godwin's work is the story of a man who flies to the moon on a harness pulled by birds, and provides a detailed account of both the journey and the world he finds when he lands. Godwin's is the most in-depth account of an inhabited moon-world considered by this thesis. Conversely, Wilkins's text is a philosophical examination of evidence concerning the moon's habitability; from the third edition of 1640, this range of evidence also included discussion of Godwin's fictional moon journey. The final three texts are all post-Restoration and have a distinctly different tone from the majority of the earlier texts. Butler's poem *The Elephant in the Moon*, which has been discussed above, was followed in 1687 by Aphra Behn's play *The Emperor of the Moon*. Behn's farce centres on the virtuoso Doctor Baliardo and his obsession with power and government on the moon. Finally, the last English text selected is *The World in the Moon*, written by Elkanah Settle in 1697, in which the eponymous world hardly makes an appearance at all.

In addition to these core texts, I selected five European works to provide a wider context for representations of life on the moon created after the publication of *Sidereus Nuncius*. Pierre Borel published his *Discours Nouveau Prouvant la Pluralité des Mondes* in 1657,

[62] Nicolson, *Voyages*, p. 50.

which was translated into English as *A New Treatise Proving a Multiplicity of Worlds* the following year. This work superficially appears similar to John Wilkins's *Discovery*, although the arguments are less intricate and Borel uses different kinds of evidence to make his case, as well as disregarding the idea of manned flight to the moon. *L'Autre Monde, ou Les États et Empires de la Lune*, written by Savinien Cyrano de Bergerac, was first published posthumously in the same year as Borel's work. In a similar vein to Godwin's *The Man in the Moone*, *L'Autre Monde* is the story of one man's journey to the moon and an account of what he finds there, although Cyrano's text is stinging satire rather than the gentle utopia found in Godwin's work. It is important to note that, when first published, *L'Autre Monde* was presented in a heavily edited form to remove much potentially controversial material, with the result that the full and original manuscript was not published until 1920.[63] A modern translation of the unabridged text is used for this research as it contains the full range of content intended by the author. The third European text selected is *Entretiens sur la Pluralité des Mondes* by Bernard le Bovier de Fontenelle, published in 1686. This text presents a conversation between a philosopher and a marquise about contemporary cosmological theory and the concept of the plurality of worlds. It was quickly translated into English after its initial publication. This research will make use of the translation by Aphra Behn, published in 1688, titled *A Discovery of New Worlds*. Although this was not the first English translation, Behn's role as translator not only provides a connection to her own work on this subject, but also her 'Translator's Note' in this edition engages with the issues raised in Fontenelle's text in a way that is missing from the first translation. In the same year as Behn's translation of Fontenelle's work, Jean de la Bruyère published his *Caractères*. The final chapter 'Des Esprits Forts', variously translated into English as 'Freethinkers', 'Libertines' or 'The Wits of the Age', contains a very brief but significant discussion of life on the moon. The final European text selected from this period is *Cosmotheoros* by Christiaan Huygens, published in 1698. This work contains a number of conjectures about planetary inhabitants and the habitability of the moon.

[63] Savinien Cyrano de Bergerac, *Other Worlds: The Comical History of the the States and Empires of the Moon and the Sun*, trans. by Geoffrey Strachan (London: Oxford University Press, 1965), p. xii.

These thirteen texts published after 1610 were selected from a list of thirty-nine potentially interesting works which were published during this period. The remaining twenty-six texts were rejected as subjects for this thesis for four different reasons. The first group of texts were those that could not be fully investigated due to a lack of English translation. As mentioned, above, this included Marino's *L'Adone* (1623), but also Giovanni Battista Riccioli's *Almagestum Novum* (1651), and *Iter Exstaticum Coeleste* (1660) by Athanasius Kircher. These latter texts are both anti-Copernican, but no analysis of them has been possible. The second group of texts was rejected after an initial examination determined that their content was not relevant to the subject of this thesis. The works in this category were Tommaso Campanella's *City of the Sun* (1623), a dialogue describing the city and inhabitants of an earthly utopia; Michael Drayton's poems *The Moone-Calfe*, a morality tale, and *The Quest of Cynthia*, a tale of a lover seeking out Cynthia in her bower, both published in 1627 as part of Drayton's collection of poems *The Battaile of Agincourt*; *Insomnium Philisophicum* (1647), an allegorical poem written by Henry More which, although describing two types of beings hovering above a revolving planet is in no way about life on the moon; the anonymous weekly periodical *The Man in the Moon: Discovering a World of Knavery under the Sunne* which was published between April 1649 and June 1650 and provided Royalist gossip and news; Gabriel Daniel's 1692 *A Voyage to the World of Cartesius*, an exploration of Descartes's philosophy; *Dioptrica Nova* (1692), William Molyneux's treatise on telescope and microscope lenses; and, finally, Joseph Addison's *An Oration in Defense of the New Philosophy*, a speech given by Addison in July 1693 extolling the virtues of modern philosophy, and published as an appendix to William Gardiner's 1728 English translation of Fontenelle's *Entretiens sur la Pluralité des Mondes*.

The last two groups of rejected texts from this period include works which are more relevant to the theme of this research. The first of these are texts which do not include enough material alluding to the concept of life on the moon to be useful for the direct purposes of this research, although they do indicate the wide cultural presence of this idea. The texts in this group may contain a small, relatively insignificant, reference, or simply repeat ideas which have been treated in earlier works. This group comprised: Charles Sorel's *L'Histoire Comique de Francion* (1623) which contains one short

description of a moon-world but is mainly irrelevant; Ben Jonson's 1625 play *The Staple of Newes* includes news of a machine for Spinola to 'winde himself with, up, into the *Moone*' and that a 'burning *Glasse*' was found in Galileo's study;[64] the poem *Democritus Platonissans* (1646) by Henry More which touches briefly on the idea of extraterrestrial life but mainly focuses on the concept of infinity; letter 9 in the third book of James Howell's *Familiar Letters* (1647), which rehearses some arguments for and against the idea of life on the moon and in the stars, although the author does not express an opinion himself, and the letter does not introduce any new or original arguments; *The Blazing World* (1666) by Margaret Cavendish, a critique of contemporary science told through the story of a lady who travels to another world and becomes queen; John Dryden's poem *Annus Mirabilis* (1667), which makes a single passing reference to a lunar world in stanza 164; Book 8 of John Milton's *Paradise Lost* (1667), in which Raphael briefly mentions the possibility of an Earth-like moon with living beings, as part of a longer discourse in answer to Adam's question about the Heavens moving around the Earth; Thomas Shadwell's comic play *The Virtuoso* (1676), which makes some minor references to politics and, indeed, elephants on the moon; the eighth sermon in Richard Bentley's *The Folly and Unreasonableness of Atheism* (1693), which talks about inhabitants of other planets not necessarily being human but does not go into any particular detail; and, William Leybourn's *Pleasure with Profit* (1694), a handbook of leisure pursuits with a section on 'Astronomical Recreations' that remarks on the geography of the moon, although does not broach the question of habitability.

The remaining five texts are similar to the previous group, in that I did not consider them to contain enough relevant content to become part of the foundation of this thesis. However, these texts have not been excluded entirely, as the small amount of relevant material found in them has been interesting, or otherwise useful, enough to ensure that they are included in a more minor way. The first of these is Johannes Kepler's *Dissertatio cum Nuncio Sidereo* (1610), which was written as a direct response to Galileo's *Sidereus Nuncius*. The speculation about lunar inhabitants that it contains is very similar in nature to the more developed conjectures found in Kepler's *Somnium*. However, this book is

[64] Ben Jonson, *The Staple of Newes: A Comedie Acted in the Yeare, 1625.* (London: Robert Allot, 1631), p. 39 (III.2).

placed alongside *Somnium* in a detailed case study, in Chapter 2, to assist in illuminating the development of Kepler's ideas on non-Earth life. Ben Jonson's *Love Freed from Folly and Ignorance* (1611) mentions a world in the moon early on, as Love tries to solve a riddle, and this is discussed further in Chapter 6. *Selenographia* (1647) by Johannes Hevelius is a collection of detailed engravings of the moon, and forms part of my consideration of mapping the moon in Chapters 3 and 7. Lastly, Peter Heylyn's *Cosmography* (1652) and John Ray's *The Wisdom of God Manifested in the Works of Creation* (1691) appear in my examination of biographical evidence in Chapter 8. Heylyn's *Cosmography* is a gazetteer of the world, which includes the world in the moon as part of a description of fantastic lands; Ray's treatise briefly discusses the likelihood of beings living on the moon, and directs the reader towards the works of Wilkins and Fontenelle for further information.

Texts composed before *Sidereus Nuncius* were also considered, to provide a basis for comparison between works published within the two different periods. I selected six from a shortlist of twenty-eight. These begin with Plutarch's *Concerning the Face which Appears in the Orb of the Moon* from the 1st century AD, which examines evidence about the moon and recounts a myth concerning the spiritual role of the moon. In the following century, Lucian of Samosata wrote *ΑΛΗΘΩΝ ΔΙΗΓΗΜΑΤΩΝ* (*A True Story*) which includes an account of a voyage to the moon, amongst numerous other fantastic adventures. The next text examined is Chapter 12 from the second book of Nicolas of Cusa's *De Docta Ignorantia* (1440). It is only in this particular chapter that Nicolas considers life beyond Earth, speculating on the characteristics of extraterrestrial inhabitants, while not limiting his speculation solely to the moon. The final three texts all come from the end of the sixteenth century, and are all English, although this, in itself, should not be considered significant in terms of this particular piece of research. Both *Endimion, the Man in the Moone*, by John Lyly (1591) and Michael Drayton's *Endimion and Phoebe* (1595) make use of the Greek myth about the moon falling in love with Endymion, a shepherd. The last text, *The Woman in the Moone*, again by John Lyly (1597), reduces the moon to a supporting character as one of the seven planets seeking revenge on Nature for overstepping her boundaries.

The twenty-two rejected texts from this period were mainly discounted, following an

initial examination, due to the irrelevance of their content. Those which fall into this category included: *Epic of Gilgamesh* (c. 2000 BC), a series of earthly quests and journeys; Cicero's *Somnium Scipionis* (c. 50 BC), a recounting of a dream which includes looking at the Earth as though from the Heavens, but which does not particularly touch on the moon or non-Earth life; *Le Livre du Ciel et du Monde* (1377) by Nicole Oresme, a translation of, and commentary on, Aristotle's work; Thomas More's *Utopia* (1516), a description of the life and inhabitants of the island of Utopia; the five books recounting the extraordinary, but terrestrial, adventures of the giants Gargantua and Pantagruel (1530s-1550s) by François Rabelais; the moral poetry of *Zodiacus Vitae* (1565) by Palingenius; *Pantometria* (1571) and *A Perfit Description of the Celestiall Orbs* (1576), both natural philosophy texts by Thomas Digges; the anonymous *La Satyre Ménippée de la vertu du Catholicon d'Espagne* (1594), a political and religious satire – although, I discuss the supplement added to later editions in some detail in Chapter 3; Ben Jonson's play *Cynthia's Revels* (1601) on the vices of courtly life, and his *Entertainment at Britain's Burse* (1609), which mentions a 'perspective' for sale in the Master's shop; and, the anonymous *The Man in the Moone Telling Strange Fortunes*, which is a collection of morality case studies, rather than being anything to do with a man in the moon. There were also two works of possible interest which could not be fully investigated, as the complete texts no longer exist: the writings of Anaxagoras (5th century BC), which may have contained some speculation on other worlds; and, *τὰ ὑπὲρ Θούλην ἄπιστα* (*The Incredible Wonders Beyond Thule*) (2nd century AD) by Antonius Diogenes, which now only exists in a summary by Photius.[65] *The Incredible Wonders* is an adventure story with similarities to the *Epic of Gilgamesh*, although there are intriguing hints which may have been relevant to this thesis. For example: 'in their journey northwards they came close to the moon, which seemed to be a kind of earth quite bare, and at that point saw what one would expect of a person of excessive imagination'.[66]

[65] See, for example, the 'Other Worlds?' section in Patricia Curd, 'Anaxagoras', ed. by Edward N. Zalta, *The Stanford Encyclopedia of Philosophy* <https://plato.stanford.edu/archives/win2015/entries/anaxagoras/> [accessed 22 July 2017]. The Greek title for *The Incredible Wonders Beyond Thule* was not given in the English translation I examined (see note 66 for details). This is taken from J. R. Morgan, 'Lucian's True Histories and the Wonders Beyond Thule of Antonius Diogenes', *Classical Quarterly*, 35.2 (1985), 475–490 (p. 475).

[66] Photius, 'Translation 166: Antonius Diogenes', in *The Bibliotheca: A Selection*, trans. by N. G. Wilson (London: Duckworth, 1994), pp. 149–154 (p. 152).

Of the remaining seven texts, four were only marginally relevant to this project, including Lucian's *Icaromenippus* (2nd century AD), a satire against philosophers; the second canto of 'Paradiso' in Dante's *La Divina Commedia* (1320), in which the substance of the moon is discussed; the notebooks of Leonardo Da Vinci (c. 1452-1519), which include some small comparisons between the Earth and the moon; *Orlando Furioso* (1534) by Ludovico Ariosto, which includes a very brief episode in which Astolpho visits the moon to recover Orlando's wits. The last three texts were those which were not relevant enough to this research to become core texts, but which were otherwise useful and have been included in some form within this thesis. *De Revolutionibus* (1543) by Nicolaus Copernicus is not discussed directly as it contains nothing of immediate relevance to the subject of this research. However, due to its importance in terms of perceptions of the universe, it is referred to numerous times throughout this work. Giordano Bruno's *De L'infinito Universo et Mondi* (1584) contains a number of dialogues and makes some references to inhabitants on the moon.[67] I discuss this text as a possible factor in the development of post-1610 moon literature in Chapter 3. This same chapter also contains a consideration of the third text, Thomas Hariot's *A Briefe and True Report of the New Found Land of Virginia* (1588), which records details of the colony and its original inhabitants.

Finally, Johannes Kepler's *Somnium, sive Astronomia Lunaris* has been selected as a significant text which does not wholly fit into either date range. The origins of this work lie in a dissertation that Kepler wrote while studying at Tübingen University in 1593.[68] Permission was never granted for disputation of this dissertation but approximately sixteen years later it formed the basis of 'a new astronomy for the inhabitants of the moon, as it were; in plain language, a sort of lunar geography'.[69] Eventually, this was published posthumously as the *Somnium* in 1634. What makes this text particularly significant, in terms of this research, is that it began to develop before the telescope had been invented and was only finally readied for the press twenty years after the publication of *Sidereus Nuncius*. These unique circumstances of composition, and the

[67] The title of Bruno's book is often given as *De L'infinito Universo e Mondi* but I have taken the title directly from the 1584 edition and, therefore, chosen to use 'et' instead of 'e'.
[68] Johannes Kepler, *Kepler's Somnium: The Dream, or Posthumous Work on Lunar Astronomy; Translated with a Commentary by Edward Rosen* (Madison: University of Wisconsin Press, 1967), p. xvii.
[69] Johannes Kepler, *Kepler's Conversation with Galileo's Sidereal Messenger: First Complete Translation, with an Introduction and Notes*, ed. by Edward Rosen (New York: Johnson Reprint Corporation, 1965), p. 26.

potential information that can be gleaned from them, are explored in more detail in a case study in Chapter 2.

Once a shortlist of texts had been selected the research began to explore the relationship between the telescope and depictions of life on the moon in literature and philosophy more fully. Firstly, the thesis investigates the extent to which representations of life on the moon changed after the publication of *Sidereus Nuncius*, by analysing and comparing the selected texts written before and after 1610. Critical textual analysis is used to identify the characteristics of these texts, allowing comparisons to be made, and revealing two things: firstly, whether there are any characteristics common to each group of texts, and secondly, whether 1610 marked any significant shifts in the representation of life on the moon. I then go on to assess the significance of the telescope's role in shaping these texts. The impact of contemporary political, historical and cultural issues is considered alongside the development of the telescope, and the texts are examined for evidence of the influence of the telescope and Galileo's work. Moreover, they are also examined to establish whether their composition would still have been possible without the existence of the telescope and *Sidereus Nuncius*.

Finally, to complete a full examination of the relationship between texts and instrument, this thesis considers how depictions of life on the moon may have contributed to the development of the telescope. To achieve this, factors are identified which shaped the telescope's development, including consideration of the growth of experimentalism, and astronomical practice. Alongside this, the role of the cultural imagination in connecting the telescope to depictions of life on the moon is explored. This includes a consideration of the cultural environment and exposure of key figures in the telescope's development to the ideas and concepts found within English representations of life on the moon during this period.

The main body of this thesis is arranged into three Parts, broadly corresponding with the research questions which I have outlined. The first, '*Sidereus Nuncius*: Point of Refraction?', comprising Chapters 1 and 2, focuses on the characteristics of the texts and draws a distinction between those published before 1610, and those published afterwards. In these chapters, both English and European texts are examined in order to

achieve as wide a view as possible. The project establishes that these two groups of texts differ in ways that can be arranged into four themes. Chapter 1 focuses on the themes which relate to how the moon is portrayed in literature and philosophy. The first of these is the significant appearance of the moon as a solid, material world after 1610, rather than as either a spiritual place, or a personified goddess, which was far more common before this time. The second theme is that of a growing humanisation of the beings imagined to be populating the moon. With lunar inhabitants looking and behaving more like humans than their monstrous and mythical predecessors, there is an accompanying element of social satire that also begins to become apparent during this period.

Chapter 2 continues the comparison of texts between the two periods of publication, but switches attention away from the portrayals of the moon, to the approach and attitudes found within the texts themselves. The first of these is the growing element of exploration that becomes apparent after 1610, expressed through a less closed perception of the world and an interest in the implications and possibilities of a differently shaped, and potentially populated, universe. The second and final theme dealt with in this chapter is a move towards a greater realism in the presentation of moon-worlds: after 1610, authors have used a number of techniques, from providing proof and evidence of the claims that their writing is making, to weaving dates and real events through fictional narratives. Finally, Chapter 2 takes the opportunity to examine the development of a single author's concept of life on the moon. Johannes Kepler's *Somnium* is of a particularly special nature, due to the fact that it was first composed before the publication of *Sidereus Nuncius* and yet only finally published in 1634. In addition to this, Kepler created a number of other works during his career which touch on the concept of life on the moon. As such, Kepler's body of work offers a unique insight into how his engagement with the idea of life on the moon developed across the two periods explored in the first two chapters.

The next Part of the thesis 'Influences on Seventeenth-Century English Moon-Worlds', which includes Chapters 3 to 6, investigates the factors which contributed to the distinctive nature of English representations of life on the moon in this period. Chapter 3 examines the influence of travel and travel writing. This is particularly noticeable in those representations of life on the moon which include the idea of a journey or voyage to the

moon. The influence of other kinds of literature, outside the travel genre, is also considered in this chapter, including both contemporary literature and texts created before the seventeenth century such as the Bible. Chapter 4 focuses on influences on moon literature originating in contemporary society. Social change is a substantial factor, and the impact of English political and religious changes, shifts in the use of language, and censorship are all discussed in this chapter. Additionally, the popularity of astronomical ideas, and the change in attitudes towards natural philosophy and its practitioners during the century, are debated. Chapters 5 and 6 concentrate on the telescope. Chapter 5 initially investigates the connection between vision and imagination, and goes on to suggest that the telescope forms a hinge between them, highlighting the crucial role that imagination played in early telescopic observation. Chapter 6 builds on the previous chapter to examine specifically the intersection between Galileo's telescopic work and imagination in the form of English moon literature. Textual evidence of this connection is presented and discussed.

The final Part, 'Influences on the Telescope', made up of Chapters 7 and 8, explores the factors which determined the development of the telescope during the seventeenth century. Chapter 7 begins by outlining the different ways in which the telescope changed during this period. Next, an examination is made of three areas which, I argue, contributed to the telescope's development: terrestrial uses of the telescope, including exploration and conflict, the growth of experimentalism, and the practice of astronomy. Chapter 8 explores the importance of the cultural imagination and the presence of moon literature within the cultural imagination of this period. Biographical evidence of six individuals, who played a significant role in the telescope's development or in related astronomical practices, is then explored as a way of assessing their awareness of these particular concepts.

Lastly, the threads of the preceding chapters are brought together in a concluding Part. Here, I argue for the truly mutual quality of the relationship between the telescope and seventeenth-century representations of life on the moon, as well as gesturing towards areas which would benefit from future research.

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PART TWO

Sidereus Nuncius: A Point of Refraction?

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Chapter 1

'I should like [...] to hear about the beings that are said to dwell on the moon'[1]

From ancient civilisations to the present day, authors and philosophers have considered the existence of worlds beyond Earth. Such a huge expanse of time will naturally have seen changes to the way these worlds are presented, changes which will not necessarily be due to any specific factor or trigger point. However, the chapters in this Part aim to demonstrate that 1610, the year that *Sidereus Nuncius* was published, marked a significant change in literary and philosophical representations of life on the moon.[2] Chapter 1 concentrates on two themes which shaped seventeenth-century moon-worlds into blurry mirrors of their authors' home planet: a growing materiality, and the developing human-like quality of their inhabitants. Chapter 2 will then examine the change in authorial approach and the way in which moon-worlds were presented to their readers. Additionally, Chapter 2 will explore Johannes Kepler's work in this area through a more detailed case study. Kepler's work is particularly interesting in that he examined the idea of life on the moon both before and after the publication of *Sidereus Nuncius* and published details of his thinking on a number of occasions over this period. This offers a unique opportunity to investigate these four key areas against one author's continually developing concept of life on the moon.

A material world

One of the most striking differences between the representations of life on the moon before and after the publication of *Sidereus Nuncius* is the increased materiality evident in the later texts. This is most evident in the thirty years between 1591 and 1621. Lyly's plays *Endimion* and *The Woman in the Moone* and Drayton's poem *Endimion and Phoebe* all share the idea that there is not so much life on the moon, but rather that the moon itself is alive. Lyly's Cynthia and Luna, and Drayton's Phoebe are first and foremost

[1] Plutarch, p. 157.
[2] Galileo Galilei, *Sidereus Nuncius* (Venice: Thomas Baglioni, 1610).

women, goddesses or, in Cynthia's case, a queen. They do possess certain qualities traditionally associated with the moon: Luna describes herself as 'New fangled, fyckle, slothfull, foolish, mad';[3] and Cynthia is described using lunar terminology, at least at the start of *Endimion*:

> [...] wauering, waxing, and waning [...] *Cynthia,* being in her fulnes, decayeth [...] What thing (my Mistris excepted) being in the pride of her beauty, & latter minute of her age, that waxeth young againe?[4]

Drayton's depiction of Phoebe goes a step further than this, encapsulating the complexity of human perception of the moon and the array of contradictions this entails. However, it is impossible to equate any of these with a material place made of rock and soil. They are characters, not locations.

In sharp contrast to this are three representations that date from the first few years after the publication of *Sidereus Nuncius*: John Donne's *Conclave Ignati*, Ben Jonson's *News from the New World* and Robert Burton's *Anatomy of Melancholy*. Each depicts the moon as an entirely material place in which inhabitants could live. Donne paints it as a place of religious exile, Jonson as a lunar version of 'Hyde Park' and Burton as just one of a multitude of Earth-like planets.[5] In fact, every one of the texts explored for this research published after 1610 represents the moon in the same, material way. Neither is a material representation, in terms of a geographical moon, entirely missing from texts in the earlier period. Unlike Lyly and Drayton, Plutarch, Lucian and Nicolas of Cusa all regard the moon - and even the stars in Nicolas's case - as locations rather than characters. Nevertheless, there is still a distinct difference between their representations and those written after 1610. Both Plutarch and Nicolas of Cusa have a strongly spiritual element to their works. For example, in *Concerning the Face Which Appears in the Orb of the Moon*, despite the first section being a fairly material discussion about the Earth-like nature of the moon, the second and final sections move away from this concrete approach. The second section is concerned with Theon's query about the habitability of the moon. For him, this is a question of teleology: if habitation 'is not possible, the assertion that the

[3] John Lyly, *The Woman in the Moone* (London: William Jones, 1597), sig. F^{v} (V.1.5).
[4] John Lyly, *Endimion, The Man in the Moone* (London: I. Charlewood, 1591), sig. B^{v} (I.1).
[5] Ben Jonson, 'News from the New World Discovered in the Moon', in *Ben Jonson: The Complete Masques*, ed. by Stephen Orgel (New Haven: Yale University Press, 1969), pp. 292–305 (p.300, line 226).

moon is an earth is itself absurd, for she would then appear to have come into existence vainly and to no purpose'.[6] While not suggesting creation by a god, Christian or otherwise, this sense of purpose does insinuate the presence of a conscious designer.[7] The final section of Plutarch's work is more overtly spiritual. Sulla's tale demonstrates that the moon has two purposes: firstly, as the home of men's souls; secondly, as a kind of staging-post for men's minds, while journeying to or from the sun, identified by Sulla as the ultimate home of human reason.[8] This refers neatly back to Theon's question. By providing a purpose for the moon, however unlikely that purpose may seem, Sulla's story adds to Plutarch's catalogue of proof that the moon is another Earth.

The spiritual nature of Nicolas of Cusa's work is clearly Christian. However, his speculations are not limited simply to the moon. In the twelfth chapter of Book 2 in *De Docta Ignorantia*, Nicolas supposes that 'in every region there are inhabitants, differing in nature [...] all owing their origin to God, who is the centre and circumference of all stellar regions'.[9] His attitude towards these potential inhabitants is much the same as Lamprias, in Plutarch's work, towards those he thought could possibly live on the moon: that although suppositions can be made about them using the characteristics of their region as a guide – the fiery nature of the sun or the moist nature of the moon, for instance - it is impossible to have any real idea of what they may be like. However, in addition to Lamprias's reasoning that this is simply because such inhabitants are completely outside his experience, Nicolas adds that 'no man can know unless he be specifically instructed by God'.[10]

Nicolas goes on to develop his speculation further by examining the assertion that 'there is a separate species on earth to correspond with each one of the stars'.[11] He reasons that, if this is the case, then it is likely that inhabitants elsewhere may also be similarly influenced by the heavenly bodies surrounding their home. Moreover, why should those various species not return to their originating stars, at least in the form of intellect or

[6] Plutarch, p. 157.
[7] A link between the purpose of the moon and its creation by God became more common in later discussions. A very strong example of this can be found in Christiaan Huygens's *Cosmotheoros* (1698).
[8] Plutarch, pp. 203-221.
[9] Nicolas Cusanus, 'Conditions of the Earth', in *Of Learned Ignorance*, ed. by Germain Heron (Eugene, Oregon: Wipf & Stock, 1954), pp. 111–18 (p. 115).
[10] Ibid., p. 117.
[11] Ibid., p. 116.

soul, once they are released by death on Earth? Again, I would suggest that this is reminiscent of Plutarch, although the difference here is that these speculations are not marked as myth or folklore, but posited as a possible operation of God's mysterious universe.

Myth is a common element amongst the pre-1610 texts. Sulla refers to his own tale in *Concerning the Face which Appears in the Orb of the Moon* as a myth.[12] The spiritual folklore it contains is woven together with the science and philosophy of the period to produce an integral whole: a discussion making use of all types of evidence to argue for the moon as another Earth. For example, Sulla mentions that souls who have arrived on the moon are 'nourished by any exhalation that reaches them' which echoes Lamprias's earlier speculation that 'men on the moon [...] are capable of being nourished by whatever comes their way'.[13] Similarly, the myth describes the 'face' of the moon being caused by geographic features, 'depths and hollows' on its surface which corresponds with the 'great depths and clefts' which Lamprias describes as the origin of the 'face' in the scientific section of the text.[14] Additionally, as Raz Chen-Morris points out in his 2005 article, 'Dreams and ancient myths come in handy when philosophy goes awry; they can bring a discussion closer to the truth than reason and science'.[15] Indeed, the myth manages to provide detailed explanations for certain phenomena that the science and philosophy of the period simply could not, for example, the haunting reason for the apparent speeding up of the moon's motion during an eclipse:

> [...] she more ardently hastens her motion in order that she may quickly pass through the gloomy place bearing away <the souls> of the good which cry out and urge her on because when they are in the shadow they no longer catch the sound of the harmony of heaven.[16]

Moreover, at the conclusion of the text, I would suggest that it is Sulla's myth that stays with the reader, despite the greatest portion of the extant text being devoted to more logical and reasoned discussions.

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[12] See for examples: Plutarch, p.34 'μύθω', although Cherniss translates it here as 'story', and p.180 'μύθον', the same word translated as 'myth'.
[13] Plutarch, p. 205 and p. 177.
[14] Ibid., p. 209 and p. 143
[15] Raz Chen-Morris, 'Shadows of Instruction: Optics and Classical Authorities in Kepler's Somnium', *Journal of the History of Ideas*, 66.2 (2005), 223–43 (p. 233).
[16] Plutarch, pp. 207-209.

The mythical components of Lyly and Drayton's works are easy to see. *Endimion* and *Endimion and Phoebe* both rework the Greek Endymion myth. This is the legend of a shepherd so beautiful that the moon fell in love with him and made him immortal by causing him to be put into an eternal sleep.[17] While Drayton's text remains faithful to the original story, Lyly inverts the tale so that Endimion falls in love with the unattainable Cynthia, creating an obvious parallel with an idealised Elizabeth I. Further allegorical interpretations concerning the political intrigues of the Elizabethan court, however, are problematic and unsatisfactory in Lyly's interpretation, leaving the play as Robert Knapp has neatly put it, a 'notorious enigma'.[18] This cloudiness of meaning gives the work a dreamlike quality, almost as if the whole play is an extension of the confusing visions Endimion experiences during his forty-year sleep. The dreaminess is only enhanced by the strange ways in which Lyly treats the passing of time within the play, presenting some very obvious discrepancies. For example, Eumenides explains to Geron that Endimion has been asleep for 'almost these twentie yeeres' and that he has not spoken of Semele for 'seauen yeeres'.[19] And, yet, when Endimion finally wakes up, thinking he has only been asleep for one night, Eumenides tells him 'thou hast heere slept fortie yeeres' and of Semele 'I neuer yet spake worde since your sleepe'.[20] Even allowing for a journey from the fountain to the lunary bank taking twenty years, which seems highly unlikely, there is still a discrepancy of thirteen years in Eumenides' silence about his love for Semele. However, as C. R. S. Lenz has noted: 'Any error in accounting for the passage of years in *Endimion* [...] is so glaring that it is probably purposeful'.[21] It is not just a case of a few days or years that could, perhaps, be accounted for by a slip of the pen or memory: Lyly has seemingly absconded with substantial portions of time. Moreover, this large amount of passing time is underlined for Endimion as he grows older and older upon the lunary bank. There is a heavy emphasis in his description, on waking, of his own 'gray beard [...]

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[17] See, for example, David Leeming, 'Endymion', *The Oxford Companion to World Mythology* (Oxford: Oxford University Press, 2005) <http://www.oxfordreference.com/view/10.1093/acref/9780195156690.001.0001/acref-9780195156690-e-498> [accessed 31 July 2017].

[18] Robert S. Knapp, 'The Monarchy of Love in Lyly's *Endimion*', *Modern Philology*, 73.4 (1976), 353–67 (p. 353). See also: C. F. Tucker Brooke, 'The Allegory in Lyly's Endimion', *Modern Language Notes*, 26.1 (1911), 12–15 for an earlier discussion of unsatisfactory allegorical interpretations of the play.

[19] Lyly, *Endimion*, sig. E4^{r} and sig. E4^{v} (III.4).

[20] Ibid., sig. H2^{r} and sig. H4^{r} (V.1).

[21] C. R. S. Lenz, 'Allegory of Wisdom in Lyly's "Endimion"', *Comparative Drama*, 10.3 (1976), 235–57 (p. 248).

hollow eyes [...] withered bodie [...] decayed lymbes' and Eumenides pointing out to him that 'the twig to which thou laiedst thy head, is now become a tree'.[22] On the stage, there would be opportunity to accentuate both of these descriptions with visual and physical changes to allow the audience to not only hear, but also to see, these differences in Endimion and the twig.

Yet, time does not appear to have passed in the same way for the rest of the characters, accentuating the mythical, dream-like nature of the play. While this would, perhaps, be understandable for the goddesses Cynthia and Tellus, it also seems to be true for other mortals, even those, such as Eumenides, who have left the protection of Cynthia's court. Aside from the emphasis on Endimion's aging and miraculous return to youth while no mention is made of changes to the appearance of the others - even in comparison to Endimion's youthful appearance at the end - there are also definite allusions to the fact that time has not passed in the same way for everyone else. For example, Sir Tophas is still young enough to struggle with growing a beard: 'your chinne is but a quyller yet,' says Epiton, 'you will be most maiesticall when it is full fledge'.[23] Samias and Dares are still young enough to be named as 'Youthes' by Sir Tophas and Cynthia describes Tellus's mischiefs as being harboured in 'so few yeres', a description that is hard to reconcile with a period of forty years.[24] Lenz has explored a number of elements that may have contributed to Lyly's illustration of uneven time. These include the change from the Julian to Gregorian calendar, beginning from 1582, which left Europe out of step with itself and also the differences between solar and lunar time which 'with fewer months and shorter years, would naturally be an appropriate measure of the time that the moon's lover lay on the lunary bank'.[25] However, something Lenz does not entertain is the simplest idea, that in a play focusing on sleep (not only Endimion's but also that of Sir Tophas and Corsites) and which revolves around the moon, that the unreliable timelines are simply part of the dream-like state Lyly has created. It is only when Endimion awakes and is restored that the dream can end and a sense of orderliness can be returned. This pervasive dreaminess only serves to emphasise the mythical nature of the play.

[22] Lyly, *Endimion*, sig. H2^{r} (V.1).
[23] Ibid, sig. H4^{v} (V.2).
[24] Ibid, sig. I^{v} (V.2) and sig. I3^{r} (V.3).
[25] Lenz, p. 251.

The pastoral setting of Drayton's work has much the same effect as the dream-like quality of Lyly's. It infuses the text, providing a constant reminder of the mythic, Arcadian quality of the poem. Additionally, Phoebe is the embodiment of multiple moon myths. Unlike many versions of the Endymion story, Drayton's poem focuses on the moon goddess rather than the shepherd. Both Lyly's Cynthia and his Luna in *The Woman in the Moone* represent only limited aspects of what 'moon' has meant over the centuries: Cynthia brings life to the Earth, in the form of Endimion, whilst remaining remote in her heavenly court; Luna brings madness and instability. Phoebe, however, encompasses more than this: chaste virginity, burgeoning fertility, active huntress, passive beauty, power and confidence, helplessness and insecurity. She reflects in her variable character the continual waxing and waning of the physical object she represents. Nancy Lynn Spring, in her 1990 thesis, has discussed how Drayton has accomplished this portrayal of the various aspects of Phoebe's character through her dress, actions and speech.[26] Nevertheless, the key point at which her variousness and contradictions are reconciled comes towards the end of the poem:

> And now great *Phoebe* in her tryumph came,
> With all the tytles of her glorious name,
> *Diana, Delia, Lana, Cynthia,*
> *Virago, Hecate* and *Elythia,*
> *Prothiria, Dictinna, Proserpine,*
> *Latona,* and *Lucina*, most diuine;[27]

By bringing all the various names of the moon together, each with its own connotations, Drayton has made Phoebe the embodiment of all those different versions of the moon. She is simultaneously both the single 'onely Mistris of the Night' and the incarnation of the multiple myths, tales and superstitions that have long surrounded the moon.[28] This has the effect of accentuating her influence and majesty: she does not have the power of one goddess, she has the power of them all, concentrated into one being.

Even Lucian's outrageous satire, *A True Story*, has mythic elements to it. Lucian treats the moon as a geographical site and a material place, in the same way that Plutarch does in

[26] Nancy Lynn Spring, 'Drayton's Moon-Goddess in Endimion and Phoebe' (McMaster University, 1990).
[27] Michael Drayton, 'Endimion and Phoebe' (London: John Busbie, 1595), sig. F2^{r}.
[28] Ibid., sig. D^{v}.

his own work. However, the preposterousness of the various locations he uses throughout the two books – islands in the belly of a whale, made of cheese or containing a society of lamps, for example – suggests that, here, the moon is simply another fantastical setting and not to be taken seriously. The framework of the text is taken straight from the classical quests which Lucian cites, such as Homer's *Odyssey*.[29] This is reflected in both the episodic nature of the narrative and the adventures that they contain, such as journeying to strange lands and battling fantastic creatures. The origin of the peculiarities of Lucian's moon men is, however, less immediately recognisable to the modern reader, as so many texts which may have provided Lucian with points of reference or parody are no longer extant. Nevertheless, it has the feel of a beautiful collage of colourful details plucked from various tales and myths. Lucian himself points the reader in this direction in his introduction to Book 1: 'everything in my story is a more or less comical parody of one or another of the poets, historians and philosophers of old, who have written much that smacks of miracles and fables'.[30] A number of critics have made efforts to unearth precedents for the various details which Lucian includes: for example, Montgomery points to Philolaus of Croton (5th century BC) who apparently thought that animals on the moon 'do not excrete', for the basis of the moon men who are 'not subject to calls of nature, which, in fact, they have no means of answering'.[31] However, there is certainly one myth, which Lucian uses briefly, that is familiar. The king of the moon turns out to be Endymion who had been 'ravished from our country in his sleep' before being made the new monarch.[32]

The materiality of the selenites depicted after the publication of *Sidereus Nuncius* forms a stark contrast to these spiritual and mythical representations. Where authors have given details, and many of them have, these later beings are of a consistently material nature. They have substance, they eat and drink: 'Food groweth every where without labour, and that of all sorts to be desired'; they sleep: 'they fall into a dead sleepe, and are not possibly to be wakened till the *Sun* be sett'; and many of them travel using mundane means such as walking, running or swimming, rather than using a more ethereal method:

[29] Lucian, 'A True Story', in *Lucian: In Eight Volumes*, ed. by A.M. Harmon, T.E. Page, and W.H.D. Rouse (London: William Heinemann, 1913), 247–357 (p. 251).
[30] Ibid., pp. 249-251.
[31] Montgomery, p. 22, and Lucian, p. 277.
[32] Lucian, p. 261.

'One of those man-beasts seized me by the scruff of my neck, [...] tossed me onto its back, and carried me off to their city. I was quite amazed [...] to see that every one of them walked on all fours'.[33] Furthermore, the majority of them are social beings: Jonson's moon people have a 'variety of nations, polities, laws [...] Inland cities, boroughs, hamlets, fairs and markets' and Christiaan Huygens's planetarians 'maintain a Society and Fellowship with, and afford mutual Assistances and Helps to one another'.[34]

Seeing ourselves in the stars

The materiality of post-1610 extraterrestrials, perhaps naturally, led to a certain amount of familiarity appearing in their representations. Before this point, there was a recognition that, whatever might be 'out there', was entirely different from what was 'down here' on Earth. Lyly and Drayton's works are again obvious examples of this: the moon and other planets are gods and goddesses. They may influence behaviour, as Luna does to Pandora, or choose to walk the Earth in human form like Cynthia, but they are powerful, heavenly creatures, like Drayton's Phoebe, who do as they please without limitation. Lucian's moon creatures, except for his single mythical human king, are entirely strange and fantastical: three-headed vultures with quills bigger than ship's masts, fleas 'as large as twelve elephants' and spiders 'far larger than the Cyclades islands' that spin webs across the heavens, amongst many others.[35] Even the moon men are bizarre and unfamiliar creatures: their legs are their bellies, their bellies are pockets, their noses run pungent honey and they eat only smoke from cooked flying frogs. Nicolas of Cusa and Plutarch's narrator, Lamprias, think that humans can 'have no comprehension of these beings', although Sulla's myth portrays them as wandering spiritual remnants.[36]

After the arrival of *Sidereus Nuncius*, however, selenites lose their characterisation as something entirely 'other' and can be described in many cases as strongly resembling human beings. Authors seem to have stopped seeing mysterious gods, ethereal spirits

[33] Francis Godwin, *The Man in the Moone or a Discourse of a Voyage Thither by Domingo Gonsales, the Speedy Messenger* (London: Printed by Iohn Norton for Iohn Kirton and Thomas Warren, 1638), p. 102 and p. 87; Savinien Cyrano de Bergerac, *Journey to the Moon*, trans. by Andrew Brown (London: Hesperus Press, 2007), p. 33.
[34] Jonson, *News*, p. 296-297 (lines 121-123), and Christianus Huygens, *The Celestial Worlds Discover'd: Or, Conjectures Concerning the Inhabitants, Plants and Productions of the Worlds in the Planets* (London: Timothy Childe, 1698), pp. 78-79.
[35] Lucian, p. 265.
[36] Plutarch, p. 179.

and strange creatures in the space beyond Earth and started seeing humans and creatures that are, if not quite 'us', then certainly recognisably anthropomorphic. This trend begins almost immediately in 1611 with Donne's *Conclave Ignati*. *Conclave Ignati* is a satire on the Roman Catholic Church and the Jesuits, with a particular focus on Ignatius Loyola, the order's founder.[37] However, its importance lies in the way Lucifer seeks to get rid of Ignatius when he becomes rather too ambitious: he offers to get Galileo to transport Ignatius and the Jesuits to the moon to establish a new church and, therefore, a new hell that Ignatius could govern himself. Despite it being an obviously tongue-in-cheek suggestion by the author, Donne is outlining the establishment of a society, however diabolical it may be, on the moon: a society of real, contemporary humans.

This continues in Jonson's 1620 masque *News from the New World*. As with Donne's *Conclave Ignati*, Jonson has sketched a society living on the moon. The difference is that Jonson's society is made up of beings originating on the moon, not dispatched from Earth. For the most part, Jonson's selenites are clearly comparable to polite English society: there are 'ladies [...] And knights, and squires [...] And servants, and coaches'.[38] However, as Mark Muggli has noted in his 1992 article 'the moon is mostly superior to the "sublunary" world': the lawyers are silent, the Anabaptists do not preach, all 'the discourse there is harmony' and privacy is provided for everyone by clouds and mists.[39] The exception to these rather human selenites is a population found on the Isle of Epicoenes. Rather than the lords and ladies of the rest of the moon, Jonson describes an androgynous race who mate in the moonshine; the females then lay eggs that hatch into Volatees, a cross between men and birds, which 'hop from island to island'.[40] Jonson's moon forms an opposite for Lucian's moon: whereas Lucian's contains one mythical human, most of Jonson's moon is inhabited with what seem like real people living as part of a contemporary English society. Equally, Lucian's moon is filled with fantastical creatures, whereas Jonson's merely has a few living among the islands.

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[37] A general biography of Loyola can be found in 'Ignatius Loyola or (Spanish) Ignacio de Loyola (1491–1556)', ed. by Gordon Campbell, *The Oxford Dictionary of the Renaissance* (Oxford: Oxford University Press, 2003) <http://www.oxfordreference.com/view/10.1093/acref/9780198601753.001.0001/acref-9780198601753-e-1907?rskey=SryuQw&result=2> [accessed 31 July 2017].
[38] Jonson, *News*, p. 300 (lines 218-220).
[39] Mark Z. Muggli, 'Ben Jonson and the Business of News.', *Studies in English Literature (Rice)*, 32 (1992), 323–340 (p. 327), and Jonson, *News*, p. 299 (lines 177-178).
[40] Jonson, *News*, p. 302 (line 261).

It does not, at first, appear possible to describe Francis Godwin's Lunars in *The Man in the Moone* as human. Their whole world is on a gigantic scale, although Godwin's Lunars themselves vary greatly in height. This disparity in their heights indicates other differences between them, with the tallest being the longest-lived, the most respected, and of the strongest constitution: able to stay awake during sunlight hours, unlike their shorter brethren who need to sleep for roughly a fortnight while the sun shines on the moon. Godwin's narrator, Domingo Gonsales, reports on other details that set the Lunars apart from Mankind. These include the Lunars' attire, indescribable in both colour and material, their means of transport via feather fans, and their musical language, as well as their origins, government and society. Overall, Gonsales demonstrates that they are a peaceful, happy nation without crime or disease, which celebrates long lives well-lived rather than grieving when loved ones die, as humans do. However, despite these many strange and wonderful attributes, William Poole has pointed out, in the introduction to his 2009 edition of the work, that 'Godwin's cheery anthropomorphoids feel distinctly human'.[41] Indeed, this is no surprise as Gonsales reveals that at least some of the Lunars are actually human or descendents of humans. Discussing Irdonozur, the supreme ruler of the moon-world, Gonsales reports that 'The first ancestor of this great *Monarch* came out of the earth [...] and having begotten divers children, returned (by what meanes they declare not) unto the Earth againe'.[42] The mixed capitalisation on the word 'earth' in this passage complicates its modern interpretation, as Godwin could either have meant that Irdonozur came 'out of the ground' or that he came from the planet Earth. However, despite Poole picking up the 'out of the ground' explanation, Gonsales obviously means planet Earth as he continues: 'our Histories afford no mention of any earthly man to have ever beene in that world before my selfe, and much lesse to have returned thence again'.[43] Similarly, later in his tale, Gonsales mentions that the Lunars send any of their children 'who are likely to bee of a wicked or imperfect disposition' to Earth and exchange them for human children.[44]

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[41] William Poole, 'Introduction', in *The Man in the Moone*, by Francis Godwin, ed. by William Poole (Peterborough, Ontario: Broadview Editions, 2009), pp. 11–60 (p. 42).
[42] Godwin (1638), pp. 76-77.
[43] Francis Godwin, *The Man in the Moone*, ed. by William Poole (Peterborough, Ontario: Broadview Editions, 2009), p. 102, n. 2, and Godwin (1638), p. 77.
[44] Godwin (1638), p. 104.

Other authors, too, have emphasised the humanity in their selenites. In his *Discours Nouveau Prouvant la Pluralité des Mondes,* Pierre Borel outlines a rationale that Paradise and Hell must be situated in one of the stars. He states that Paradise is possibly 'adjoyning the Circle of the Moon', and that 'there are already divers bodies in Hell, and also in Paradise. In Hell are those who have yielded up their bodies to the unclean spirits and Dæmons; but in Paradise are *Elias* and *Enoch*'.[45] This logic leads to the conclusion that at least some of the extraterrestrials Borel envisages are, in one form or another, actually human. Savinien Cyrano de Bergerac's lunar inhabitants in his *L'Autre Monde, ou Les États et Empires de la Lune* are, in many ways, some of the least human created during this period. However, the first thing his narrator notices when he sees them clearly for the first time is that 'they had the same shape, size and face as we do'.[46] Aphra Behn's Doctor Baliardo in *Emperor of the Moon* appears to have no concept of a selenite beyond the human model as he shows no surprise or curiosity when he meets false ambassadors from the moon, being played by the very human Don Charmante and Harlequin. Although, like Borel before him, Huygens does not write exclusively about the moon in *Cosmotheoros*, but about a wider universe, he too sees extraterrestrials as essentially human beings living in the stars. The overarching principles throughout *Cosmotheoros* are those of uniformity and fairness. 'Who doubts' he writes, 'but that God, if he had pleased, might have made the Animals in *America* and other distant Countries nothing like ours? [...] yet we see he has not done it'.[47] It is this similarity of overall form and mechanics that he projects into the rest of the universe, while allowing some small modifications according to a planet's distance from the sun and its consequently unique conditions of temperature and light. As David Knight has pointed out, this gives the effect that 'the further one travels the more everything is the same'.[48] The principle of fairness that Huygens employs emerges initially through his desire not to see any other planet disadvantaged in comparison to the Earth:

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[45] Pierre Borel, *A New Treatise Proving a Multiplicity of Worlds. That the Planets Are Regions Inhabited and the Earth a Star, and That It Is out of the Center of the World in a Third Heaven, and Turns Round before the Sun Which Is Fixed. And Other Most Rare and Curious Things*, trans. by D. Sashott (London: John Streater, 1658), pp. 149-150 and p. 152.
[46] Cyrano de Bergerac, *Journey*, pp. 32-33.
[47] Huygens, p. 23.
[48] David Knight, 'Science Fiction of the Seventeenth Century', *The Seventeenth Century*, 1.1 (1986), 69–79 (p. 77).

> Now should we allow the Planets nothing but vast Deserts, lifeless and inanimate Stocks and Stones, and deprive them of all those Creatures that more plainly speak their Divine Architect, we should sink them below the Earth in Beauty and Dignity; a thing that no Reason will permit, as I said before.[49]

This attitude is clearly evident in his discussion of the planets' rational creatures, allotting them knowledge of the arts and sciences, five senses, and an upright position, as well as feet and hands, 'or else we must say that Nature has been kinder not only to us, but even to Squirrels and Monkeys than them'.[50] In fact, the more Huygens continues in his description of these rational creatures, the more they begin to sound exactly the same as the rational creatures of Earth. This is not lost on Huygens: the particularly interesting thing about his work is that Huygens is entirely aware that he is creating this homogeny and seems to have done it in spite of himself. He deems the opinion that 'it is impossible a rational Soul should dwell in any other shape than ours' to be ridiculous and proceeding from weakness, ignorance and prejudice.[51] Yet, Huygens fully admits that he cannot quite get away from the same idea himself:

> Yet methinks this fancy has such a rule upon my mind, that I cannot without horror and impatience suffer any other figure for the habitation of a reasonable Soul. For when I do but represent to my Imagination or Eyes a Creature like a Man in every thing else, but that has a Neck four times as long, and great round sawcer Eyes five or six times as big, and farther distant, I cannot look upon't without the utmost aversion, altho at the same time I can give no account of my Dislike.[52]

Seeing humankind staring back from the stars allowed representations of life on the moon created after *Sidereus Nuncius* to be made use of differently from those created before that point. Although *Conclave Ignati* is an obviously religious satire, the satirical element in later works changed to become more all-encompassing: it was not only religion that was a target, but also wider contemporary society. Nevertheless, it is clear that the use of satire in conjunction with representations of life on the moon was not a brand new combination after 1610. Lucian's *A True Story* is a prime example from the earlier period. However, Lucian's satire is not of the society he saw around him, but

[49] Huygens, p. 21.
[50] Ibid., p. 73.
[51] Ibid., p. 76.
[52] Ibid., p. 77.

specifically of the 'classical quest' genre of writing which he found far-fetched and hypocritical: 'I did wonder [...] that they thought that they could write untruths and not get caught at it'.[53]

The earlier social satires began gently enough. Jonson's lunar little England takes the faintly ridiculous from contemporary society and stretches it further for comic effect. The stereotypical sighing lovers 'sigh or whistle themselves away, and those are presently hung up by the heels like meteors, with squibs i' their tails, to give the wiser sort warning' and the conceited dandies waste away for 'want of tailors' or turn into moon calves, the lunar ladies' lap-dogs.[54] Despite the comedy, however, Jonson is portraying an improved society where life is harmonious and private, and the silly and irritating get their comeuppance: a situation that the audience of the court masque is likely to have found a very appealing suggestion.

Godwin's work is a much deeper social exploration and, indeed, is the earliest account of selenites that explores their society to such a degree. The sting of Donne's and Jonson's satires are missing from Godwin's work, replaced by gentle idealism which creates a utopia that it is possible Godwin thought Earth-dwellers should be aiming for. The Lunars' society is organised as a strong world-wide monarchy, the people are peaceful, monogamous and obviously religious, and there is no crime or disease. Their eventual death is a painless time of celebration at which the Lunars felt they 'should now leave the counterfeit pleasures of that world, and bee made partaker of all true joyes and perfect happinesse': an unsurprising revelation from the erstwhile bishop of both Llandaff and Hereford.[55]

Cyrano de Bergerac's social satire is somewhat different, using his selenites to hold a rather unflattering mirror up to contemporary society. The text demonstrates the narrow-mindedness of human traditions and customs when seen in comparison to those of the lunars, but also reflects the 'intransigence and incomprehension' that the unfamiliar or unknown would face on Earth, through the narrator's experience on the

[53] Lucian, p. 251.
[54] Jonson, *News*, p. 300 (lines 202-205, 208-209 and 217).
[55] Godwin (1638), p. 108.

moon.[56] And yet, perhaps most damning of all, when the narrator finally returns to his own world, it seems he has learned nothing at all from his experiences at the hands of the lunars; instead he describes his adventures merely as 'marvels' and is thankful that God has thought to confine the lunars to the moon and punish 'them for their pride by abandoning them to their own conceit'.[57] Moreover, Cyrano appears to be the first to turn his target on its head so completely. Instead of using society's own standards to provide an aspirational ideal, such as the harmony and privacy of Jonson's *New World* or the moral perfection of Godwin's Lunars, Cyrano steps away from society's perspective to create a whole new set of standards for his lunar world 'as if human life were somehow being examined from the outside, by an extra-terrestrial'.[58]

Later in the seventeenth century, the element of social commentary becomes a stronger focus than the concept of life on the moon in a number of texts, effectively reducing the concept to a mere plot device. This can be seen clearly in Samuel Butler's *The Elephant in the Moon* and Behn's *Emperor of the Moon*. Both use the concept to target 'bad science', to use a modern phrase. The focus of *The Elephant in the Moon* is a satire on the Royal Society: the virtuosi of a 'Learn'd *Society*' gather to observe the moon one night and believe they have discovered the warring inhabitants and an escaped elephant. Only later is it revealed that these are, in fact, a mouse and some gnats trapped inside the telescope.[59] Rosslyn D. Haynes and Barbara M. Benedict both identify the telescope with the distortions of the virtuosi's speculations.[60] However, it is not clear that this is what Butler intended. Although the overexcited virtuosi use what they see through the telescope to create an elaborate moon-world, it is they, rather than the instrument, that is at fault. Neither the footboys, nor the one 'sensible' natural philosopher, see anything except what is actually there, despite observing through the same instrument. Therefore it cannot be the telescope that has introduced the distortion. Butler himself indicates this

[56] Bruno Ferraro, 'Giordano Bruno's Infinitely Numerous Worlds and "Lunar" Literature', *European Legacy*, 11.7 (2006), 727–36 (p. 735).
[57] Cyrano de Bergerac, *Journey*, p. 116.
[58] Ibid., p. xiv.
[59] Butler, p. 1 (line 1).
[60] Roslynn D. Haynes, 'Representations of Astronomers in Literature', *Astronomy Quarterly*, 8.3 (1991), 131–76 (pp. 139-140) and Barbara M. Benedict, *Curiosity : A Cultural History of Early Modern Inquiry* (Chicago: University of Chicago Press, 2001), p. 63.

difference by describing the footboy who discovers the mouse as 'viewing well'; it is the quality of the viewing that matters and not the use of the telescope.[61]

The moon-world that the virtuosi describe is that of Kepler's *Somnium*. As Nicolson has noted, they 'see' the gigantic Privolvans and Subvolvans making war on each other from their underground homes, built to shelter them from the hot sun.[62] However, Butler's implication is that life on the moon is simply a product of the virtuosi's imagination: much of what they report could not even have been observed. Instead, they use a fiction written by somebody else to create a complex political and sociological back story for their newly discovered selenites. Indeed, the virtuosi's creatures, like Donne's and Godwin's, are actually from Earth:

> From th'old *Arcadians* th' are believ'd
> To be, before the *Moon*, deriv'd;
> And, when her Orb was new created,
> To people her, were thence translated[63]

However, the literary associations of Arcadia are with the home of Pan, a fabled, pastoral utopia. So it seems the fictional race of selenites is descended from a mythical people. Butler's point has been very neatly made.

Behn's target, on the other hand, is ostensibly a single virtuoso. While Doctor Baliardo is an obvious example of the virtuoso-as-figure-of-fun common during this period,[64] with his wide ranging interests demonstrated in Mopsophil's reference to 'his *Microscope*, his *Horoscope*, his *Telescope*, and all his *Scopes*', it seems his interest in the actually scientific is somewhat limited.[65] His chief occupation in the play is astronomy, but he does not use his giant telescope to observe the stars or the planets. Instead, he trains the instrument on the moon to try to 'Peep into the Kings Closet'.[66] To him, astronomy is not a scientific activity, but about politics and power, and it is this that Behn is criticising. It is the Doctor's thirst for secrets and advancement that blinds him to what is going on around

[61] Butler, p. 17 (line 335).
[62] Nicolson, *Science and Imagination*, p. 77.
[63] Butler, p. 7 (lines 99-102).
[64] For other examples, see Samuel Butler's fragmentary *A Satire Upon the Royal Society*, and Thomas Shadwell's *The Virtuoso*.
[65] Aphra Behn, *The Emperor of the Moon: A Farce* (London: Printed by R. Holt for Joseph Knight and Francis Saunders, 1687), sig. B3^{r} (I.2).
[66] Ibid., sig. B4^{r} (I.1).

him, despite mounting evidence that a plot is hatching: evidence that a scientifically minded man may have paused to examine more closely.

In both examples, it is clear that the text is not truly about life on the moon. In Behn's play the concept is used merely as an elaborate fabrication designed to trick Doctor Baliardo into giving his niece and daughter permission to wed their beaux. In Butler's poem it is a useful device for ridiculing members of the Royal Society. In both cases, it is easy to imagine the authors using other situations for the same ends: observation through the microscope, perhaps, or attempts to weigh air, for Butler; foreign governments or other supposedly powerful organisations, for Behn. However, the popularity of the concept of life on the moon made it ideal for their purposes. This will be examined more closely in Part Three.

In Elkanah Settle's *The World in the Moon*, the removal of the concept of life in the moon to a mere plot device has been taken just about as far as it can go without it vanishing entirely. In the 1697 play, it has become little more than an excuse for extravagantly spectacular scenery and stage dressing. For example, towards the end of Act I comes the following stage direction:

> *The Flat-Scene draws, and discovers Three grand Arches of Clouds extending to the Roof of the House, terminated with a Prospect of Cloud-work, all fill'd with the Figures of Fames and Cupids; a Circular part of the back Clouds rolls softly away, and gradually discovers a Silver Moon, near Fourteen Foot Diameter: After which, the Silver Moon wanes off by degrees, and discovers the World within, consisting of Four grand Circles of Clouds, illustrated with Cupids, &c. Twelve golden Chariots are seen riding in the Clouds, fill'd with Twelve Children, representing the Twelve Celestial Signs. The Third Arch intirely rolling away, leaves the full Prospect terminating with a large Lanschape of Woods, Waters, Towns, &c. Enter Cynthia's Train, being Twenty Singers, and other Retinue* [...][67]

It is not hard to imagine the audience reacting with amazement and wonder when faced with such a spectacle. However, after a song, some dancing swans and dancing green men, both faint echoes of Godwin as Nicolson has noted, the Act finishes.[68] When the

[67] Elkanah Settle, *The World in the Moon* (London: Abel Roper, 1697), pp. 6-7.
[68] Nicolson, *Voyages*, p. 89.

action begins again, the scene is entirely different and the unrelated interlude apparently forgotten.

Where details of the moon-world are revealed, often through stage directions such as these, the theatre could almost have returned to the previous century, if the Restoration irreverence is put aside. Cynthia is there, together with cupids, the zodiac and a range of classical gods and goddesses, from Jupiter and Juno to Bacchus and Ceres. While the woods, waters, towns and gardens mentioned are slightly newer details, they are most definitely not original with this play. Nicolson has taken the last few lines to indicate that a moon-world 'still seemed a "new" theme to the searchers for novelty':[69]

> HAYNS Well, Sir; and what think you of our New World in the Moon?
> WILDBLOOD Why, Faith, *Jo,* I think, as your Painter has dress'd it, 'tis a new World indeed.
> HAYNS And how do you like it?
> WILDBLOOD As I do a mistress the better for being a new one.[70]

Wildblood specifically refers to the world being new because of the way the painter has dressed it. There is nothing in the moon-world itself that is unique, but its breathtaking portrayal and numerous song-and-dance routines may very well have been. By this point in the seventeenth century, the novelty is in the spectacular nature of the production rather than in the theme.

However, the final word on the matter of life on the moon must go to Christiaan Huygens. Despite the apparently dense population of the universe in his *Cosmotheoros*, Huygens finds himself unable to extend that abundance to the moon. Stepping logically through knowledge of the moon gleaned from observations made with 'a good long Telescope', Huygens reviews the evidence:

> Nor can I find anything like Sea there [...] Nor do I believe that there are any Rivers [...] Nor have they any Clouds to furnish the Rivers with Water [...] 'Tis certain moreover, that the Moon has no Air or Atmosphere surrounding it as we have [...] This is that notable difference between that Planet and us that hinders all probable Conjectures about it. If we could but once be sure that

[69] Ibid.
[70] Settle, p. 43 (V.1). The spelling of 'Hayns' varies throughout this edition of the play. The spelling quoted here has been taken from the character's first appearance.

> they had Water, we might come to an Agreement, and plant a Colony perhaps there; we might allow it then most of our other Privileges, and, with *Xenophanes*, furnish it with Inhabitants, Cities and Mountains. But as 'tis, I cannot [...][71]

As quickly as the moon was furnished with inhabitants, Huygens removes them with reasoning. Whilst there is no longer a dispute on its material nature by the close of the seventeenth century, the moon's existence has lost the vibrant potential for life that characterised its portrayal throughout so much of the period.

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[71] Huygens, pp. 130-132.

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Chapter 2

'I need only draw the Curtain, and shew you the World'[1]

Despite the disappearance of a truly material and inhabited world in the moon by the end of the century, other changes appearing in post-1610 moon literature were of a more lasting nature. The way in which authors approached both their own material, and the concept of life on the moon, became more investigative than it had previously been, moving beyond conventional boundaries. Moreover, a sense of realism began to develop: texts left the myths behind and instead began to wrestle with ideas of evidence and proof. This is not to say that fiction itself was discarded. On the contrary, the role of fiction was central. Indeed, the works examined here demonstrate that the specific ways in which authors presented their fictions to readers only enhanced their nascent realism.

Exploring the possible

Exploration is a third theme that divides texts from before and after the publication of *Sidereus Nuncius*. Those written in the earlier period have a boundaried, finite nature. While Plutarch's characters speculate about the moon, they remain very much Earth-bound: not only physically, but also in their terms of reference. They look at their own surroundings, both in regard to the world around them and their academic environment, to give them clues to explain the phenomena of the moon's spots and light. They make use of the evidence they have available to them. Nevertheless, Montgomery raises an interesting point, arguing that, despite the whole work revolving around a visual, physical object, 'the moon itself is absent from the dialogue'.[2] Perhaps it would be more accurate to say that the moon is absent from the extant part of the dialogue, the misfortune of a partial text being that it is impossible to know what was written in the missing part. However, this apparent absence is unlikely to be an oversight on Plutarch's part. Much of what is discussed in the dialogue has nothing to do with any physical evidence that could be provided by looking at the moon during the discussion: the possible causes of the

[1] Bernard le Bovier de Fontenelle, *A Discovery of New Worlds* (London: William Canning, 1688), p. 14.
[2] Montgomery, p. 36.

visual effect of the 'face' cannot be discovered by looking up at the moon, neither can any proof for or against the possibility of habitation. Despite being prompted by a visual effect, the content of the debate goes beyond the visual, limited as it was to human eyesight at this time, so there seems little reason for the characters to spend time in gazing up at the moon. The exception to this could possibly be for a scene-setting effect, perhaps covered in the missing introductory portion of the text. However, this is entirely speculative and also, I would suggest, unlikely given the lack of other such dramatic details in the extant part of the text. Even the characters themselves are there less for dramatic effect and more for the structure and clarity they add to the content. Indeed, the expectation that the characters should spend time making observations of the object under scrutiny, rather than referring to what authorities had to say on the subject, is anachronistic.

Similarly, Lyly and Drayton's works are also Earth-bound. While there is a limited amount of sky-gazing, the action all takes place on Earth or Utopia, as Earth's equivalent in *The Woman in the Moone*. Cynthia, Luna and her planetary companions, and Phoebe all come to Earth to interact with Endimion and Pandora. In Cynthia's case, she even brings her whole court with her. While Pandora chooses to go to the moon at the conclusion of *The Woman in the Moone*, the play concludes at this point before the action would need to relocate. All three of these texts are situated, and remain, within the limits of a mythical world of folklore throughout. Lucian's text, despite being the story of a long voyage which includes a trip to the moon, has similar boundaries. Despite a physical exploration on the part of the narrator's crew, the story stays firmly within the boundaries of the classical, mythical world it is parodying.

In contrast to this closed quality of early texts, those written after *Sidereus Nuncius* demonstrate exploration beyond Earth in a number of ways. Obviously, it was not actually possible to travel beyond Earth's confines in the seventeenth century. Yet, a number of authors suggested ways of doing exactly that. Donne suggests that Galileo uses his telescope to 'draw the *Moone,* like a boate floating vpon the water, as neere the earth as he will. And thither (because they euer claime that those imployments of discouery belong to them) shall all the Iesuites bee transferred'; Jonson prefers the 'neat

and clean power of poetry' and his poet flew to the moon 'upon the wings of his muse'.[3] While neither Donne nor Jonson are seriously suggesting these modes of transport to get to the moon, both Godwin and Cyrano de Bergerac elect to send their explorers to the moon using far more mechanical methods, suitable for travelling to material locations. Godwin's vessel is 'an Engine' pulled by a flock of gansas, which his protagonist trains to fly on command during the early part of the story.[4] Cyrano's narrator at first tries bottles of dew which allow him to rise as the dew is evaporated by the sun, abandoning the idea when he ends up heading for the sun instead of the moon. His second attempt is in a winged machine that crashes almost immediately. However, this becomes the first space rocket when soldiers tie fireworks to it while the narrator is recovering after the crash. When the fireworks are burned out and the machine falls back to Earth, the narrator completes his journey under the power of attraction from the waning moon to the ox marrow on his bruised skin. While this is not exactly a mechanical means of travel, it can still be classed as a physical method of transportation rather than spiritual or magical. The key part of these representations is not the various methods employed to travel to the moon but the very fact that they show human beings leaving Earth and travelling outwards.

Scrutiny of the cosmos also took place in rather less physical ways. John Wilkins, Borel, Fontenelle and Huygens all made mental journeys beyond Earth. They, or their characters, may not have physically left the planet, but virtually they traversed the universe. Wilkins's is very much an intellectual exploration. The work is made up of a number of 'propositions', each of which is intended to build evidence towards his argument that the moon is habitable. The propositions cover such things as the solidity of the moon's body, the physical geographical features, the atmosphere, and the weather. In each proposition, Wilkins examines what has previously been written on the subject, both by ancient authorities and by his contemporaries, and constructs the most likely case. Indeed, as Aït-Touati highlighted in her 2011 book, 'the argument of the *Discourse* is not apodictic but probable': Wilkins is not seeking to prove 'any Exact,

[3] John Donne, *Ignatius His Conclave or His Inthronisation in a Late Election in Hell* (London: Printed by N[icholas] O[kes] for Richard Moore, 1611), p. 117, and Jonson, *News*, p. 296 (line 94) and p. 298 (lines 166-167).
[4] Godwin (1638), p. 27.

Accurate Treatise' but 'only probable Arguments', as he sets out in the prefatory 'Epistle to the Reader'.[5] The Epistle acts as a fairly standard 'Apology to the Reader' and characterises the work as 'but the Fruit of Some Lighter Studies'.[6] However, aside from one or two humorous digressions, such as his ponderings on the diet and sleep of moon travellers, Wilkins approaches his material with serious intent. Even Godwin's fiction, treated from the revised format 1640 edition onwards, is extended the same courtesy. Whilst acknowledging Godwin's text as a 'pleasant and well contriv'd Fancy', Wilkins goes on to an earnest discussion of swarming locusts and migrating birds, concluding that 'tis easily conceivable how once a year a man might finish such [a] Voyage' by making use of the gansas' migratory habits.[7]

Borel's approach is superficially similar to that of Wilkins in terms of layout, building up of evidence and overall aim. Yet, despite the similar formats, Borel seems to have less interest than Wilkins in the intricacies of proving his argument. Like Wilkins, he refers to a number of authorities on the topics he discusses and yet, in many cases, Borel is content simply to point readers to those authorities rather than probing the merits of their opinions. This results in a more concise product, but the outcome is a much less complete argument and a requirement for more effort if the reader wishes to follow Borel's reasoning fully.

Overall, Borel's conclusion is simply that it is illogical for Earth to be the only populated place in the universe. He makes frequent use of analogies between the Earth and other planets, such as the moon. For example:

> *Pythagoras* did often call the Earth a Moon; and, all well considered, What hinders, that the Earth be not as well reckoned in the numbers of the Stars, as the Moon, seeing that [...] the body of both of them is of a thick, dark and heavy matter, that both do borrow their light from the Sun, that they are both solid, and reverberate the beams of this light of the World, that both produce vertues and spirits of themselves, and that both are heng'd and suspended each in its aire or heaven, and upon its center; and having all these things

[5] Aït-Touati, p. 57, and John Wilkins, *A Discovery of a New World, Or, A Discourse Tending to Prove That 'Tis Probable There May Be Another Habitable World in the Moon. With a Discourse Concerning the Probability of a Passage Thither. Unto Which Is Added, a Discourse Concerning a New Planet,* 5th edn (London: John Gellibrand, 1684), sig. A2^{r} and sig. A2^{v}.
[6] Wilkins, *Discovery*, sig. A2^{r}.
[7] Ibid., p. 160.

> common together, may not the Moon, and so consequently the other Stars, infinitely bigger then it self, have Inhabitants?[8]

Additionally, he employs a number of teleological arguments: it is unlikely all the stars and planets were made for Mankind alone, the planets would be purposeless if they were not inhabited and so forth. These were not uncommon arguments amongst proponents of a moon-world during the period, and are captured as such in James Howell's letter to Doctor J. D. in his *Familiar Letters* of 1650:

> Among other arguments which Assertors of Astrean Inhabitants do produce for proof of this high Point, one is, that [...] the Allmighty Fabricator of the Univers, who doth nothing in vain [...] did not make those huge immense bodies, whereof most are bigger than the earth and sea, though conglobated, to twinkle onely, and be an ornament to the roofe of heaven [...][9]

However, Borel also introduced some more unusual pieces of evidence. Perhaps the most charming of these is in Chapter 24, where the bird of paradise is used as evidence of life on the moon. The bird's extraordinary beauty, unusual - though, now, obviously inaccurately reported - biology and the apparent fact that it was only ever found dead on Earth, lead Borel to conclude 'that it may come from some other Starre, where it lives and breeds' and fell to Earth after venturing too far from its home planet.[10]

Fontenelle is also interested in the possibility of habitation in his *Entretiens sur la Pluralité des Mondes*. However, he approaches the question differently, and has the advantage that almost fifty years has provided him with more of a foundation than Wilkins on which to build his exploratory fictions. Wilkins's reluctance to speculate on 'any thing of these *Selenites*' has been replaced with a desire to imagine the possibilities of the universe, to dream of what *might* be.[11] This open-endedness, noted by Robin Howells in his 1992 article, is not the pure freedom of thought encapsulated by Cyrano de Bergerac's work.[12] Rather, Fontenelle takes what is known, such as the amount of light and heat a planet

[8] Borel, pp. 34-35.
[9] James Howell, *Epistolæ Ho-Elianæ: Familiar Letters*, 2nd edn (London: Humphrey Moseley, 1650). The letter to Doctor J. D. appears in a third volume of letters, first published with the second edition, p. 20.
[10] Ibid., p. 94.
[11] Wilkins, *Discovery*, p. 135.
[12] Robin Howells, 'The Principle of Mobility in Fontenelle "Entretiens Sur La Pluralite Des Mondes"', *French Studies*, 46.2 (1992), 129–43 (p. 133).

might receive due to its distance from the sun, or the length of time it takes to make its annual and diurnal rotations, and constructs a credible image from this evidence. That he allows these images to vary as the conversation flows is simply part of the exploration. Occasionally, the change occurs as a new thought strikes him: 'The Moon, which I told you last night (by all appearance) was inhabited, now I begin to think, may be otherwise'.[13] Sometimes, it happens on the whim of the Marquise: '"I shall not unpeople the Moon then, Madam", said I, "but for your sake shall restore to it its Inhabitants"'.[14] However, a sense of reason is retained at all times:

> It may be therefore, as I said, that Vapours which arise from the Moon are not gather'd together, as a rounded Surface, into Clouds, but fall gently upon it again in insensible Dews, and not in Rain [...] so that, in our Imagination, we may furnish 'em with Fruits and Grain of several sorts, Waters, and what else we please [...][15]

Thus, imagination is used as a tool to assist the philosopher and the Marquise on their virtual voyage across the stars, pursuing their scientific studies. Here, it is not the mutually exclusive case that 'the end of reason is truth, the end of fancy is fiction'.[16] Instead, although the fictions are created by fancy, or imagination, they are guided by reason. And truth, as a goal, is too far out of reach; the search for truth has been replaced by the journey itself, the exploration of the possible.

Finally, Huygens explores a universe that is one of the most populated to be found in the seventeenth century. Not only does his virtual tour of the six primary planets furnish each of them with plants, animals and creatures 'endued with Reason', as well as the universal practices of astronomy, geometry and music, but he goes further in granting the same life to 'all those Planets that surround that prodigious number of Suns' outside our own solar system.[17] Furthermore, Huygens not only recognises the difficulties of trying to establish the facts of something so far outside the human experience, but celebrates the explorations that he and his contemporaries are making: 'In such noble and sublime

[13] Fontenelle, p. 71.
[14] Ibid., p. 75.
[15] Ibid., pp. 76-77.
[16] Margaret Cavendish, 'The Blazing World (1666)', in *An Anthology of Seventeenth-Century Fiction*, ed. by Paul Salzman, The World's Classics (Oxford: Oxford University Press, 1991), pp. 249–348 (p. 252).
[17] Huygens, p. 37 and p. 150.

Studies as these, 'tis a Glory to arrive at Probability, and the search it self rewards the pains'.[18]

It was not only the universe itself that seventeenth-century authors sought to explore by physical or virtual means. There was also a growing exploration of the implications and meanings of what they saw or imagined around them. Texts written before the publication of *Sidereus Nuncius* display a satisfaction with reasonably superficial facts. Lyly's and Drayton's works accept the existence of the moon goddess within the world of folklore they depict, her journeys to Earth, and the way she interacts with humans. Lucian and Plutarch's works, despite their more material outlook and the presentation of a greater range of information about their moon beings, such as how they might look and what they might eat, also do not question what they are describing. This is not unexpected in *A True Story*: Lucian is aiming for outrageous comedy rather than philosophical speculation. However, *Concerning the Face which Appears in the Orb of the Moon* is an attempt to collect and review evidence in response to a difficult and complex problem. His narrator, Lamprias, outlines this intent towards the beginning of the extant text:

> [...] in obscure and perplexing speculations, when the ordinary and reputable and customary accounts are not persuasive, it is necessary to try those that are more out of the way and not scorn them but literally to chant over ourselves the charms of the ancients and use every means to bring the truth to test.[19]

This objective is delivered by beginning with the technical and authoritative material available at this period, moving through reasoning and logic, and ending with spiritual folklore at the opposite end of the spectrum. Yet, Plutarch does not question his marshalled evidence in terms of its relation to the inhabitants of the Earth; the examination of the moon is a distinct and separate issue. Perhaps the nearest Plutarch comes to joining the two issues is in the expression of the opinion he shares with Nicolas of Cusa that Mankind can have no real knowledge of the beings in the rest of the universe.

[18] Ibid., p. 10.
[19] Plutarch, p. 35.

The first English author to question the implication of the existence of extraterrestrials was Robert Burton in his *Anatomy of Melancholy*. The 'Digression of the Aire', found in the second partition of the book, includes an exploration of cosmological theory and, by the 1651 sixth edition which was the last to include any authorial amendments, a huge array of 'astronomical speculations', as R.G. Barlow has described them.[20] However, even in the first edition published thirty years earlier, Burton is starting to question what meaning the existence of inhabitants of other planets would have for Mankind. Quoting Kepler, he asks:

> But who shall dwell in these vast Bodies, Earths, Worlds, *if they be inhabited, rationall creatures*, as *Kepler* demands? *or haue they soules to be saued, or doe they inhabit a better part of the World then we doe, or are we or they Lords of the World, and how are all things made for man?* [21]

Burton concludes merely that 'it is difficult to untie this knot [...] t'is hard to determine'.[22] Although reminiscent of Plutarch and Nicolas of Cusa's conclusions that extraterrestrial beings are unknowable, Burton's speculations have moved beyond the concentration on superficial qualities of those beings seen in texts before *Sidereus Nuncius*, such as what they look like and what they eat, to question the implications of their very existence. What do they mean for Man's relationship with the Universe? And with God? Burton may not have had the answers, but it is significant that he asked the questions.

A few years later, Wilkins was asking similar theological questions: 'whether they are the seed of *Adam*, whether they are there in a blessed Estate, or else what means there may be for their Salvation?'.[23] This line of questioning expresses anxiety over the inadequacy of prevailing religious precepts to account for the apparently increasingly obvious existence of other creatures in the universe, whether on the moon or the other planets. The medieval incorporation of Ptolemaic concepts into Christian teachings left little room for manoeuvre against the conceptually increasing size of the universe in the wake of Copernican theory. Yet, this anxiety was not to be long-lived. *The Man in the Moone* was

[20] R.G. Barlow, 'Infinite Worlds - Robert Burton's Cosmic Voyage', *Journal of the History of Ideas*, 34.2 (1973), 291–302 (p. 292).
[21] Robert Burton, *The Anatomy of Melancholy* (Oxford: Printed by Iohn Lichfield and Iames Short, for Henry Cripps, 1621), pp. 327-328.
[22] Ibid., p. 328. 'It is difficult to untie this knot' – my translation from the original Latin '*Difficile est nodum hunc expedire'.*
[23] Wilkins, *Discovery*, p. 124.

first published at the same time as Wilkins's work, and Godwin's Lunars are obviously religious. The first indication of this is their reaction to Gonsales's amazed exclamation of '*Iesus Maria*' when he sees them for the first time: they 'fell all downe upon their knees, (at which I not a little rejoyced) holding up both their hands on high, and repeating all certaine words which I understood not'.[24] At his later meeting with Pylonas, a similar scene is repeated and Gonsales discovers that they revere St. Martin above all others as '*Martin* in their language signifieth God'.[25] Additionally, there is a religious figurehead, named Imozes, living on a holy island mentioned later in the story. This element of the Lunar society serves to underline the ubiquitousness of God and Christianity, but it also raises a number of theological questions that Godwin simply does not address in the text. As the Lunars knew the name of Jesus, did He also die to save them? There is no sin in the moon-world, so are the Lunars living in a pre-lapsarian state? Did they even need saving? Such deliberations are complicated still further by the human presence in their society. As Poole puts it succinctly: 'Godwin introduces his aliens into the economy of a Christian universe but does not explain exactly what their role is in that economy'.[26] It is possible to speculate that Godwin felt making his Lunars religious was a satisfactory answer to the kind of questions that Burton had highlighted or, perhaps, that he simply did not experience those concerns himself. Nevertheless, for whatever reason, the fact is that there are no hints of religious anxiety in Godwin's text. Huygens, too, writing roughly sixty years later appears similarly unconcerned in this area. Despite being infused throughout with a Deistic, teleological approach, *Cosmotheoros* shows no sign of the religious anxiety apparent in Burton and Wilkins's texts.

Other writers in the second half of the century demonstrate the prevalence of these anxieties by addressing them directly. Borel, for example, reveals that he is confident enough in God simply not to worry about it: 'God has so many means and wayes, to us unknown, for to save them, and to satisfie his justice, that we need not inform our selves about these things, but believe them in faith'.[27] Conversely, both Fontenelle and Jean de La Bruyère dismiss such questions peremptorily. Indeed, La Bruyère has no interest at all

[24] Godwin (1638), p. 73.
[25] Ibid., p. 83.
[26] Poole, 'Introduction', p. 41.
[27] Borel, p. 140.

in such uncertainties and rejects them as vain and frivolous in section 45 of the final chapter of his *Caractères*. He reasons that, until there is some kind of proof that inhabitants exist beyond Earth, there is no point in worrying about what they are and whether they are Christian or not. Clearly, La Bruyère felt unthreatened by the concept of life beyond the Earth in his relationship with God and thought all good Christians ought to be equally unconcerned. Fontelle's approach is slightly different, although the outcome is much the same. In fact, religion does not really feature at all in his *Entretiens sur la Pluralité des Mondes*. Adam Roberts has described this work, in his 2005 history of science fiction, as 'remarkably secular in its speculations' and it is true that Fontenelle, as Howells states, 'evokes not God but nature itself as the creative power' throughout.[28] However, despite Behn's prefatory criticism in her 1688 translation of this work that '[h]e ascribes all to Nature [...] so that one would almost take him to be a Pagan',[29] Fontenelle was fully aware of how his work might be perceived and meets such potential criticism head-on in his 'Author's Preface':

> But when I shall tell you the Moon is inhabited, you presently represent to your Fancy Men made as we are; and if you are a little of the Theologician, you will then be presently full of Difficulties: *The Posterity of* Adam *could not possibly extend to the Moon, nor send Colonies into that Country; then they are not the Sons of* Adam: And that would be a great perplexing Point in Theology, to imagine there should be Men, and those not to descend from *Adam*; there is no need of saying any more, all the Difficulties are reduced to that [...] I have no need of answering them; let the Men in the Moon do it, who are only concern'd; for 'tis they that put the Men there, I only put Inhabitants [...][30]

Fontenelle shows clearly that he comprehends the issues at stake, but his words indicate an acceptance that cosmology and religion are separate concerns. This is a significantly different position from that expressed by Burton and Wilkins earlier in the century.

Towards science and reality

The split between cosmology and religion evident in Fontenelle's work is not the only division that occurred during this period. Authors, whether writing fiction or philosophy,

[28] Roberts, p. 51, and Howells, p. 132.
[29] Fontenelle, p. A8^{v}.
[30] Fontenelle, pp. b4^{v}-c.

began to demonstrate a change in how they dealt with their material: expending effort on making their fictions appear more believable, more 'real' than writers had done previously, on making their philosophy irrefutable. As part of this, there was a drive to provide the reader with evidence that what was being read was true, with proof that the author was correct in his or her statements and assumptions.

There are some indications of this type of approach in the period before *Sidereus Nuncius* was published, demonstrated by the work of Plutarch and Lucian. *Concerning the Face which Appears in the Orb of the Moon* offers a range of evidence collected in order to tackle a particular question, as suggested above. Despite the interpretation, shared by Montgomery and Maurice Bennett, that this is an exclusively literary discourse, Plutarch has incorporated a large amount of technical material, such as the laws of reflection.[31] He cites both Hipparchus and Aristarchus of Samos including, as Cherniss has pointed out in the introduction of his Plutarch translation, 'a technical work of the latter [which] is quoted verbatim'.[32] This can be explained by the fact that Bennett and Montgomery appear to be judging the scientific content of this text using modern definitions of science, rather than one which would have been more familiar when the essay was written. In the first century AD, there was no great tradition of empirical science, of experiment and observation, of facts and formulae that would be recognised as 'science' today. Until that point, philosophy, reasoning and analogy *were* science, so, while Bennett and Montgomery are judging it by a somewhat irrelevant standard, in comparison to works written after *Sidereus Nuncius* they do, perhaps, have a point. One of the most similar works to Plutarch's written in the later period is Wilkins's *The Discovery of a World in the Moone*. It, too, collects evidence to build a case that the moon is an Earth-like world and, from the 1640 edition, as noted above, makes use of a piece of fiction, Godwin's *The Man in the Moone*, as a conclusion to the evidence. However, it is in the respective approaches taken to their fictional 'evidence' that the different attitudes of Plutarch and Wilkins can be seen most clearly. Firstly, Plutarch's narrator announces his intention early on to make use of all kinds of evidence, including

[31] Montgomery, p. 32, and Maurice J Bennett, 'Edgar Allan Poe and the Literary Tradition of Lunar Speculation', *Science Fiction Studies*, 10.2 (1983), 137–47 (p. 139).
[32] Plutarch, p. 19.

that which is 'more out of the way', which is later revealed to be Sulla's myth.[33] Wilkins, however, resists creating any fictions himself by stopping short of any detailed speculation on inhabitants: 'I dare not my self Affirm any thing of these *Selenites*, because I know not any Ground whereon to Build any Probable Opinion'.[34] The only way for Wilkins to describe the selenites would have been to enter the realms of fiction and, while he was content to seek out and use the possibilities in Godwin's fiction, his own text was entirely non-fictional. Secondly, Sulla's myth is presented in *Concerning the Face which Appears in the Orb of the Moon* in a very different way from the presentation of Godwin's work in *The Discovery of a World in the Moone*. Sulla's myth is given in full as a stand-alone section of the work. Although there are elements of the story which echo evidence in earlier sections, there is no overt attempt to treat the myth as another, similar, piece of evidence: it is not discussed or questioned as the philosophical claims and statements were in the first and second sections, it is merely allowed to speak for itself. As Sulla says at the conclusion of the whole text: 'You and your companions, Lamprias, may make what you will of the tale'.[35] Yet, they do not make anything of it and no authorial analysis is given. This would seem to demonstrate that, despite the stated intention to make use of 'all kinds' of evidence, myth is not regarded as a piece of evidence in its own right, a supportive and enjoyable finale, perhaps, but not of the same weight and rigour as philosophy or reasoning. In contrast, Wilkins's use of Godwin's fiction is far more in keeping with the rest of his work. Although making it clear that he is absolutely aware that *The Man in the Moone* is a work of fiction, Wilkins scrutinises it in the same way that he has analysed the philosophical evidence he has collected, comparing it to other knowledge, 'if we peruse the Authors who treat of them we shall find that [...]', and considering the force and usefulness of the information it contains: 'Now this Bird being of a great Strength, able to continue for a long Flight; as also going usually in Flocks [...] might be thought to carry the weight of a Man'.[36] To Wilkins, unlike Plutarch, knowledge and ideas can be gleaned from fiction as long as it is treated as rigorously as other types of evidence under consideration.

[33] Plutarch, p. 35.
[34] Wilkins, *Discovery*, p. 135.
[35] Plutarch, p. 223.
[36] Wilkins, *Discovery*, p. 160.

Similarly, Lucian makes use of techniques to make his story seem like evidence. Although being clear that he intends to 'tell all kinds of lies', he states that he plans to do so 'in a plausible and specious way'.[37] He goes on to use, in effect, the testimony of his first-person narrator to make his story more persuasive, as well as several claims to be telling the truth even though it is incredible. For example: 'Anyone who does not believe this is so will find, if ever he gets there himself, that I am telling the truth'.[38] However, his intent is absolutely to be outrageous and to parody the classical genres he is imitating. There is no aim on his part to provide any real evidence, to persuade his readers that events took place in the way he portrays them, or that any of his bizarre creatures actually exist. Again, contrasting this text with a similar work from the later period demonstrates the differences clearly. As James Knowlson has noted, the events that Godwin uses in the construction of the first part of *The Man in the Moone* are just one way in which 'a very real effort is made to lend an apparent verisimilitude to the fiction'.[39] The use of contemporary travel accounts, accurate dates and identifiable place names together with a 'fairly precise historical and geographical setting' provides the tale with an authentic feel despite the utopian quality of the lunar world itself.[40] The narrator's engaging autobiographical account, together with his repeated insistence on the proof of his own eyes, invites the reader to accept the unfolding account as genuine.

Yet, Godwin subtly introduces points that undermine this enticement to believe the story being related. The first of these is that the narrator, Domingo Gonsales, is a Spaniard, a nation not known for its good relations with England during the story's historical time span. Moreover, Gonsales is a 'slightly ridiculous Spaniard adventurer' who seems to tumble from one mischance to another while proclaiming his noble parentage.[41] This complicates the narrator-reader relationship by removing any implicit trust in the narrator's words. It is unclear exactly how much the reader should believe in what the narrator is saying. Secondly, the narrator places great emphasis on visual experience and his own status of 'little eye-witnesse' throughout the tale: 'I know thou wilt not have the

[37] Lucian, p. 249.
[38] Ibid., p. 281.
[39] James R. Knowlson, 'A Note on Bishop Godwin's "Man in the Moone": The East Indies Trade Route and a "Language" of Musical Notes', *Modern Philology*, 65.4 (1968), 357–361 (p.359).
[40] Ibid.
[41] William Poole, 'Preface', in *The Man in the Moone*, by Francis Godwin, ed. by William Poole (Peterborough, Ontario: Broadview Editions, 2009), pp. 7–8 (p. 8).

Grace to beleeve, till thou seest it', 'which ever I held in mine eye', 'which these eyes of mine can testifie', 'mine eyes have sufficiently informed me there can be no such thing'.[42] However, as a short novel rather than a play or masque, *The Man in the Moone* provides the reader with no more than a report of what Gonsales has seen, something that the narrator himself has no time for: 'for testimonies I care not'.[43]

Cyrano de Bergerac uses a similar technique in *L'Autre Monde*. His first-person narrator is a witness to all that occurs and certainly the majority of his attempts to reach the moon are via material, rather than spiritual, means. Even the last part of his journey by ox marrow, although perhaps rather less material, has a certain logic about it:

> I realised that since the Moon was on the wane, a phase in which she is accustomed to suck the marrow from animals, she was drinking the marrow I had smeared over myself all the more greedily because her globe was closer to me, and there were no clouds between us to weaken her vigour.[44]

Even more than Godwin, however, Cyrano undermines the believability he has put in place. The very structure of the text makes it a less comfortable and submersive reading experience. There is no authorial guidance or view on the topics that are discussed. As Joan DeJean has noted, the narrator's 'own point of view in these dialogues is shifting' and the reader is left adrift amid 'a multiplicity of opinions on every issue'.[45] Socrates' demon is, perhaps, the closest *L'Autre Monde* gets to a moral guide and yet the text makes it difficult for a reader to identify with him: he is from the Sun, with knowledge far greater than humankind's, and can only make himself visible via the disconcerting practice of possessing a recently deceased body. Additionally, inclusion of a character from a different fiction, Godwin's Gonsales, and reference to another of Cyrano's own real-life works, *Les États et Empires du Soleil*, complicates the status of the world in *L'Autre Monde*. The integrity of Cyrano's creation is broken down. As Eric MacPhail argues, the boundaries are blurred 'between fiction and the real world to which fiction

[42] Godwin (1638), sig. A4^{v}, and pp. 42, 56, 60, and 66.
[43] Ibid., p. 106.
[44] Cyrano de Bergerac, *Journey*, p. 15.
[45] Joan E. DeJean, 'Method and Madness in Cyrano de Bergerac's Voyage Dans La Lune', *French Forum*, 2.3 (1977), 224-237 (p. 225, and p. 227).

purports to refer' and the concept of 'literary fideism' has been subverted.[46] In other words, Cyrano deliberately disrupts the suspension of disbelief and internal logic required for a fictional situation to appear 'real' for the period of the story. However, it is worth noting that such disruptions necessarily require the construction of convincing fictions in the first place. Additionally, the uncertainty encouraged in the reader lends an air of greater realism to the texts, certainly in modern narrative terms. This uncertainty prompts the reader to assess the narrator's character and trustworthiness, in turn making that character appear more 'real'.

Later texts published before *Sidereus Nuncius* lose the evidential quality apparent in Plutarch and Lucian's texts. Nicolas of Cusa's *De Docta Ignorantia* is based on supposition and the strength of his faith in God. Lyly and Drayton's texts are purely fictional and make no claims to authenticity, they are consciously and deliberately mythical throughout. After *Sidereus Nuncius*, however, there appears to be a level of resistance to absolute fiction of this kind. As well as the increase in verisimilitude, discussed above, an inclination to use fiction as 'proof' of certain phenomena emerged. For Godwin this was the material nature of the universe and the motion of the Earth. As Gonsales travels through space, Godwin is able to bring contemporary astronomical theories to life using his explorer's observations of what he sees around him. In particular, Gonsales notes the distinct lack of a 'Region of Fire'and describes watching Africa appear to move around the globe as 'a spot like unto a Peare that had a morsell bitten out upon the one side of him [...] slide away to the *East* side'.[47] He is able to measure out the length of his journey in days by counting the number of Earth's revolutions. Despite Gonsales's decidedly unusual vantage point, the use of familiar images allows the scene to become at least comprehensible to an Earth-bound seventeenth-century reader. Poole has interpreted Gonsales's refusal to 'go so farre as *Copernicus*, that maketh the Sunne the Center of the Earth, and unmoveable' as evidence that Gonsales denies the sun is the centre of the whole universe.[48] However, Gonsales's specific words are 'Center of the *Earth*' (my emphasis) and come as part of his discussion on the rotation of the Earth, which he has

[46] Eric MacPhail, 'Cyrano's Machines: The Marvelous and the Mundane in L'Autre Monde', *French Forum*, 18.1 (1993), 37–46 (p. 42 and p. 39).
[47] Godwin (1638), p. 66 and p. 57.
[48] Ibid., p. 60.

observed. I would suggest that what Gonsales is actually saying is that he will not make any statements over whether the Earth moves around the Sun, as well as rotating on its own axis. This is a rather different assertion as it does not stray into the realms of theories of an infinite universe, as Poole has proposed.[49] It makes sense, in terms of the text's emphasis on visual experience, that Gonsales is withholding judgement on what he has not witnessed himself.

Cyrano de Bergerac's narrator also makes observations during his journey to the moon. He notes that his changed perspective allows the Earth and moon to look the same, highlighting their similarity:

> After one or two days' travelling, the distant refractions of the Sun had confused the diversity of bodies and climates, and the Earth now appeared to me as nothing but a great plate of gold, just like the other body.[50]

As he falls he takes the opportunity to consider the relative attractions of the Earth and moon: 'This mass weighs less than ours [...] and so the sphere of its activity must also be less extensive. As a result I felt the force coming from its centre only later'.[51]

Seeking the probable over the factual is another common theme amongst texts written after *Sidereus Nuncius*. Whereas Plutarch uses the three sections of *Concerning the Face which Appears in the Orb of the Moon*, as Paul Coones has argued, 'to establish the fact that the moon is an earth', Wilkins, Fontenelle and Huygens all display a search for what is probable rather than hard, absolute fact.[52] Indeed, there is an acceptance that searching for facts about something so far outside Man's reach and experience is simply unattainable:

> [...] we would gladly know more than we see, and there's the difficulty: for if we could see well and truly what we see, we should know enough; but we see most Objects quite otherwise than they are; so that the true Philosophers

[49] Godwin (2009), p. 94, n. 3.
[50] Cyrano de Bergerac, *Journey*, pp. 15-16.
[51] Ibid., p. 16.
[52] Paul Coones, 'The Geographical Significance of Plutarch's Dialogue "Concerning the Face Which Appears in the Orb of the Moon"', *Transactions of the Institute of British Geographers*, 8 (1983), 361–372 (p. 368).

> spend their time in not believing what they see, and in endeavouring to guess at the knowledge of what they see not [...][53]

This plays somewhat into the hands of those seventeenth-century authors who are simply not interested in such speculation. La Bruyère demands observational proof of lunar inhabitants before he is prepared to discuss the question of their religion:

> You have observed the moon, Lucilius [...] now contrive some new instruments; observe it again, and see whether it is inhabited, whether they are like men, or really are men. When you have done this, let me look, that we both may be convinced that there are men that inhabit the moon; and then, Lucilius, we will consider whether these men are Christians or no [...][54]

This instruction to Lucilius could be considered as one contemporary perception of the purpose of the telescope: to search for proof of extraterrestrial life. However, I would suggest that this demand for proof and facts is largely what Huygens was defending against in his overt celebration of the glory of probability.

The emergence of a recognisably, and more modern, scientific approach culminates at the end of the century with Huygens making an explicit attempt to differentiate his work from that of his forebears. He particularly takes pains to distinguish his own work from that of Fontenelle and other 'pretty Fairy Stories of the Men in the Moon', amongst which he includes Kepler's *Somnium*.[55] Aït-Touati has discussed the differentiation that he makes between conjecture and fiction in some depth and has hypothesised that the 'exclusion of the fictional register marks a desire to establish an independent scientific discourse'.[56] This air of deliberate separation between Huygens's own 'probable conjectures' and the fictions of his predecessors is notable throughout *Cosmotheoros*.[57] Nevertheless, in many cases, it is difficult for a modern reader to recognise the difference between Huygens's own method and those he rejects. For example, at one point, he is unable to take his reasoning any further: 'I must then confess that I think it beyond the force of Imagination to arrive at any knowlege in the matter, or reach probability

[53] Fontenelle, p. 9.
[54] Jean de La Bruyère, *The Characters of Jean de La Bruyère*, trans. by Henri van Laun (London: John C. Nimmo, 1885), p. 489.
[55] Huygens, p. 3.
[56] Aït-Touati, p. 98.
[57] Huygens, p. 128.

concerning the figures of these Planetary Animals'.[58] While it is most likely that Huygens means *scientific* imagination, as in his own 'probable conjectures', a number of authors have already proved that it is perfectly possible to use imagination to create a fictional knowledge of such possible creatures. And, while he does use a kind of controlled logic to step from one conjecture to the next, it is, of necessity, not based entirely upon hard evidence. This is something that Huygens is only too aware of himself: 'I can't pretend to assert any thing as positively true (for that would be madness) but only to advance a probable guess'.[59] It is equally likely that contemporary readers would have experienced much the same confusion over the division that Huygens is trying to make between conjecture and fiction: there are signs in *Cosmotheoros* of a first step towards splitting apart science and literature in areas where no definite conclusions can be drawn. There is no more proof of extraterrestrials in Huygens's work than there is in Fontenelle's. Indeed, there could not possibly have been during this period. Nonetheless, their treatments of the same topic *are* different.[60]

Kepler: a case study

But what of Kepler? His *Somnium, Sive Astronomia Lunaris*, which translates into English as *The Dream, or Lunar Astronomy*, must be counted as a key text in this period, including as it does a detailed picture of a moon-world quite unlike any others that existed in philosophy or fiction at the time. Moreover, the circumstances of its composition mark it out as a rather more complicated text than many of its fellow representations of life on the moon. The roots of this work were formed in a dissertation Kepler wrote while studying at Tübingen University in 1593 that was never taken to disputation.[61] Approximately sixteen years later, the dissertation had mutated into 'a new astronomy for the inhabitants of the moon, as it were; in plain language, a sort of lunar geography'.[62] Following his mother's arrest and trial, partially due to the misinterpretation of its contents, and the addition of a huge number of notes, this work was eventually published

[58] Ibid., p. 33.
[59] Ibid., p. 9.
[60] Aït-Touati, p. 102.
[61] Kepler, *Somnium*, p. xvii.
[62] Kepler, *Conversation*, p. 26.

posthumously in 1634 as the *Somnium*.[63] However, what makes this text particularly interesting is that it began developing before the invention of the telescope, and was only finally ready for publication twenty years after *Sidereus Nuncius*. This extended period of composition increases the difficulty of analysing it. Donald Menzel has suggested that Kepler 'must have rewritten the manuscript a number of times' and this is entirely possible.[64] However, there is evidence to suggest that, while the extensive notes were added over several years and so may have been reworked multiple times, the text of the *Somnium* itself remained the same as the manuscript which led to the charges against the author's mother. Firstly, Kepler's reason for publishing the *Somnium* was to demonstrate that it had always been an innocuous text and had been blown out of proportion by his enemies: 'I therefore decided to avenge this dream of mine for the affair just cited by publishing the book, which will be another punishment for my adversaries'.[65] Making changes to the original text would have caused further suspicion, encouraging the idea that there was something to hide in the work. Secondly, there are errors in the text, which are discussed and corrected in the additional notes. For example, where the text discusses the deduction of longitude from magnetic movement, Kepler's referring note 134 reads 'when I wrote the *Lunar Astronomy*, the declination of the magnet from the meridian was in some repute as though it were suitable for determining the longitudes of places everywhere'.[66] Similarly, the text of the *Somnium* indicates that, from a great distance, land would be seen as dark and water would be seen as bright, whereas Kepler's note 154 turns this around: 'I referred to this mistake in my *Conversation with the Sidereal Messenger* [...] Galileo taught me that the high and rugged places on the moon are not the spots but the bright area, whereas the water flowing into the lower depths darkens and takes on the appearance of spots'.[67] This indicates that the published content of the *Somnium* was exactly as Kepler had originally conceived it. Additionally, the second example also indicates that it was complete prior to Kepler reading *Sidereus*

[63] Nicolson provides an outline of Katharina Kepler's arrest and trial in *Voyages*, p. 44. A more detailed account is given in John Lear, *Kepler's Dream*, trans. by Patricia Frueh Kirkwood (Berkeley: University of California Press, 1965), pp. 33-37.
[64] Donald H. Menzel, '15.5. Kepler's Place in Science Fiction', *Vistas in Astronomy*, 18 (1975), 895–904 (p. 901).
[65] Kepler, *Somnium*, pp. 40-41.
[66] Ibid., p. 98.
[67] Ibid., pp. 108-109.

Nuncius in April 1610, despite Nicolson's objection that it contains 'details which could not possibly have been known to Kepler before the spring of 1610, when [...] Galileo in the *Sidereus Nuncius* announced that the moon was a world [...] with irregularities which could not be detected by the naked eye'.[68] Indeed, in his response to *Sidereus Nuncius,* Kepler refers to his own earlier deductions of the moon's rough surface from the uneven lunar terminator, which he had published in *Astronomia Pars Optica* in 1604.[69] He may not have been able to see those irregularities in the same detail as Galileo could observe them with his telescope but Kepler was aware of their existence nonetheless, and able to include them in the *Somnium* before the publication of *Sidereus Nuncius*.

So, it can be safely concluded that Kepler created his Levanians before the results of Galileo's observations were published. The *Somnium*'s extensive notes, however, were added a significant amount of time afterwards. Kepler, in the text, claims that 'these Notes were written in order between the years 1620 and 1630'.[70] In the introduction to his translation of the *Somnium*, however, Rosen has argued that 1620 was a convenient approximation and the notes were more likely to have been created from 1622, or 1621 at the very earliest, due to the amount of time Kepler spent on his mother's trial and her death shortly afterwards in April 1622. Regardless of whether it was 1620 or 1622, this would easily have been a large enough amount of time for Kepler to absorb and reflect upon the material contained in *Sidereus Nuncius*, if he so wished. Additionally the *Somnium* also contains a 'Geographical or, if you prefer, Selenographical' appendix, which focuses on moon dwellers, based on a letter Kepler wrote in July 1623.[71] Aside from the *Somnium*, Kepler speculated on lunar inhabitants in his 1604 *Astronomia Pars Optica* and in his 1610 response to Galileo's work, *Dissertatio cum Nuncio Sidereo*. Consequently, an interesting situation arises: over a period of approximately twenty-five years which spans the development of the telescope, Kepler not only speculated about selenites, but published those speculations plus additional material about his thought processes during the creation of the publications. This provides a unique opportunity to examine a range

[68] Nicolson, *Science and Imagination*, p. 63.
[69] Kepler, *Conversation*, p. 27.
[70] Kepler, *Somnium*, p. 30.
[71] Ibid., p. 149.

of material on the same subject to see if, within a single author's work, changes similar to those noted in the rest of this section can be identified.

Kepler's allusion to life on the moon in *Astronomia Pars Optica* is very brief, not even spanning a whole paragraph within a sizeable book. It follows a discussion on the roundness of the moon which concludes that 'the moon was correctly described by Plutarch as the kind of body the earth is, uneven and mountainous, and that the mountains are even greater in proportion to its globe than are the terrestrial ones in their proportion'.[72] Here Kepler diverts to 'jest along with Plutarch' that life is adapted to its environment and so:

> [...] there will consequently be living creatures in the moon, with much greater bodily size and ruggedness of temperaments, than ours, for the simple reason that they endure a day fifteen of our days in length, and indescribable tides, because of the sun's being so long overhead [...][73]

Although referencing Plutarch, Kepler's conclusion about the selenites is a very different one from that found in *Concerning the Face which Appears in the Orb of the Moon*. Plutarch acknowledges that, for example, 'plants of the same kind, which in our region if sharply nipped by winter bear good fruit in abundance, in Libya and in your home in Egypt are very sensitive to cold and afraid of winter' and concludes that 'it is plausible that the men on the moon [...] are slight of body and capable of being nourished by whatever comes their way': more slender waifs than Kepler's rugged giants.[74] Kepler finishes this passage with a reference to Sulla's myth, which provides an air of indecision between material and spiritual beings 'if, indeed, there are any there. For that place is not absurdly credited by the superstition of the people with being destined for the purification of souls'.[75]

It is easy to see the antecedents of the *Somnium*'s Levanians in the moon dwellers mentioned so briefly in *Astronomia Pars Optica*, although they are sketched in greater detail in the later work. The lunar inhabitants Kepler describes in the *Somnium* are unlike

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[72] Johannes Kepler, *Optics: Paralipomena to Witelo and Optical Part of Astronomy*, trans. by William H. Donahue (Santa Fe: Green Lion Press, 2000), p. 262.
[73] Ibid.
[74] Plutarch, p. 171 and p. 177.
[75] Kepler, *Optics*, p. 262.

any others found in seventeenth-century texts: even Jonson's Volatees and Cyrano's lunars are partially human in their appearance or heritage. And yet, neither do they have any great affinity with the mythical gods, heroes and spiritual waifs of the sixteenth century and earlier. The Levanians almost seem to belong nowhere in this period, instead being closer to some of the monsters found in modern science fiction. Kepler divides them into two peoples: the Subvolvans, who live on the side of the moon (or Levania) that always faces the Earth (called Volva throughout the text), and the Privolvans in the opposite hemisphere, which is constantly deprived of the sight of Volva. Curiously, although some general comments may apply to all Levanians and the geography of the whole moon is discussed, Kepler only specifically describes the Privolvans. They roam nomadically across the moon and crawl into caves or lurk at the bottom of deep waters to escape the boiling heat of the sun. They eat what they can find in the evenings and most, though grown to massive proportions, only live for a single lunar day. Both Mark Brake and Neil Hook in their 2007 article, and Gale Christianson in his own article from 1976, have noted Kepler's linking of habitat and life form, his rejection of 'simply recreating a terrestrial civilization on the moon; for in Kepler's Lavania [sic] there are no men and no women, no civilization as he knew it'.[76] Indeed, there are no hints of any social or political aspects to the lunar creatures although, in note 213, Kepler indicates that there may have been political comments in his original university theses. Rosen suggests that the later omission of these comments from the *Somnium* was due to the changed political situation at the time Kepler was working on it, referred to in the opening sentence: 'In the year 1608 there was a heated quarrel between the Emperor Rudolph and his brother, Archduke Matthias'.[77] Despite this lack of 'civilisation', however, there are signs in Kepler's work that at least some of the creatures possess a level of reason: some 'follow the receding water in boats', implying their ability to construct and use such devices; others 'introduce the hot water into the caves through a narrow channel in order that it

[76] Mark Brake and Neil Hook, 'Science, Fiction and the Age of Discovery.', *Physics Education*, 42.3 (2007), 245–52 (p. 248), and Gale E. Christianson, 'Kepler's Somnium: Science Fiction and the Renaissance Scientist', *Science Fiction Studies*, 3.1 (1976), 79–90 (p. 85). The quote is taken from Christianson, p. 85.
[77] Kepler, *Somnium*, p. 11. Rosen's suggestion appears in his footnote 352 to Kepler's note 213 (p. 130).

may flow a long time to reach the interior and gradually cool off', indicating the capability to plan and engineer such a solution.[78]

The purpose of the *Somnium* is clear from note 96 which reads: 'Here is the thesis of the whole *Dream*; that is, an argument in favor of the motion of the earth or rather a refutation of the argument, based on sense perception, against the motion of the earth'.[79] However, there has been much debate over why Kepler chose to present his thesis in fictional form. Aït-Touati has described it as a 'thought-experiment', a way to 'dramatize, to visualize, an experiment that cannot be performed on Earth' and, certainly, Kepler's writing lends a vibrancy to his thesis that dry philosophy and mathematics would have been unlikely to achieve.[80] Alternatively, in his 1990 *Science Fiction Studies* article, Roger Bozzetto has seen the fictional framework as a kind of sugar-coating, an attempt 'to render more acceptable those "unthinkable" premises upon which the allegory itself is based (Copernican astronomy)', something with which Campbell strongly disagrees in her more recent book chapter: 'it is disrespectful of fiction, even fiction at its most skeletal, to think of it as a palliative add-on or pedagogical strategy'.[81] However, Kepler himself can provide an answer to this question. In his *Dissertatio* he gives the reason for writing his 'lunar astronomy' as 'To please Wackher'.[82] Johann Matthäus Wackher of Wackenfels was a good friend of Kepler with whom he debated astronomical issues and who was the first person to tell him of Galileo's work. Also in the *Dissertatio*, Kepler describes his preferred style in his 'Notice to the Reader':

> Whereas most debaters get all heated up, I regard humor as a more pleasant tone in discussions. Other authors strive for impressiveness in the exposition of philosophy by the weightiness of their assertions; yet they often prove

[78] Ibid., p. 27 and p. 28.
[79] Ibid., p. 82, n. 96.
[80] Aït-Touati, p. 27.
[81] Roger Bozzetto, 'Kepler's Somnium; Or, Science Fiction's Mission Link', *Science Fiction Studies*, 17.3 (1990), 370–382 (p. 377), and Mary Baine Campbell, 'Alternative Planet: Kepler's Somnium (1634) and the New World', in *The Arts of 17th-Century Science: Representations of the Natural World in European and North American Culture*, ed. by Claire Jowitt and Diane Watt (Aldershot: Ashgate, 2002), pp. 232–249 (p. 243)
[82] Kepler, *Conversation*, p. 26.

> amusing, unintentionally. I seem by nature cut out to lighten the hard work and difficulty of a subject by mental relaxation, conveyed by the style.[83]

Certainly within the *Somnium* and its notes, Kepler has included a number of jokes and humorous touches, reminiscent of his 'jesting' in *Astronomia Pars Optica*. In note 56, he does so explicitly: 'here, of course, I indulge in a joke: looking straight ahead, I concentrate on physical reasoning; out to the side, I shoot satirical arrows in all directions at spectators who feel sure of themselves'. In note 188, he does so with more of a straight face: 'See how anxiously I worry about correcting my statements lest some recent observer of these phenomena come down from the moon and prove me wrong'.[84] In putting together a demonstration of a particular phenomenon for a good friend, who is already conversant with astronomical theory, what could be more natural than to make it fun and a little bit of 'mental relaxation' – both for the author and the reader? In particular, this could explain the detail into which Kepler goes when describing the moon's inhabitants. It absolutely makes sense to use the concept of inhabitants to give a 'point of view' to the moon's perspective on the Earth. However, details of their appearance and lifestyle would not be needed to achieve this. Despite the careful logic that has obviously gone into the creation of the Levanians, 'when [the water] receded, I had the living creatures accompany it. To enable them to do so quickly, I gave some of them long legs and others the ability to swim and endure the water', they can be seen as another fun element added by Kepler to amuse himself and his friend.[85] The brevity of the description, only three paragraphs long, and its position at the very end of the dream, following after the serious astronomical arguments, underlines this. Indeed, Campbell suggests that this placement is a 'formal parody' of the traditional position of ethnographic material at the end of contemporary travel reports.[86]

While Kepler's selenites have become more definitely material in the *Somnium* than they were in *Astronomia Pars Optica*, and have gained some level of reason, there is nothing remotely human about them. He uses logic to extrapolate from the environment to his creatures and offers an eye-witness account of the motion of the Earth. The eye-witness

[83] Ibid., p. 5.
[84] Kepler, *Somnium*, pp. 63-64 and p. 118.
[85] Ibid., p. 130.
[86] Campbell, 'Impossible Voyages', p. 3.

in question is apparently a shadowy daemon summoned by witchcraft, which provides the text with the occult overtones that were at least partially responsible for the trial of Kepler's mother. Nevertheless, the similarity of role between the daemon and Domingo Gonsales in *The Man in the Moone* is notable, although Godwin would never have seen the *Somnium* in print as he died the year before it was published. However, despite the logic and proof elements of the text, fictional believability in terms of, for example, the mechanical methods of transportation in Godwin and Cyrano de Bergerac's works, is missing, as the *Somnium*'s proposed journey is a supernatural one.

Kepler's first discussion of lunar inhabitants following the publication of *Sidereus Nuncius* comes in his *Dissertatio*, written in direct response to Galileo's work. Certainly before this point, Kepler does not seem to have taken the idea of extraterrestrial life seriously; it was simply an idea of Plutarch's that, as he said himself, he 'enjoyed toying with'.[87] Yet, in the *Dissertatio* itself, something seems to have changed. While continuing to use the same argument that 'the inhabitants express the character of their dwelling place' and that, therefore, the selenites are gigantic, Kepler attributes a greater level of reason to them than he has previously.[88] In wondering whether the large circular cavity that Galileo observed was 'a work of nature, or of a trained hand', Kepler describes the inhabitants working together to build large circular shelters from the sun's heat.[89] He pictures them creating a 'sort of underground city' with 'fields and pastures in the middle, to avoid being forced to go too far away from their farms in their flight from the sun'.[90] He draws a picture of a co-operative society of beings that possess the foresight, knowledge and skills necessary for building and farming. They are no longer the nomadic scavengers of the *Somnium*; in fact, they are beginning to sound distinctly human. Perhaps it is this train of thought that prompts Kepler to raise more philosophical questions, for the first time, about the implications for Mankind of the existence of such rational creatures. Later to be quoted by Robert Burton, he asks: 'who occupies the better portion of the universe?', and 'how can we be the masters of God's handiwork?'.[91] Kepler also goes further in suggesting that 'it is not improbable [...] that there are inhabitants not only on

[87] Kepler, *Conversation*, p. 28.
[88] Ibid.
[89] Ibid.
[90] Ibid.
[91] Ibid., p. 43.

the moon but on Jupiter too'.[92] He argues that the moons discovered around Jupiter by Galileo must have been made for Jupiter's inhabitants, not Earth's, as most humans would not see them. He also suggests that perhaps they are 'to make up for the planets concealed from the Jovians but visible to us earth-dwellers [...] Let the Jovian creatures, therefore, have something with which to console themselves'.[93]

Finally, Kepler last wrote about selenites in his 'Selenographical Appendix' to the *Somnium*. This is based on a letter written in 1623, but a set of explanatory notes was added some time later, probably when it was being prepared for publication as part of the *Somnium*. In it, Kepler thanks his correspondent for the gift of a telescope, which he has already been able to use in making his own observations of the moon, and demonstrates further development in his ideas about lunar life. The 'Appendix' concentrates on the construction and use of 'the towns on the moon': multiple habitations, now, rather than the single one of the *Dissertatio*.[94] Kepler offers a different building method, making use of ropes to construct perfectly circular ramparts, some of which have fortifications and ditches that can be used for walking or sailing, depending on the water levels. Again, the lunar inhabitants are depicted as a very co-operative society, able to plan and build multiple towns. But, here, they are also endowed with enough understanding of geometry or mathematics to create perfect circles and, with a need for fortification to protect them from their enemies, at least a rudimentary political activity is implied. Whereas Kepler depicted his lunar creatures as grotesque and almost entirely animalistic in the text of the *Somnium*, something completely 'other', his later interpretations portray them as approaching humanity much more closely. Perhaps due to Kepler unconsciously assuming that causes and reasoning would be the same on the moon as on Earth, the selenites have started to look more like the model Kepler is working from.

It is notable that Kepler signs off the 'Appendix' with 'But these are playful remarks, etc'.[95] The implication is that he does not take what he has written seriously and that, perhaps, he does not believe in the existence of life on the moon. However, a closer

[92] Ibid., p. 39.
[93] Ibid., p. 46.
[94] Kepler, *Somnium*, p. 151.
[95] Ibid., p. 152.

examination of the accompanying notes leads to a rejection of this supposition. Kepler finds himself unable to attribute the circles he has been able to observe first-hand to anything other than a rational being:

> [...] the perfectly round shape of the hollows and their arrangement, or a certain equality of the distances between them, are artificial and produced by some architectural mind. [...] From the foregoing we must conclude, it seems, that on the moon there are living creatures, capable of reasoning with a view to constructing those orderly things.[96]

In this case, the playfulness does not surround the central tenet of the 'Appendix' that the observed hollows are made, rather than natural, phenomena. Instead, it is directed at the fictional elements of the text that Kepler has used to 'prove to you that I see' those phenomena that he has observed.[97] This demonstrates an awareness, perhaps, that the intricate details and reasoning for such remote 'creations' could only be guessed at and not really understood without more knowledge.

This demonstrates that, even within Kepler's own body of work, there are identifiable differences between speculations made about life on the moon before the publication of *Sidereus Nuncius* and those made afterwards. After *Sidereus Nuncius*, Kepler's sketches of lunarians give them a much greater 'human' quality than previously: they have increasing levels of reason and skills in building and farming, the population forms a co-operative society, and there are even hints of political activity and conflict. The sketches also become more believable in their own fictional logic: Kepler is deducing the selenites' existence and activity from what he has established for himself as facts. I would suggest that he has arrived at the point where his own logic has persuaded him to believe in their existence, so it is hardly surprising that his writing reflects this adjustment in his attitude towards them. And, finally, an element of exploring the meaning of moon inhabitants' existence appears, even if only briefly, in Kepler's writing after *Sidereus Nuncius*. Possibly it was only when he found that he 'must conclude [...] that on the moon there are living creatures, capable of reasoning' that such questions began to occur to him.[98]

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[96] Ibid., pp. 160-161.
[97] Ibid., p. 151.
[98] Ibid., p. 161.

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PART THREE

Influences on Seventeenth-Century English Moon-Worlds

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Chapter 3

'[A] place where they say never man came before'[1]

Whilst I have demonstrated that representations of life on the moon created before and after 1610 were significantly different in key areas, it is also necessary to examine the possible reasons for these changes. The chapters in this Part will explore a variety of factors which have emerged as particularly influential in terms of English moon literature during the course of this research. Chapter 3 concentrates on the new horizons – both physical and literary – which appeared both prior to, and during, the seventeenth century, while Chapter 4 examines the influence of social change and society's attitudes towards natural philosophy. Chapter 5 explores the link between vision and the imagination, particularly in reference to the nascent telescope. Finally, Chapter 6 completes this Part by looking in detail at the strength of the influence that the telescope and *Sidereus Nuncius* had on seventeenth-century English moon literature.

Travel

Travel and its physical product, travel writing, were both familiar by the seventeenth century. Joan-Pau Rubiés, in his extensive work on early modern travel, has written about the origin and history of travel accounts which, in their various forms, are recognisable from antiquity onwards. In their development from the heroic quests of classical mythology, through to the pilgrimages of the Middle Ages, and 'the humanistic figure of the gentleman as traveller, which became an important educational model in the late Renaissance', he has aptly described travel literature as a 'genre of genres'.[2] Rubiés has noted the incorporation in travel writing's early modern European incarnation of links with other categories, such as: 'chivalric and picaresque romances [...] utopian and anti-utopian literature, with philosophical works, and with educational treatises'.[3] I

[1] Godwin (1638), p. 43.
[2] Joan-Pau Rubiés, 'Travel Writing as a Genre: Facts, Fictions and the Invention of a Scientific Discourse in Early Modern Europe', in *Travellers and Cosmographers : Studies in the History of Early Modern Travel and Ethnology* (Aldershot: Ashgate, 2007), pp. 5–35 (p. 10 and p. 6).
[3] Ibid., p. 10.

would suggest that the model which Rubiés describes is one that looks familiar to readers of seventeenth-century moon literature in a number of ways. For instance, the interest in the strange and exotic that these texts exhibit in such details as Jonson's Volatees and the strangely hued skin and clothes of Godwin's gigantic Lunars, can be thought to have been seen first in travel literature where it 'fuelled the genre and shaped its most representative forms'.[4] In the texts examined for this research, there is an early example of this: even leaving aside the moon episode within Lucian's *A True Story*, the remainder of his travel narrative is teeming with strange and monstrous beings, such as the vine women on the very first island the crew visits, cork-footed men who could walk on water and the savage, man-eating Bull-heads. Rubiés has noted that, in travel literature, this idea of 'the other' has been used not only to entertain but also to critique the traveller's or author's own society, thereby providing them the opportunity to portray their contemporary society in a comparative light alongside the new and extraordinary cultures. In other words, instead of merely describing the recently discovered peoples as types of mythical monster, 'they also can denounce their original 'tribe' itself as monstrous'.[5] Again, this is a model that can readily be seen in the moon literature. Perhaps the most obvious example of this is Cyrano de Bergerac's *L'Autre Monde* where the author deliberately sets out to examine contemporary French society from an entirely disconnected and external viewpoint. However, it is also present in English representations during the period, although in a rather less acerbic and unsettling way. To use Jonson and Godwin as examples again, both of these authors fashion reasonably gentle comparisons with their own societies, as discussed in Chapter 1. Rather than any negative facets of their own society, both authors highlight the aspirational aspects of their lunar cultures: the peace and privacy of Jonson's, the religiosity and seemingly innate goodness of Godwin's.

Aside from the 'fascination with human difference' and 'the genre of alternative societies' that can be seen in both travel and moon literature, they also have stylistic connections, particularly in their descriptions of people and places.[6] Rubiés has noted that 'one of the

[4] Joan-Pau Rubiés, 'Travel Writing and Ethnography', in *Travellers and Cosmographers : Studies in the History of Early Modern Travel and Ethnology* (Aldershot: Ashgate, 2007), pp. 1–39 (p. 5).
[5] Rubiés, 'Travel Writing as a Genre', p. 8.
[6] Rubiés, 'Travel Writing and Ethnography', p. 5 and p. 26.

most fundamental traits [of the travel genre] is the creation of representations of other peoples directly or indirectly motivated by actual exchanges and confrontations'.[7] This 'creation of representations' is evident in a number of the texts I have studied in this research, despite the fact that the 'actual exchanges and confrontations' could not possibly have taken place with real lunar inhabitants. It is not hard to trace the antecedents of these literary selenites in the very peoples being represented in pre-existing travel literature. Godwin even points his readers directly towards that conclusion by suggesting that his Lunars bear a strong resemblance to original Americans 'partly in regard of their colour, partly also in regard of the continuall use of Tobacco which the *Lunars* use exceeding much'.[8]

Carey has discussed the link made by a number of authors during the seventeenth and eighteenth centuries between the moon and America, concluding that 'this connection goes beyond a mere impulse to exoticism or a happy literary confluence of new-found lands'.[9] In terms of this research, it is possible to a see a connection between selenites and the peoples of the New World with regard to the increasingly scientific style of observation and depiction used to write about them. Rubiés has identified this in the increasing incidence of 'instructions for travellers' in the processes of observation, classification and methods for recording the observed information, which was evident by the end of the sixteenth century.[10] This was later codified into an activity for the purposes of natural history and philosophy by the Royal Society, through the publication in the Society's 1665 volume of *Philosophical Transactions* of such items as their 'Directions for Sea-Men, Bound for Far Voyages' and Robert Boyle's 'General Heads', or categories, for travel.[11] Both of these impart instructions to the traveller on the kind of observations that should be made and measurements taken while on their journey in order to ensure a useful result that could be used for the purposes of natural philosophy

[7] Rubiés, 'Travel Writing as a Genre', p. 8.
[8] Godwin (1638), p. 105.
[9] Carey, p. 180.
[10] Joan-Pau Rubiés, 'Instruction for Travellers: Teaching the Eye to See', in *Travellers and Cosmographers : Studies in the History of Early Modern Travel and Ethnology* (Aldershot: Ashgate, 2007), pp. 139–190 (p. 141).
[11] 'Directions for Sea-Men, Bound for Far Voyages', *Philosophical Transactions*, 1.1–22 (1665), 140–143, and Robert Boyle, 'General Heads for a Natural History of a Countrey, Great or Small, Imparted Likewise by Mr Boyle', *Philosophical Transactions*, 1.1–22 (1665), 186–189.

and history. They encourage the traveller to make use of careful observation, to categorise their findings and to prefer recording reality over fable and people over monsters. Such information structures can be seen reflected in some of the moon texts, of which Godwin's *The Man in the Moone* is an excellent example. Comparing the St Helena and moon episodes of Godwin's work with both Boyle's *General Heads* and Thomas Hariot's *A Briefe and True Report of the New Found Land of Virginia* (1588), reveals a number of similarities in the type of information recorded, as well as its observational manner of documentation.[12] The overtly fiscal purpose of Hariot's text is evident from the first part which lists and describes the 'marchantable commodities' of Virginia; this is something that is missing from Boyle and Godwin's texts, which have a greater emphasis on natural philosophy.[13] There are similarities in the types of geographical and topographical information noted, but the descriptions of the inhabitants (found only in the moon episode of Godwin, as St Helena was uninhabited) are most interesting. To look at a fairly high-level list of the general topics outlined, Boyle's *General Heads* recommends recording the inhabitants' appearance, food, 'Inclinations, and Customs', information about the women, diseases, traditions and some measurement of '*Learning* or *Skill*'.[14] Godwin and Hariot cover all of these in their works and also share the provision of information on towns and housing design, mode of government and religion. That these two texts, published fifty years apart, share such a long list of information categories in describing new peoples, as well as the matter-of-fact style of delivery, indicates that they share some kind of principle or formula at a basic

[12] An account of Thomas Hariot (also known as Thomas Harriot) and his life can be found in: J. J. Roche, 'Harriot, Thomas (c. 1560-1621)', *Oxford Dictionary of National Biography* (Oxford: Oxford University Press, 2004) <http://www.oxforddnb.com/view/article/12379> [accessed 27 December 2016]. Briefly, he was a mathematician and natural philosopher with great expertise in navigation, who assisted Sir Walter Raleigh on overseas expeditions. Moreover, he observed and sketched the surface of the moon through a telescope before Galileo, although he never published his observations.

[13] Thomas Hariot, *A Briefe and True Report of the New Found Land of Virginia of the Commodities There Found and to Be Raysed, as Well Marchantable, as Others for Victuall, Building and Other Necessarie Vses for Those That Are and Shalbe the Planters There; and of the Nature and Manners of the Naturall Inhabitants: Discouered by the English Colony There Seated by Sir Richard Greinuile Knight in the Yeere 1585. Which Remained Vnder the Gouernment of Rafe Lane Esquier, One of Her Maiesties Equieres, during the Space of Twelue Monethes: At the Speciall Charge and Direction of the Honourable Sir Walter Raleigh Knight, Lord Warden of the Stanneries; Who Therein Hath Beene Fauored and Authorised by Her Maiestie and Her Letters Patents: Directed to the Aduenturers, Fauourers, and Welwillers of the Action, for the Inhabiting and Planting There: By Thomas Hariot; Seruant to the Abouenamed Sir Walter, a Member of the Colony, and There Imployed in Discouering.* (London: [R. Robinson], 1588), sig. B^{r}.

[14] Boyle, p. 188 and p. 189.

organisational level. Added to that, the commonalities they both share with Boyle's much later condensation of guidance for travellers suggests that this was a long-accepted pattern of conveying such ethnographic information. Campbell has suggested that they were absorbed into the contemporary culture to such an extent that 'the categories become progressively invisible as themselves potential objects of scrutiny'.[15]

Religious debate was stimulated by travel literature before moon literature began to have the same effect for much the same reasons. The discovery of other peoples who were so utterly different from early modern Europeans, such as the Chinese and original Americans, did not merely make for entertaining stories. As Rubiés has argued, such discoveries 'had a deeper impact in elite culture because they were subjected to further analysis and interpretation by theologians, moralists, political thinkers and antiquarians'.[16] This analysis and debate is instantly recognisable as a forerunner to the religious anxiety expressed in a number of the moon-world depictions studied in this thesis. The idea that there could be another group of humans that had developed entirely separately from Europeans presented a number of problems with theories about Man's place in the world and his relationship with God. The specific way in which Rubiés has discussed this in relation to America demonstrates just how closely the two sets of debates were related:

> America appeared to be a completely new place. [...] A new continent that seemed wholly isolated from the others, however, constituted a major threat. If its inhabitants were indeed human beings, sons and daughters of Adam and Eve and thus with a place in a universal history that traced its roots to the Bible, a new formulation of the theory had to be produced.[17]

I would suggest that substituting 'America' for 'the moon' would leave later religious thinkers with exactly the same problem. The only difference is the lack of the selenites' actual existence, an issue which moon literature authors were to tackle using the very same methods as travel writers.

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[15] Campbell, 'Impossible Voyages', p. 7.
[16] Rubiés, 'Travel Writing as a Genre', p. 24.
[17] Joan-Pau Rubiés, 'Hugo Grotius's Dissertation on the Origin of the American Peoples and the Use of Comparative Methods', in *Travellers and Cosmographers : Studies in the History of Early Modern Travel and Ethnology* (Aldershot: Ashgate, 2007), p. 10.

Robert Appelbaum, writing on 'anti-geography', has also identified a pattern in travel and geographical writing that applies in equal measure to moon literature. He defines anti-geography as:

> [...] a system of imaginary geography, a geography beyond geography, as it were -- a system of fantasy with roots in classical antiquity that had a long development in early modern Europe [...] Sometimes serious and quasi-scientific, sometimes merely playful or comic, and often a combination of the two, a specimen of jocoserious discourse, anti-geography fills up the spaces of the beyond as if they were similar to or continuous with the known; it imagines the world beyond us as if it were really contiguous with the world at hand, and as if contiguity guaranteed some form of continuity. In anti-geographical fantasy, in effect, the world is imagined to extend beyond itself; the world never really stops; it fills up the worlds beyond itself with more of itself. But on the other hand anti-geographical fantasy commonly populates the spaces of the beyond with a compendium of strange things -- with exotic, exorbitant, monstrous, and marvellous phenomena.[18]

The resemblance of Appelbaum's description to the activity of the earlier authors selected for this research is striking, and leads me to propose that these authors could be described as engaging in an equivalent enterprise: anti-cosmography. However, perhaps the most significant part of Appelbaum's work for this research is his identification of the descending popular interest in anti-geography. He notes that, as geography itself transformed and expanded, the role of anti-geography in filling the gaps between the known portions correspondingly reduced. It was simply no longer needed: 'less was out there; and what was out there was both less outlandish and less interesting'.[19] This, too, is evident in the moon literature as outlined in Chapter 1: during the seventeenth century, the alien becomes human, and nature's great variety becomes God's fairness and uniform equality. What Appelbaum calls 'wholesale disenchantment' within geographical writing can be recognised as a move towards a more realistic, *scientific*, exploration of the universe in cosmographical writing.[20] In particular, Appelbaum suggests that *The Antipodes*, by Richard Brome, marks the point of extinction for anti-geography. In this play, he writes, 'it is taken for granted that the traditions of anti-

[18] Robert Appelbaum, 'Anti-Geography', *Early Modern Literary Studies*, 4.2 (1998) <http://extra.shu.ac.uk/emls/04-2/appeanti.htm> [accessed 29 January 2014], paragraph 2.
[19] Ibid., paragraph 3.
[20] Ibid., paragraph 7.

geography are entirely factitious, and even silly [...] that belief in the marvellous is a neurotic illusion'.[21] Interestingly, *The Antipodes* was written in 1638, the point at which moon literature could be considered to be at its height, with the independent publication of both Godwin's *The Man in the Moone* and Wilkins's first edition of *The Discovery of a World in the Moone*. Rubiés notes that the period after 1500 saw 'the multiplication of travel narratives and their role as basis for a new, historically informed, scientifically constructed anthropological vision' – the beginning of the end for anti-geography, so to speak, yet it took until 1638 for it to be extinguished.[22] The fall of anti-cosmography took place much more quickly. If we consider 1638, as its high point, to be the beginning of the downward slope for anti-cosmography, it took only roughly 60 years for its extinction to occur. This is demonstrated in Part Two both by Huygens's denial of lunar life and his attempt to split the scientific from the literary in his *Cosmotheoros*, and by the disappearance of the new moon-world in Settle's masque. It is possible that this acceleration occurred simply due to the close connection between anti-geography and anti-cosmology: once the first had died, the second simply could not exist very much longer – in a way, it had already been disproved. Alternatively, Rubiés's suggestion that the 'growth of travel literature was [...] a major element in the definition of Europe's cultural transformation from its medieval background to its invention of modernity' indicates the possibility of a more complex and less direct cultural reason: that in its new era of modernity, European culture no longer harboured a place for monsters and myths.[23] This would lead to the speculation that by the time anti-cosmology was at its height, Europe had already set itself on the path of true cosmology and simply moved on.

In some ways cosmology can be considered a natural successor to geography. As the Earth became better known through colonialism and exploration it also became, in effect, 'smaller', a phenomenon alluded to by Appelbaum. So much so, in fact, that the early seventeenth century saw the first European migrations to America: for example, the voyage of the *Mayflower* in 1620. The New World no longer held the utter mystery and fear for Europe that it once had: journeys, however dangerous, could be made there; new lives, however precarious, could be established on its shores. The moon, however,

[21] Ibid., paragraph 8.
[22] Rubiés, 'Travel Writing and Ethnography', p. 6.
[23] Ibid., p. 3.

retained its inaccessible mystique. Despite advances made in drawing and mapping the moon, from Galileo's first sketches to Johannes Hevelius's detailed engravings in his 1647 *Selenographia*, Earth's constant companion was still very much unknown and full of possibilities: the eternal island floating 'bright and round and shining with a great light' in the sky, ready to be populated by the imagination.[24] Indeed, there is evidence in Thomas Hariot's earliest attempts to sketch the moon of a passing overlap between geography and cosmology. In his investigations of Hariot's papers and cartographic sketches, Amir Alexander has uncovered Hariot's long experience of terrestrial coastal mapping and demonstrated the likelihood that he was using exactly the same techniques to compose his early moon maps.[25] Hariot's lunar drawings have been criticised for their lack of topographical detail but, in Alexander's opinion, this misses the point as his intention was never to do more than represent the division, or coastline, between the light and dark portions of the moon. Indeed, when you consider Hariot's experience and the long-held belief that the lunar surface was indeed composed of the same landscape features as found on Earth, referred to in Plutarch's *Concerning the Face which Appears in the Orb of the Moon* in the first century, this becomes all the more persuasive.

Allison Kavey, in her introduction to *World-building and the Early Modern Imagination*, has suggested that the 'dark side of world-building is inseparable from the wonder and imagination it reflects', referring to the colonial 'subjugation of individuals and nations deemed "new" or threatening by invading Europeans'.[26] In the progress from geography to cosmology, the moon provided an opportunity for colonialism without this 'dark side'. Certainly the lunar travellers' tales examined that were written prior to the Interregnum generally portray their visits as beneficial to the traveller, or to Earth as a whole, without causing any unpleasant consequences to the moon or its inhabitants. Donne's *Conclave Ignati* outlines Ignatius's transfer to the moon as a benefit to him, as well as to the hellish community he would be leaving behind, although the text does not touch on the possibility of a lunar population and any potential consequences for them. Jonson's poet and Godwin's Domingo Gonsales both gain knowledge and marvellous experiences from

[24] Lucian, p. 259.
[25] Amir Alexander, 'Lunar Maps and Coastal Outlines: Thomas Hariot's Mapping of the Moon', *Studies in History & Philosophy of Science Part A*, 29.3 (1998), 345–68.
[26] Allison B. Kavey, '"Think You There Was or Ever Could Be" a World such as This I Dreamed', in *World-building and the Early Modern Imagination* (New York: Palgrave Macmillan, 2010), pp. 1–4 (p. 2).

their trips to the moon. Gonsales even benefits from the strange and wonderful gifts given to him by Irdonozur. Neither of these travellers is any less than a welcomed visitor: they are free to observe the lunar world around them and participate in offered hospitality. They cause no harm to the new land they are exploring or the people they meet, and the lunar world is left entirely unchanged by their visit. Even John Wilkins pauses momentarily in his lunar propositions to speculate about colonisation:

> 'Tis the Opinion of Keplar, that as soon as the art of Flying is Found out, some of their Nation will make one of the first Colonies, that shall Transplant into that other World. [...] I Agree with him, That when ever that Art is Invented, or any other, wherby a Man may be Conveyed some Twenty Miles high, or thereabouts, then, 'tis not altogether Improbable that some or other may be Successful in this Attempt.[27]

Wilkins, too, displays no less a positive attitude than Godwin and Jonson, certainly from the potential colonists' perspective. He gives the possible lunar inhabitants scant consideration in the enterprise, only briefly mentioning their possible strangeness, concluding: 'In brief, do but consider the pleasure and profit of those later Discoveries in *America*, and we must needs conclude this to be inconceivably beyond it'.[28]

Another consequence of real travel was the discovery of languages that were entirely alien to the early modern European ear – in particular, Chinese. These, too, found their way into the cosmological travel accounts of the seventeenth century. The tonal quality of Chinese and the challenge for Europeans of picking out individual words, led to the transformation of Chinese dialects into the musical language of Godwin's Lunars (Figures 1 and 2).[29] Godwin uses a fairly simple 'musically notated cipher based on Latin' although, as Poole has noted, there are a number of errors in the printed text in both the 1638 and 1657 editions.[30] Extending this idea further, Cyrano de Bergerac gives his moon-dwellers two languages: the first, a musical language used by the nobles, which could equally well be communicated using a musical instrument as by the voice; the

[27] Wilkins, *Discovery*, p. 138.
[28] Ibid., p. 160.
[29] Godwin (1638), p. 94, and p. 95. Images taken from the British Library copy electronically published by ProQuest in Early English Books Online (EEBO). Reproduced under the terms of the University of Chichester's licence agreement.
[30] Poole, 'Introduction', p. 46.

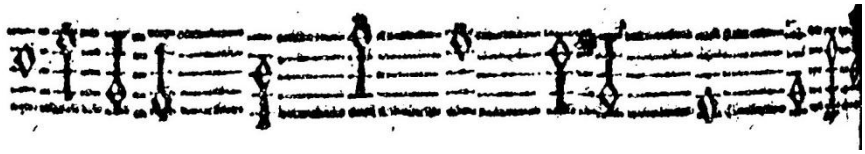


Figure 1: Gonsales's musical transcription of the Lunar phrase 'Glorie be to God alone'



Figure 2: Gonsales's musical transcription of the Lunar for 'Gonsales'

second, a literal body language which means that while his lunar inhabitants are speaking 'their limbs, accustomed to gesticulating their ideas, move about so violently that it does not seem to be a man speaking, but a body shaking'.[31]

Literature

In addition to the expansion of physical horizons through travel and travel writing, other types of literature also provided seventeenth-century readers with new possibilities to consider. Moreover, the growing range and availability of texts in this period allowed for the simultaneous combination of a greater number of ideas, leading to a more collaborative approach to knowledge. It was not simply the improved accessibility of larger numbers of texts that was important, as Spiller has illustrated in her 2004 book *Science, Reading and Renaissance Literature*, but, specifically, the ability of a single reader to gather a range of ideas into one place and to synthesise and adapt them for his or her own purposes:

> [...] it is thus perhaps less important that 1,000 different readers were, in Venice and Frankfurt, able to purchase copies of Galileo's *Starry Messenger* than that one reader, Johannes Kepler, was able to acquire Galileo's tract to

[31] Cyrano de Bergerac, *Journey*, pp. 40-41.

> read alongside both Descartes's *Optics* as well as Plutarch's *Orbe in the Face of the Moon* [...][32]

So, in addition to the travel literature discussed above, the texts that will be considered here fall into two categories: texts written before the period in question and contemporary texts.

In the first category, utopian writing, such as Thomas More's *Utopia* (1516), seems an obvious example. Jonson and Godwin as well as Donne, to a certain extent, portray the society on their versions of the moon as utopian; in Donne's case, it is simply utopian because the Jesuits are no longer on Earth and have found their own hellish nirvana on the moon: 'without doubt, after the Jesuites have been there a little while, there will soone grow naturally a *Hell* in that world also: over which, you *Ignatius* shall have dominion, and establish your kingdome & dwelling there'.[33]

The ideals exhibited in these texts are not merely modelled on the 'natural history' of a country as found in travel literature, there is something over and above this in their creation. Rather than limiting themselves to recording their lunar cultures' major figures, events and rules, Jonson and Godwin have taken the opportunity to *redesign* society to a greater or lesser extent. Jonson has increased the peacefulness and privacy of life in contemporary England, for the nobility at least. Godwin, on the other hand, has taken this still further. Rather than limiting himself to the model of the culture he saw around him, Godwin stretches the concepts of society to make his lunar world truly idealistic. Campbell has stated that 'there are no utopias in Godwin's book'.[34] However, it is hard to credit this opinion based on the evidence in the text: the lack of need for doctors and lawyers, for example, and the harmony and order of the Lunars' society. Even the religious and political structures that Godwin has taken from his own contemporary culture, he has made more encompassing – one king and one holy church leader for the whole moon, rather than for each region or country – and the core of the ideal civilisation he describes:

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[32] Elizabeth Spiller, *Science, Reading, and Renaissance Literature: The Art of Making Knowledge, 1580–1670* (Cambridge: Cambridge University Press, 2004), p. 12.
[33] Donne, p. 118.
[34] Campbell, 'Impossible Voyages', p. 6.

> This Island they call Gods *Island* [...] they say it hath a particular governour [...] his name is said to be *Hiruch*, and he comandeth after a sort over *Irdonozur* himself, especially in that *Island* out of which he never commeth.
>
> There is another repairing much thither [...] and hee commandeth in all things (throughout the whole Globe of the Moone) concerning matters of Religion, and the service of God, as absolutely as our holy Father the *Pope* doth in any part of *Italy*.[35]

Indeed, this idea of a redesigned society is rather easier to construct in a moon setting than somewhere on Earth. Campbell has described it as the 'opportunity the Moon holds out to a writer, of being culturally *designed*, from the ground up'.[36] The more that became known about the new worlds being discovered on Earth, the more difficult it became to use them as the basis for a utopian vision. With societies, rules and customs already in place it was difficult, if not impossible, for authors to create their own from-scratch utopias there: 'such ideas about government would be suitable in a new world; but we have to deal with the one already fitted and shaped to certain customs [...] we can hardly wrench it from its accustomed bent without altogether shattering it'.[37] On the other hand, the moon remained a perfectly blank canvas, ideal for projecting a multitude of hopes and desires and constructing the most ideal of model societies. This was an opportunity that Godwin, in particular, took full advantage of.

I would suggest, however, that the Bible has an even greater importance than utopian texts as it is almost a 'first principle' for seventeenth-century moon literature. It has been used as a piece of factual evidence in the debates about heliocentrism and life on the moon, often in terms of denying their existence. The most regularly cited example is drawn from Joshua 10:12-13:

> Then spake Ioshua to the Lord in the day when the Lord deliuered vp the Amorites before the children of Israel, and hee said in the sight of Israel, Sunne, stand thou still vpon Gibeon, and thou Moone in the valley of Aialon. And the Sunne stood still, and the Moone stayed, vntill the people had auenged themselues vpō their enemies. Is not this written in the booke of

[35] Godwin (1638), pp. 90-91.
[36] Campbell, 'Impossible Voyages', p. 10.
[37] Michel de Montaigne, *Essais* III, 9: 'Of vanity', quoted in Joan-Pau Rubiés, 'New Worlds and Renaissance Ethnology', in *Travellers and Cosmographers : Studies in the History of Early Modern Travel and Ethnology* (Aldershot: Ashgate, 2007), pp. 157–197 (p. 166).

> Iasher? So the Sunne stood still in the midst of heauen, and hasted not to goe downe, about a whole day.[38]

In this instance, the references to the sun and moon standing still are taken as evidence of their usual movement through the heavens and, therefore, Earth's motionlessness at the centre of the universe. If this was the case then Earth was special in God's eyes and Mankind, in its privileged position on a central Earth, was also special and unique. However, later in the period, the very same Bible passages were interpreted in exactly the opposite manner. For example, Aphra Behn's 'Translator's Preface' appended to her translation of Fontenelle's work does exactly this in reference to the verses from Joshua quoted above. Behn's logic, which demonstrates that this passage in the Bible is as much *for* a Copernican universe as *against* it, is reasonably extensive. However, her first key point centres on the translation of this passage from the original Hebrew. She writes: '*the best Edition of the English Bible* [...] *has an Asterism at the Word* stand, *and renders it in the Margent, from the Hebrew*, Be thou silent'.[39] If the original text includes a command for silence, rather than stillness, then the support that some interpreters had found in the passage for the sun's motion is removed. Behn's second key point focuses on the apparent redundancy in requiring the moon to stay still as well as the sun in order to light the battlefield.

I propose that much of the religious anxiety identified in the texts studied in Chapter 2 was created at the tipping point between the two opposing interpretations of such Biblical passages. There was a point where doubt began to creep in about the previously accepted view of the universe, before it had been replaced by a strong belief in a different view. This left an uneasy space, readily filled by anxiety. The exploratory quality of much seventeenth-century moon literature demonstrates a way of searching for answers where no certainty can be found, a way of beginning to tackle that uneasy space. Moreover, the search for probability rather than absolute fact, which is found in the later texts, corresponds with a decrease in the expression of religious anxiety.

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[38] *The Holy Bible Conteyning the Old Testament, and the New: Newly Translated out of the Originall Tongues: & with the Former Translations Diligently Compared and Reuised, by His Maiesties Speciall Comandement.* (London: Robert Barker, 1611).
[39] Fontenelle, sig. a6^{r}.

Other works that fall into the category of texts written before the moon literature at the heart of this research, include Giordano Bruno's 1584 work *De L'infinito Universo et Mondi* and the 1595 supplement to the anonymous French publication *La Satyre Ménippée*, entitled *Le Supplément du Catholicon ou Nouvelles des Régions de la Lune*. Bruno's work, despite focusing on the plurality of worlds debate rather than the concept of extraterrestrial life, makes a small number of references to inhabitants in the moon and other stars in the second and third of his five dialogues. However, although the work is very focused on the possibility of other worlds and how they might be similar to the Earth, in general the references to non-Earth inhabitants are merely to generate a point of view situated on the moon or another star, a technique which Huygens was to make use of over a century later. For example: 'if something receding from us proceedeth toward the moon, when we should say that it goeth upward, then the inhabitants of the moon, our own *anticephali*, would say that it is in descent'.[40] Nonetheless, the scope of Bruno's work, aiming to prove the infinity and, therefore, the endless possibilities of the universe, opens the way to considerations of what may be filling up and inhabiting that infinite space. However, whether this text made any significant contribution to English moon literature is rather more doubtful. Lyly's plays *Endimion* and *The Woman in the Moone* and Drayton's *Endimion and Phoebe* were all published in the 1590s, after *De L'infinito Universo et Mondi* but before *Sidereus Nuncius*. As discussed in Part Two, none of these demonstrate any of the features which characterise English moon literature created after the publication of *Sidereus Nuncius*, so it is unlikely that Bruno's work was of great importance to the genre.

Nouvelles des Régions de la Lune is a text that some critics, such as Eugene Korkowski and Evelyn Simpson, have cited as a strong near-contemporary influence on Donne's *Conclave Ignati*.[41] This is not simply because the main work *La Satyre Ménippé* , is a satire attacking the Jesuits, but also because the supplement published alongside later editions 'included a moon-journey which established, like Donne's *Ignatius*, a new church in the

[40] Dorothea Waley Singer, *Giordano Bruno: His Life and Thought* (New York: Henry Schuman, 1950) <http://freedom.lege.net/Giordano_Bruno__On_The_Infinite_Universe_and_Worlds__1584/bruno00.htm> , Second Dialogue, [accessed 3 January 2017].
[41] Evelyn M. Simpson, *A Study of the Prose Works of John Donne*, 2nd edn (London: Oxford University Press, 1948), p. 192.

moon'.[42] Charles Coffin, too, is convinced that *La Satyre Ménippée* was a major source for *Conclave Ignati*, even though a number of the similarities he highlights between the two texts are, as Korkowski has demonstrated, simply characteristics of the Menippean satire genre, particularly in its Renaissance guise: the 'apology', the mix of prose and verse, the element of 'debate' and the direction of the satire towards a religious victim.[43] It is important to acknowledge that, as far as these components are concerned, there was a wide range of classical and European sources from which Donne could have borrowed. This makes a solo, exclusive, connection with *La Satyre Ménippée* seem less convincing, as, indeed, does the lack of material beings on the moon in the earlier text. On reaching the lunar sphere, the companions in *Nouvelles des Régions de la Lune* see only drifting phantoms, appearing differently to each of them, rather than creatures of substance. These apparitions are a phenomenon rather more akin to the spirits of Plutarch's work than the living, breathing Jesuits in Donne's. Even after Langue-Belle 'removes the masks of deception and error which [...] they have previously worn' the travellers discover that the moon is merely populated with the 'ideas' of various strange people.[44] Beverly Ridgely has constructed an excellent study of this anonymous supplement and concluded that:

> As a lunar voyage, the *Nouvelles des régions de la lune* is an old-fashioned work which reveals, on the part of its author, neither the slightest interest in astronomy or awareness of sixteenth-century discoveries and speculations in that science, nor the least concern with the real possibility of human flight.[45]

This is the key point that must be remembered when comparing this work to *Conclave Ignati*. There are certainly some similarities between the texts: the Jesuit satire and the tour of hell before the main business begins, for example. However, the apparent purpose and the presentation are different enough to require a reconsideration of the

[42] Eugene Korkowski, 'Donne's *Ignatius* and Menippean Satire', *Studies in Philology*, 72.4 (1975), 419–438 (p. 424).
[43] Charles Monroe Coffin, *John Donne and the New Philosophy* (New York: The Humanities Press, 1958). In particular see p. 201, n. 21.
[44] Beverly S. Ridgely, 'A Sixteenth-Century French Cosmic Voyage: Nouvelles Des Régions de La Lune', *Studies in the Renaissance*, 4 (1957), 169–189 (p. 181). I am indebted to this article for much of my knowledge of the content of *Nouvelles Des Régions de La Lune*. This text has never been translated into English, as far as I am able to ascertain, and I am unable to make an adequate translation from the original French myself.
[45] Ibid., p. 187.

debt apparently owed by *Conclave Ignati* to the *Nouvelles*. For instance, Ridgely has stated that 'the aim of the author of the *Nouvelles* was not only amusing satire but a warning to his compatriots of the wave of "fausse apparence" which had engulfed them under the guise of politics and religion'; whereas Donne's purpose was a much more direct satire of Ignatius Loyola and the society he founded.[46] Additionally, Donne makes use of specific named people, such as Galileo and Copernicus, even if rather embroidered for artistic and satiric purposes, rather than the stock traditional characters of the *Nouvelles*. For example: Aliboron, the faux savant; the 'franc archer de Bagnolet', named here as Enguerrand, a coward full of bluster; and, Roger Bontemps, as happy-go-lucky as his name might suggest.[47] Moreover, whilst not scientifically accurate, Donne's proposed means of sending the Jesuits to the moon is somewhat more mechanical than the purely magical and superstitious means of ascent in the *Nouvelles*, making use as it does of the telescope, a real piece of engineering. Lastly, although a minor point, it is the Jesuit narrator of the *Nouvelles*'s dedication who suggests conquering the moon to Philip II of Spain in order to give the Jesuits somewhere to go to establish a collège; whereas in *Conclave Ignati* it is Lucifer who suggests it as a way to rid himself of the annoying Ignatius.

The second category of literature being considered here is made up of texts contemporary to the period. Obviously, others' depictions of life on the moon were a potential influence on authors of moon literature and it is possible that, for a short period, such works became a kind of self-fulfilling prophecy: that is, the increasing number of texts available on the topic led to a growing interest which, in turn, led to further texts. Or, at least, this may have been the case until fashion turned to other things. A number of the core texts studied for this research explicitly indicate a debt to other, similar, literature of the period. For example, Cyrano de Bergerac's text contains numerous echoes of Francis Godwin's work in his *L'Autre Monde*. These have been detailed by H. W. Lawton in his article for *Review of English Studies*, including the lack of hunger on the journey to the moon, the moon's attractive force that causes the traveller's feet to swap places with his head at a certain point in the journey, and the

[46] Ibid., p. 181.
[47] Ibid., p. 176-177.

large size of the moon's inhabitants.[48] However, probably the most persuasive detail is Cyrano's use of Domingo Gonsales, Godwin's diminutive Spanish narrator, as a character within his own work. While Gonsales's personality has undergone a makeover for Cyrano's purposes, his transplantation into the later work is irrefutable evidence that Cyrano knew of Godwin's book. Godwin is also an obvious influence on Wilkins's *The Discovery of a World in the Moone*. In fact, Wilkins rewrote the end of his text after he had read Godwin's work. The changes appear from the 1640 third edition, as mentioned in Part Two, and, despite the fact that Godwin is not named, the mention of Domingo Gonsales and references to his gansas once again provide the link back to Godwin's work. Indeed, it is only from the 1640 edition that Wilkins discusses the possibility of actually visiting the moon, rather than merely reasoning about its habitability. Without Godwin's work, Wilkins's text would not have ended up in its final form. Finally, Aphra Behn's *Emperor of the Moon* provides another example of the direct connections between these seventeenth-century texts. In the very first scene of the play, Elaria explains her father's obsession with the idea of a world in the moon as a result of 'reading foolish Books'.[49] The titles she cites are none other than Godwin's *The Man in the Moone* and Wilkins's *The Discovery of a World in the Moone*. She also mentions Lucian by name, although in reference to his *Icaromenippus*, a dialogue about a man who flies to the moon using birds' wings, rather than *A True Story*.

It is particularly interesting that Elaria mentions Lucian as one of the authors influencing her father's behaviour. Far from being ancient sources of information for authors of this period, Lucian and Plutarch can both be considered contemporary influences. This is due to their relatively recent 'rediscovery' and the fact that both of their texts studied for this research were only translated into English during the seventeenth century: Plutarch's *Concerning the Face which Appears in the Orb of the Moon* in 1603 and Lucian's *A True Story* in 1634, coincidentally the same year that Kepler's *Somnium* was finally published. An English translation of *Icaromenippus* was also included in the 1634 book containing *A True Story*. Both originally written in Greek, they would have become much less available in England, and much of Europe, when Latin became the intellectual language of choice

[48] H. W. Lawton, 'Bishop Godwin's Man in the Moone', *Review of English Studies*, 7.25 (1931), 23–55 (p. 48).
[49] Behn, sig. B2^{v} (I.1).

and knowledge of Greek, to all intents and purposes, faded. This did not begin to re-emerge with any strength until the Renaissance, so these texts would have been unfamiliar in Europe for a long period. This makes their restoration to the world of literature and philosophy an important event, providing fresh models of the moon's materiality and, in Lucian's case, a journey to the moon, at a time when these issues were generating interest and debate. And, indeed, at a time when the power of the ancient 'authority' figure had not yet entirely diminished.

Chapter 4

'How, Sir, Peep into the King's Closet[?]'[1]

The new ideas and possibilities revealed by travel and other writing, both before and during the seventeenth century, provided authors of moon literature with a context for their own works. There are clear connections between this and the newly material, mechanical presentation of moon-worlds, as well as the increasingly exploratory approach taken by their creators. However, these stimuli alone cannot fully account for all the changes in moon literature that were discussed in Part Two. During the seventeenth century, a number of changes took place in English society, not only in terms of politics and religion, but also in the popularity of astronomical ideas and natural philosophy more widely. These, too, had an impact on the specific forms that moon literature took in this period.

Social change

There were a number of changes throughout European society during the seventeenth century, but perhaps the most specific to England were those of a political nature. England had experienced a substantial phase of relative stability and established leadership during the 45-year reign of Elizabeth I. Despite leaving royal debts to her successor, James I and VI, Elizabeth's reign had experienced a great deal of prosperity: trade flourished and sought new overseas markets, private trading companies were established to take advantage of the new opportunities, new lands - such as Newfoundland and Virginia - were claimed in Elizabeth's name, and the Poor Law of 1601 sought to combat the poverty generated, particularly in rural areas, by the economic depression of the previous decade.[2] Moreover, England had retained its sovereignty, despite ongoing threats of invasion, perhaps most famously during the defeat of the

[1] Ibid., sig. B4^{r}.

[2] Hereafter, King James I and VI will be referred to using just his English title, as the focus of this Part is on England. A general history of this period can be found in, for example, Roger Lockyer, *Tudor and Stuart Britain: 1485-1714*, 3rd edn (London: Routledge, 2005).

Spanish Armada in 1588. Despite the unarguable difficulties of her reign, the plots and conspiracies against her, her wrangling with Parliament on issues of religion and the succession, Elizabeth maintained the affection and loyalty of a substantial number of her subjects through shrewd choices, personal charisma, and 'a deep ground-swell of popular nationalist feeling'.[3] A picture of popular warmth was reflected in flattering literature and drama created during her reign, such as Spenser's *The Faerie Queene* (1590) and Lyly's *Endimion*, as discussed briefly in Chapter 1. There is also evidence of a continued regard in Godwin's *The Man in the Moone*, which was written a number of years after Elizabeth's death. This is demonstrated by Pylonas's desire to learn more about her and the promise he extracts from Gonsales, as the Spaniard leaves the moon, to 'salute from him *Elizabeth*, whom he tearmed the great *Queene* of *England*, calling her the most glorious of all women living'.[4]

When Elizabeth died in 1603 this apparent 'Golden Age' came to an end, and the Tudor dynasty gave way to the Stuarts. While there were no abrupt and immediate changes in the monarch's relationship with the country, James I and his descendants were very different, both in terms of policy and personality, from Elizabeth. Gradually, the Stuarts lost the support of Parliament and their subjects, and England became increasingly politically turbulent. Over the 85 years that followed Elizabeth's death, the citizens of England experienced growing tension between monarch and Parliament, civil war, regicide, Interregnum, Restoration and revolution – a stark contrast to the relative constancy of Elizabeth's long reign. This is a very broad-brush description of an extremely complex period in English political history. However, the point I would like to highlight is the contrast between Elizabeth's reign and the years that followed. Lawrence Stone has drawn attention to the 'carefully orchestrated propaganda campaign in portraiture, ballad, poetry, and prose [...] [which stressed] her function as the unifying figure who preserved England for the Protestant religion, and kept at bay the destructive flames of civil war'.[5] While the Elizabethan period had its difficulties and troubles, this 'personality

[3] Lawrence Stone, *The Causes of the English Revolution 1529-1642* (London: Routledge & Kegan Paul, 1972), p. 88.
[4] Godwin (1638), p. 112.
[5] Stone, p. 88.

cult' was, unfortunately for the Stuarts, 'a hard act to follow'.[6] It is significant that Godwin's text praises a long-dead Queen rather than the King on the throne at the time it was written.[7]

In such a troubled environment it would hardly be surprising to find expressions of dissatisfaction with society, whether in the form of satiric criticism of contemporary practices and behaviours, or the utopian desire for a better social order. Such expressions were not unusual in seventeenth-century literature and can be found in examples such as Francis Bacon's *New Atlantis*.[8] Moreover, as discussed in Chapter 3, they were also apparent in the moon literature of the period, encompassing both the satiric, as seen in Donne's *Conclave Ignati*, and the more truly utopian, as in Godwin's *The Man in the Moone*. These texts form an intersection between the opportunity provided by the moon's blank canvas and the contemporary desire to express social dissatisfaction.

Religious changes were also significant in this period and inextricably tied into politics. They added another element of instability to English society and provided evidence for those who sought to question established practices and beliefs. Elizabeth's era of Protestant monarchy and her enshrinement in law of Protestantism as the nation's religion had 'placated both Catholic lords and radical Protestants by leaving crucial matters of doctrine deliberately ambiguous'.[9] The accession of James I to the English throne, however, was an uncertain time for his new subjects in religious terms. As the son of the staunchly Catholic Mary I, his rise to the throne gave English Catholics reason to hope for more freedom and concessions to their faith; conversely, as the King of Calvinist Scotland, he represented hope for a purer form of Protestantism to English Puritans. Ultimately, James's passionate belief in the Divine Right of Kings and an Erastian church, subservient to the State, was to disappoint both parties.[10]

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[6] Ibid., p. 89.
[7] The creation date of Godwin's *The Man in the Moone* is discussed in more detail in Chapter 6.
[8] *New Atlantis* was first published posthumously in 1627, as part of Bacon's *Sylva Sylvarum*.
[9] Mark Kishlansky, *A Monarchy Transformed: Britain 1603-1714* (London: Penguin Books, 1997), p. 74. The pieces of legislation I refer to here are the Acts of Supremacy and Uniformity (1559), followed by the Thirty-Nine Articles in 1571.
[10] James expressed his reasoning on the Divine Right of Kings in his essay *The True Law of Free Monarchy*, first published in 1598.

However, the question of religion was by no means a settled one during the reign of the Stuarts, often, though not exclusively, for political reasons. Charles I's marriage to the Catholic Henrietta Maria of France for diplomatic reasons came with a proviso of freedom of worship for English Catholics.[11] At a time when support for Puritanism was growing and the Church of England, under Archbishop William Laud, was accused of having Catholic sympathies, this resulted in a polarisation of religious belief - certainly one of the causes of the Civil War.[12] The Interregnum gave England a period of strict Protestantism, followed by the Protestant Charles II who was married to a Catholic, Catherine of Braganza, and favoured religious tolerance for both Catholic and Protestant dissenters. However, Charles was prevented by Parliament from enacting this tolerance in law when he was forced to withdraw his 1672 Royal Declaration of Indulgence.[13] James II, a convert to Catholicism, shared his brother's belief in religious tolerance, equally unsuccessfully: the combination of James's second Declaration of Indulgence and the birth of his first son, who would be brought up as a Catholic, resulted in an invitation being issued to William of Orange, James's Protestant son-in-law, to invade England and, eventually, take the thrones of England and Scotland.[14] It was only after the second revolution experienced by the country in the space of forty years, that the intertwined issues of religion and monarchy could begin to settle back into Protestantism.[15]

While this is a rapid summation of multiple intricate events and issues, my aim is to provide just a broad flavour of the twists and turns involved in English religion during the seventeenth century. This vastly unsettled atmosphere, and the explosion of competing versions of Christianity, contributed to an increasing scepticism and paved the way for doubt about the old traditions and rules that people had always believed were right. If there were multiple ways to worship God, and if Divine Will no longer kept the King on the throne and his subjects loyal to him, who was to say that everything the people had previously believed to be true was actually correct? Were there other ways to see the world? Was the universe contained within crystalline spheres, after all, and did the Sun really circulate around a stationary Earth?

[11] Kishlansky, p. 107.
[12] Stone, p. 129.
[13] Kishlansky, p. 247.
[14] Ibid., pp. 277-286.
[15] A Protestant succession to the English throne was assured by the 1701 Act of Settlement.

English moon literature reflects a number of these contemporary ideas and questions. I discussed, above, the unsurprising use of the moon as a blank canvas for expressions of social dissatisfaction. Equally unsurprisingly, religion is also a common element. Indeed, at a time when religion was absolutely embedded in all aspects of social and political life, it would have been far more surprising to have found no mention of it at all. While the existence of a religious element across the various texts was discussed in Part Two, it is worth noting at this point the idealistic tone to the presentation of religion shared by some of the earlier English texts. Although Burton and Wilkins do not dwell on the religion of any potential lunar inhabitants, and Jonson provides a passing mention that the 'Doppers [...] have leave only to hum and ha, not daring to prophesy or start up upon stools to raise doctrine', Donne and Godwin's texts offer more detail.[16] The implication of Jonson's comment on the Anabaptists is that, without their preaching, life on the moon is more peaceful. Conversely, the implication of *Conclave Ignati* is that, with the Jesuits translated to the moon, life on Earth would be more peaceful – despite the fact that it is Lucifer who is longing for a return to calm. I would suggest that both of these instances provide hints on the social disturbance generated by religious dissenters during the reign of James I.

Godwin uses the same utopian approach to religion as he does with the rest of his lunar society, producing a similar outcome to Jonson and Donne. His Lunars are strongly religious and 'doe live in such love, peace, and amitie, as it seemeth to bee another Paradise'.[17] Death holds no fear or pain for them and instead there is rejoicing when a Lunar 'should now leave the counterfeit pleasures of that world, and bee made partaker of all true joyes and perfect happinesse'.[18] The faith of the Lunars is deep-seated, embedded in their society and, most crucially, is a single faith that is spread throughout the moon. There are no hints whatsoever that there might be any alternative beliefs and the result is portrayed as settled and comforting. However, it is noteworthy that Godwin has chosen to demonstrate a 'perfect' religion in this way, whilst also using his text to provide an account of the universe that breaks with traditional ideas, picking up on some of the questions raised by the emergence of competing religious factions in contemporary

[16] Jonson, *News*, p. 299 (lines 186-188).
[17] Godwin (1638), p. 104.
[18] Ibid., p. 108.

England. Gonsales's journey to the moon includes a description of gravity that contradicts the Aristotelian theory that heavy things naturally move downwards: 'those things which wee call heavie, do not sinke toward the Center of the Earth, as their naturall place'.[19] Gonsales also reports watching the motion of the Earth that 'turneth round upon her owne Axe every 24. howers from the *West* unto the *East*', describing himself as 'constrained to joyne in opinion with *Copernicus*' on the subject of the Earth's motion.[20] Finally, Gonsales peremptorily dismisses the idea of spheres and elemental regions in the heavens: 'As for the Region of Fire our *Philosophers* talke of, I heard no newes of it; mine eyes have sufficiently informed me there can be no such thing'.[21] While *The Man in the Moone* does not openly comment on the balance between a 'modern' concept of the universe and an established church, I would suggest that this juxtaposition found in Godwin's work is of no small significance.

Interestingly, religion and natural philosophy have been mooted as early bedfellows. For example, David Knight has suggested that:

> [...] the two were intertwined, so that the doctrines of creation and providence threw up scientific questions, while studies of planets, plants and animals had theological implications. The boundary was poorly demarcated and policed. There was nothing like the modern idea of 'two cultures' [...][22]

Taking this further, both Hill and Roberts have theorised that the religious connection with natural philosophy was to be found specifically in Protestantism, rather than Catholicism. Roberts has described the tension between Protestant perspectives 'which veer towards materialism and the unmediated individual exploration of the cosmos' and Catholic perspectives 'which stress a spiritual, transcendental, divinely mediated and fundamentally magical universe' as being at the root of the science fiction genre; a genre which, I would suggest, has its roots in the moon literature of the seventeenth century.[23] From this delineation, it is a simple step to match Protestantism with both the growing materialism and tendency towards exploration noted in seventeenth-century moon literature, and, therefore, with the developing practices of natural philosophy itself;

[19] Ibid., p. 46.
[20] Ibid., p. 56.
[21] Ibid., p. 66.
[22] David Knight, 'Religion and the "New Philosophy"', p. 164
[23] Roberts, p. 39.

whereas his picture of the Catholic perspective is a far closer match to the earlier, mythical and magical, moon literature examined in this research. Hill has suggested the theory that Protestantism was a path for early science and its practitioners: 'Historians have noted the Protestant origins of many of the early scientists'.[24] Even if considering such notable natural philosophers of the period as Galileo casts doubt on this idea, looking specifically at the English authors under examination in this research does yield some interesting results. Despite a possible expectation that members of the English establishment during this period, such as those people in a position to write and publish their work, would be Protestant, this is not necessarily a foregone conclusion. The Elizabethan church had silently tolerated dissenters who outwardly conformed, leading to a greater variance in religious practice than might otherwise have been assumed. However, the expectation of Protestantism does seem to be borne out, to a certain extent, within this particular sample. The texts in which the greatest exploration of the themes and issues surrounding the concept of life on the moon is evident are those written prior to the Restoration, comprising the works by Donne, Jonson, Burton, Godwin and Wilkins. Each of these men was Protestant for at least a portion of their adult lives. While Godwin, Burton, and Wilkins were all lifelong Protestants, Donne was born into a Catholic family but had converted to Protestantism by around 1600.[25] Jonson was born into a Protestant family, but spent 12 years as a Catholic after converting in 1598, and reconverting to Protestantism in 1610.[26] However, at the time of writing their works which are under consideration in this piece of research, all five of these authors were members of the Protestant faith. It is also notable that four out of the five of them became clergymen – the one exception being Jonson, who happens to have been the son of a clergyman. I selected these authors for this research on the basis of the content of their works alone, so it is fascinating to discover this connection between them. Despite the unlikelihood of this small sample having any statistical significance in terms of the general natural philosophical canon, in this case it is certainly enough to prompt a question about whether there was something in the Protestant outlook or experience, particularly for the clergy, that promoted consideration of this concept and a desire to

[24] Hill, p. 91.
[25] David Colclough, 'Donne, John (1572–1631)', *Oxford Dictionary of National Biography* (Oxford: Oxford University Press, 2004) <http://www.oxforddnb.com/view/article/7819> [accessed 3 August 2017].
[26] Martin Butler, 'Ben Jonson's Catholicism', *The Ben Jonson Journal*, 19.2 (2012), 190–216 (pp. 194-196).

explore its implications and possibilities. Indeed, if this is the case, then it also raises a further question on whether England's continued Protestantism during this period also made its own contribution to the burgeoning moon literature genre.

Social changes also began to see a transformation in the way language was perceived and utilised. In Chapter 3, I touched on the discovery of Chinese and the realisation that language did not have to sound the way a European spoke. However, there were also changes in language occurring within Europe itself. A trend began to emerge that moved Europe away from the use of Latin towards the various vernaculars of each country. For instance, Galileo chose to publish many of his works in Italian which Jean Dietz Moss has suggested, particularly in reference to his 1615 letter to the Grand Duchess Christina, was for two reasons. Firstly, writing in his native Italian made the works accessible to a different audience, one that comprised a wider public within his own country as well as others who happened to speak Italian, rather than simply scholars and churchmen who understood Latin. Secondly, it was a far less formal language for communication than Latin: a language of day-to-day correspondence. This made it 'especially suitable for the circulation of his views on a theological matter, for he had been warned by both Cardinal Bellarmine and Cardinal Barberini against invading the province of theologians'.[27] Even if Galileo's works may seem ostensibly scientific to the modern reader, it was simply not possible to separate their theological implications from the natural philosophy in their content at the time they were composed. I would suggest that this partially accounts for Galileo's switch from the Latin of his *Sidereus Nuncius* to the Italian of his later works.

This trend towards writing in the vernacular was happening in England, too. Indeed, it is reflected prominently in English moon literature, bearing in mind that all the texts under consideration here were written in English, with just a single exception. Only Donne's *Conclave Ignati*, the very earliest of these seventeenth-century texts, was first published in Latin before its subsequent translation into English. However, the trend did not necessarily emerge in England for the same reasons as elsewhere. A growing market for books written in English meant that publishers began to drive this change; a change not

[27] Jean Dietz Moss, 'Galileo's Letter to Christina: Some Rhetorical Considerations', *Renaissance Quarterly*, 36.4 (1983), 547–576 (p. 553).

all authors were pleased about as Robert Burton revealed in the first edition of his *Anatomy of Melancholy*:

> [...]it went against my *Genius*, to prostitute my muse in English, my intent was to have it expose this more contract in *Latin*, but I could not get it printed. Any scurrile pamphlet is welcome to our mercenary Printers in *English*, but in *Latin* they will not meddle with it [...][28]

There was also a developing inclination towards a more precise, factual use of English amongst natural philosophy advocates. Francis Bacon was an early proponent of a plain, functional prose style. In his 1605 *Advancement of Learning* he discusses:

> [...] the first distemper of learning, when men studie words, and not matter [...] for wordes are but the Images of matter, and except they haue life of reason and inuention: to fall in loue with them, is all one, as to fall in loue with a Picture [...][29]

This campaign for plainness was later taken up by the Royal Society. Thomas Sprat declared in his 1667 *History of the Royal Society* that the Society had resolved to

> [...] reject all the amplifications, digressions, and swellings of style: to return back to the primitive purity, and shortness, when men deliver'd so many *things*, almost in an equal number of *words*. They have exacted from all their members, a close, naked, natural way of speaking; positive expressions; clear senses; a native easiness: bringing all things as near the Mathematical plainness, as they can: and preferring the language of Artizans, Countrymen, and Merchants, before that, of Wits, or Scholars [...][30]

While Sprat was preparing his *History*, other Society members were working on ways to accomplish this delivery of 'so many *things*, almost in an equal number of words' through the use of artificial languages, for example, John Wilkins and his work described in *An Essay Towards a Real Character, and a Philosophical Language* (1668). Wilkins's aim was to construct 'a *Real universal Character*, that should not signifie *words*, but *things* and

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[28] Burton, p. 10.
[29] Francis Bacon, *The Tvvoo Bookes of Francis Bacon. Of the Proficience and Aduancement of Learning, Diuine and Humane* (London: Henrie Tomes, 1605), sig. $E3^{v}$-$E4^{r}$).
[30] Thomas Sprat, *The History of the Royal Society of London, for the Improving of Natural Knowledge* (London: I. Martyn and I. Allestry, 1667), p. 113.

notions, and consequently might be legible by any Nation in their own Tongue'.[31] This concept resonates in those moon texts that touch on the idea of a lunar language, such as those by Jonson, Godwin, and Cyrano de Bergerac. There, language is conveyed by movements or through music, earthly words have no place. At one point in Jonson's *News*, his second Herald says of the language on the moon, 'All the discourse there is harmony'.[32] This brief line pulls together both the idea of a musical language as well as the idyllic society, and could equally well be applied to Godwin's moon. Furthermore, while it can be taken as a nod towards the musicality of newly discovered languages, such as Chinese, there is also a backward glance towards more traditional ideas of the musical harmony of the heavenly spheres. Jonson and Godwin both agree that there *is* musicality in the planets, but it is from the language of their inhabitants, and not from the rock and soil on which they live.

Wilkins's attempt to establish a universal character was ultimately a failure. However, his text built on the growing conviction that studying the Book of Nature necessitated an understanding of the non-verbal language of mathematics in which it was written. Margreta de Grazia, in her article on the secularisation of language in the seventeenth century, has discussed the replacement of the Bible as the authority on God's word with the Book of Nature and the inner book, copied onto every Christian soul. This had 'the effect of dissociating language from God'.[33] Language was no longer divine but of low origin, fit only for the vulgar or common man. Again, this is demonstrated in the use of music or movement rather than spoken languages for those 'perfect' lunar societies that were such improvements on contemporary English society. Hill has also highlighted how Puritan preachers used plain language to reach the common man in the years of the Civil War and Interregnum: 'the Puritans demanded plain sermons, addressed to the understanding not of scholars but of ordinary men. The object [...] was not to impress, not to delight, but to convince'.[34] This precise, factual method is evident in the increasing move towards a realistic approach within the depictions of life on the moon. Words are

[31] John Wilkins, *An Essay Towards a Real Character, and a Philosophical Language* (London: SA: Gellibrand and John Martyn, 1668), p. 13.
[32] Jonson, *News*, p. 299 (lines 177-178).
[33] Margreta de Grazia, 'The Secularization of Language in the Seventeenth Century', *Journal of the History of Ideas*, 41.2 (1980), 319–329 (p. 325).
[34] Hill, p. 181.

used to set out facts - such as the real dates, places and events given in *The Man in the Moone* – and, therefore, to 'convince' the reader that this is not only possible, but probable too. Even the embellishment that is used, such as Godwin's description of the Lunars, is aimed at giving the reader a more thorough and realistic picture in their mind's eye.

Finally, Campbell has suggested that censorship had an impact on moon literature. As part of her work on Kepler's *Somnium*, Campbell has proposed that texts on alternative worlds, which were constructed as fictions, were deliberately left unpublished during the author's lifetime because their content was 'anticipated as dangerous by reactionary forces in [their] time', a kind of self-censorship in expectation of the authorities' reaction, if you will.[35] However, Campbell only specifies three texts by name in this category: Kepler's *Somnium*, Godwin's *The Man in the Moone* and Cyrano de Bergerac's *L'Autre Monde*.[36] This seems a very small sample from which to draw such a conclusion, especially considering that Jonson's *News from the New World* and Behn's *Emperor of the Moon* were both published within their lifetimes – unless, perhaps, Campbell does not categorise masques and plays as fiction. Indeed, these texts are not mentioned in Campbell's article at all. While the impact of censorship should be considered on moon literature, I would argue that posthumous publication of a work is not necessarily indicative of this. There are a number of plausible reasons why such a work would have been left unpublished at the time of the author's death: perhaps the author simply ran out of time, as Kepler did with the *Somnium*; perhaps it was never intended for publication, only personal amusement; perhaps no money could be found to meet the publication costs.[37] Moreover, aside from *The Man in the Moone*, all the English texts under examination which were published or performed during this period were licensed within their authors' lifetimes, although it must be acknowledged that Donne was not named as the author of *Conclave Ignati* until after his death. The only exception to this is Settle's *The World in the Moon* which was first performed outside of censorship laws, following the lapse of the Licensing Act in 1695. It could be speculated that censorship

[35] Campbell, 'Alternative Planet', p. 234.
[36] Campbell names Cyrano de Bergerac's text as *Voyage dans la Lune*, but I have chosen to refer to the same text here with the title I have used throughout, for the purposes of consistency.
[37] Kepler, *Somnium*, p. xxi.

may still have had an impact on these texts, in terms of their composition. However, there is no evidence to support this theory.

Attitudes towards natural philosophy and its practitioners

Astronomical ideas were popular during the seventeenth century. A number of the texts selected for this research were published in multiple editions or performed on a number of occasions, and translated into other languages. And they were by no means the only works published in connection with astronomical topics during the period. In fact, there were many works in which mention of the concept of life on the moon was too brief or repetitive for inclusion in this thesis, or which concentrated on other astronomical subject areas, such as the plurality of worlds or heliocentrism debates without touching on the idea of extraterrestrial inhabitants at all. A number of these texts were discussed in Part One. A brief search of the *English Short Title Catalogue* (*ESTC*) shows that 1200 works were published on astronomical or lunar topics during the seventeenth century, accounting for roughly 1% of the total items recorded in the database as being published between 1600 and 1699.[38] The *ESTC* also provides interesting figures regarding the potential popularity of astronomical publications during this period. For example, as a percentage of the total number of items published in each century, there were more astronomy-related works published in the seventeenth century than either the sixteenth or the eighteenth centuries.[39] Additionally, the publication rate of these texts increased quite considerably during the century. For example, in the first decade of the seventeenth century, 33 items were published, but in the last decade of the century 236 were published. An examination of the totals for each decade demonstrates a fairly consistent increase over the period, with one minor dip in publication numbers occurring

[38] Search carried out on the *English Short Title Catalogue* (estc.bl.uk) on 29th January 2017, looking for any item with a title or subject including the terms moon, moone, or any terms beginning with the stem 'astronom'. Total number of discrete results published between 1600 and 1699 was 1200, accounting for 1.01% of the 118,792 items recorded as being published during this period. In no way was this designed to be a thorough survey of astronomically related titles, but was undertaken to provide a rough idea of publication numbers. It is acknowledged that a number of these titles will be almanacks or kalendars which would belong more properly to the modern category of astrology, rather than astronomy, and that a number of astronomy-related texts may be recorded with a title and subject that does not include any of these terms.

[39] Using the same keyword search, there were 129 items published between 1500-1599 accounting for 0.86% of the total number of items. From 1700-1799, there were 2765 items published, accounting for 0.82% of the total. Although there is not a large difference between these figures, it is interesting, as above, to see a pattern emerge.

between 1660 and 1669. It is, perhaps, curious that a reduction in publication should occur during the decade in which the Royal Society was founded. Given that overall numbers of items published in that decade also dropped, this reduction could be due, in part, to the tighter restrictions on printing introduced by the 1662 Licensing Act. This was a piece of legislation which resulted in the trial and execution of one man, John Twyn, who was convicted of printing a seditious pamphlet in 1664.[40] However, it could also be due to a number of other reasons, including evidence of some publications not surviving to the modern day, or not yet having been made available in the *ESTC*.

The popularity of astronomical ideas in the seventeenth century within 'polite society' is also demonstrated by Anna Marie E. Roos. In her 2003 essay on this topic, Roos discusses the role of late seventeenth- and early eighteenth-century newspapers in the reception of new scientific ideas during this period.[41] In particular, the *Athenian Gazette, or Casuistical Mercury*, which was published from 1691-1697, invited questions from readers to be answered in print by the editors and 'anonymous experts'.[42] Roos reports that 'an average of 39 scientific questions were addressed in each volume of the *Mercury*, the total of 760 amounting to 20 per cent of all questions in the twenty volumes of the newspaper'.[43] Given that questions were invited on a wide variety of topics 'including literature, politics and conduct advice', this indicates a high level of interest within the newspaper's readership.[44] The issue of life on the moon is one that was addressed specifically. A question published by the *Mercury* in May 1695 asks the editors to revisit their previously stated opinion on the existence of a world in the moon. In particular, the enquirer expresses an anxiety about the religious implications of such a possibility:

> And that there are not more worlds than this one, this seems to prove; that Christ who is one God hath died for this world, and therein for all, now suppose you the inhabiters of another world should sin, can anything less than

[40] Although, figures show that the number of astronomy-related works as a percentage of all works published was at a seventeenth-century high in the 1660s and 1670s, totalling 1.3% of all works published in each of those decades. This would suggest that the number of astronomy-related works published in the 1660s was not as badly affected as works published on other topics may have been.
[41] Anna Marie E. Roos, 'Polite Society and Perceptions of the Sun and the Moon in the *Athenian Mercury* and the *British Apollo*, 1691-1711', in *Didactic Literature in England 1500-1800: Expertise Constructed*, ed. by Natasha Glaisyer and Sara Pennell (Aldershot: Ashgate, 2003), pp. 79–98.
[42] Ibid., p. 81.
[43] Ibid.
[44] Ibid.

> a sacrifice satisfy for sin, and can Christ dye twice, or cannot they sin or how? I could rather grant it were inhabited by Angels, or is that your meaning? Is not this and the like opinion of other worlds injurious to true faith?[45]

This demonstrates quite a significant discrepancy in the speed at which different parts of the population worked through the religious anxiety caused by the idea of an inhabited moon. Those involved in the world of natural philosophy, whether by dint of their own scientific work, or by exploring the issues through fiction and more general philosophy, had tackled this particular problem in the first part of the century, as discussed in Chapter 2. In fact, they had dealt with the subject so successfully that it was no longer an issue in the second half of the century: Butler, Behn and Settle make use of the idea only for its comedic value, with no hint of worry; natural philosophers, such as Fontenelle, de la Bruyère and Huygens, brush off the potential for anxiety, or even see the concept of extraterrestrial life as something that naturally *would* occur in God's universe.

Popular interest did not necessarily accompany a great level of understanding. This situation was, perhaps, recognised in some cases by authors of seventeenth-century moon literature and could be considered a reason for writing their texts in the first place: as a way of explaining or defending the new cosmological ideas. As Campbell has identified, the very impossibility of accessing the moon as a destination 'obviates inhibition in the representation and permits the introduction, not only of the perfectly Strange but of the conceptually Impossible'.[46] In other words, since it could not possibly be real, authors were less constrained to write about cosmological concepts in a way that was traditional or bowed to the accepted wisdom.

The modern academic boundaries that we recognise between disciplines such as science and literature did not exist, certainly at the beginning of seventeenth century, so using a literary form to defend or explain ideas proposed by natural philosophers would not have been considered at all strange. It is not until the end of the century that the first inkling of such an academic divide begins to emerge, at least within astronomy, as noted in Chapter 2, through the discussion of Christiaan Huygens's work. Indeed, in a period when the concept of the scientific experiment was just beginning to emerge, it seems that

[45] 'Question 1', *The Athenian Gazette, or Casuistical Mercury* (London, 7 May 1695), p. 1.
[46] Campbell, 'Impossible Voyages', p. 6.

literature was being used as an experiment in itself, to try out ideas or to recreate expected observations of the newer theories. I have previously discussed the fact that it has been suggested by some critics that this was purposefully done in literary form to make it more palatable or attractive to the reader, or perhaps simply safer for the author. However, Aït-Touati is probably closer to the mark in her exploration of the intimate connection between the astronomy of this period and the imagination. She argues that astronomy is strongly connected to imagination due to its own innate nature: astronomy 'has the characteristic of treating phenomena that are inaccessible or difficult to observe. Consequently, the scholar, like the writer, is obliged to call on his imagination in order to have a working conception of the phenomenon under study'.[47] Therefore, the use of imagination held the key to producing shareable findings. Obviously, it was impossible during this period to prove cosmological theories, due to the inaccessibility of phenomena that Aït-Touati has highlighted. A real seventeenth-century person could not simply step away from the Earth and look back at it, to see whether it rotated or not. And yet, *fictional* seventeenth-century characters suffered from no such limitations: not only could their creators have them observe the Earth as it turned, but also land on the moon and meet its equally fictional inhabitants.

A fictional experiment could also provide an opportunity to explore in greater depth the various debates that were prompted by the new theories on, for example, religious grounds. The paradoxical situation in which heliocentrism, and the possibility of multiple inhabited worlds, seemed to place traditional Christianity was irresistible for these created explorers. The question of what such possibilities meant for Mankind was raised by Kepler as early as 1610 in his *Dissertatio cum Nuncio Sidereo*, and picked up by various authors throughout the century, whether simply worrying at the thought like Burton and Wilkins, or generating a Christian lunar race that may well have been descended from humans, like Godwin.

However, later on in the century the popularity of these ideas became, to a certain extent, their downfall. Astronomy became a trend amongst the fashionable classes and polite society, as Roos has demonstrated: amongst those with the money and leisure to

[47] Aït-Touati, p. 10.

read books and newspapers, and to obtain fine-looking telescopes. Yet, somewhere along the way, the science became subsumed within the fashion. This is reflected in the many comedic portraits of the virtuosi of the later seventeenth century, those found within Shadwell's *The Virtuoso* (1676) being a prime example. Two specifically astronomical examples are found within Butler and Behn's works where, as demonstrated in Chapter 1, the lack of scientific principle behind the outwardly scientific activity is criticised. Elkanah Settle's work is an admirable example of this critique in action. Ostensibly, *The World in the Moon* presents, well, a world in the moon. However, in reality, no astronomical science and very little in the way of an actual world in the moon is involved in the production at all.

Chapter 5

'[I]t is a most beautiful and delightful sight to behold the body of the moon'[1]

Changes in society and social attitudes during the seventeenth-century helped to determine the nature of the moon-worlds appearing in literature during this period. The kind of fictional communities that authors created, their governments, religions, and even their languages, can be seen as refractions of Earth-bound events, clearly linking these to the increasingly human cast of moon literature's lunar inhabitants. Another change, which took place at around the same time, was a shift in how sight and vision were perceived. This was a far more subtle change than those taking place in society, and yet it was fundamental to the way people viewed, and thought about, the world around them. Coinciding with the birth of the telescope, this repositioning of visual significance impacted the status and utilisation of the imagination. Consequently, as I will discuss in this Chapter, the visual and the imagination found their way back into natural philosophy during the seventeenth century.

Vision and imagination

Humans are extremely visual creatures. Sight provides us with both distance and close vision, detailed colour differentiation and excellent depth perception. These qualities have led to sight becoming a dominant method for gathering a broad, information-rich picture of the world around us. However, sight was not necessarily considered absolutely reliable in the early modern period. Stuart Clark has proposed that, between the fifteenth and seventeenth centuries, 'European visual culture experienced not so much the rationalization as the de-rationalization of sight'.[2] Before this period, sight was regarded as having a high degree of certainty. Confidence in human vision was derived

[1] Galileo Galilei, 'The Sidereal Messenger (1610)', in *The Essential Galileo*, ed. by Maurice A. Finocchiaro (Indianapolis: Hackett Publishing, 2008), pp. 45–84 (p. 48). All subsequent references will be to this edition, unless otherwise specified.

[2] Stuart Clark, *Vanities of the Eye: Vision in Early Modern European Culture* (Oxford: Oxford University Press, 2007), p. 329.

from the Aristotelian model of perception, where it was understood that objects gave off resemblances of themselves which were then received via the eye into the brain. Anything that departed from this orderly standard of visual certainty could be explained simply as an error or an untruth but, to a great extent 'the world was what it appeared visually to be'.[3] However, in the period Clark is referring to, this framework underwent a re-evaluation that entirely undermined such a high level of visual confidence. Clark cites a number of cultural developments that he believes led to this situation. Firstly, a growing interest in and study of demonology from around the 1430s led to an acceptance of the devil's power to intervene not only in the spiritual, but also the physical world:

> [...] the power, for example, to suddenly displace objects so that they seemed to become invisible, the power to adopt any bodily form or shape whatever, the power to create exact simulations of people and events, and, above all, the power to disrupt the cognitive process itself by physically entering either brain or eye or both and moving images around them at will.[4]

Secondly, at around much the same time, perspective techniques began to be adopted by artists of the Italian Renaissance, leading to the exploration of 'the artificiality of normal perspective and an attempt to expose perspective's claims to objectivity and truth'.[5] This same idea of visual contrivance and deception was also a motif of natural magic in the later Renaissance, often making use of mirrors and lenses to stretch the boundaries between visual fact and visual fiction. Thirdly, the Protestant Reformation led to an examination from the early sixteenth century of the level of truth involved in Catholic images, miracles and rites, such as the Mass. They were labelled as illusions and lies by Calvinists, 'with the consequence that Calvinist language became saturated with the idioms of "juggling", "dissembling", "duping", and "conjuring", all of them having visual implications'.[6] And, finally, from the 1560s, an enthusiastic revival of Greek scepticism destabilised the Aristotelian-based optical theory that allowed visual problems to be treated merely as errors in relation to 'normal' vision. It achieved this simply by removing the absolute concept of 'normal' vision and reducing all visual events to relative experiences. In fact, the new sceptics 'established the principle that for every visual

[3] Ibid., p. 2.
[4] Ibid., p. 3.
[5] Ibid.
[6] Ibid., p. 4.

experience deemed to be true it was always possible to have a deemed-to-be-false visual experience that was indistinguishable from it'.[7] Without a reliable standard by which to assess each instance, it was impossible to judge the veracity of any visual encounter.

While not wishing to dwell too long on Clark's detailed arguments, his work's importance lies in the signification of the fundamental doubts surrounding both the reliability and accuracy of visual experiences at the dawn of the seventeenth century. This is a key aspect of the emerging visual culture of the period and I would propose that these lingering doubts were highly influential in the debate on the reliability of the telescope: that is, whether it was really providing an enhancement to reality or somehow creating the image itself. This is illustrated by Richard Dunn, of the National Maritime Museum in Greenwich, in his description of the infamous response to *Sidereus Nuncius* by the Jesuit mathematician, Christopher Clavius, who 'in 1610 reportedly said that Galileo could not have seen Jupiter's moons unless he had first put them into the telescope'.[8] When the sights that could be viewed through the telescope could not be verified by the experience of any other sense or, indeed, by any other means at all, and when viewed astronomical phenomena did not necessarily appear the same to different witnesses, it is unsurprising that telescopic observations were not instantly accepted as factual evidence of what lay beyond Earth's boundaries.[9] An additional issue with acceptance of astronomical telescopic evidence was the legacy of belief in Aristotle's theory that the Earth was made of different material from that of the heavens. Whereas the Earth and everything beneath the moon, so the theory went, was composed of the four terrestrial elements - earth, water, air and fire - the heavens were made of æther, the pure fifth element. Æther did not change and did not decay, so was entirely unlike everything on Earth. Spiller quotes an example of Julius Caesar Lagalla's excitement at being able to read an inscription carved on the Lateran palace 'so clearly, that we distinguished even the periods carved between the letters, at a distance of at least two miles'.[10] However, even when the objects that the telescope showed in terrestrial demonstrations, such as this one, could be verified by closer physical inspection without the instrument, there was not

[7] Ibid.
[8] Dunn, p. 31.
[9] I discuss the barriers to making and replicating observations using the early telescope in Chapter 6.
[10] Spiller, 'Reading through Galileo's Telescope', p. 192.

an automatic translation of the principle to astronomical observation. Who was to say that æthereal objects would behave in the same way or cause the same reaction with the telescope as material, earthly objects? Indeed, in describing the moon's surface as 'just like the face of the earth itself', Galileo was doing more than simply using an analogy.[11] He was constructing a new kind of reality where rules could be applied in the same way to both earthly and heavenly objects. For example, Galileo made the assumption that shadows on the moon were caused in the same way and, therefore, could have the same implications drawn from them, as shadows on Earth: that is, that an object of height, such as a mountain, causes a shadow when the sun is behind it, and that the shadow will change as the object and the sun move in relation to each other.

And yet, seventeenth-century natural philosophers had to learn to trust what their eyes revealed in order to make any progress in the growing area of understanding the natural world. Observation came to be considered a new form of knowledge, as captured by the seventeenth-century philosopher and educator, John Comenius, in his *Didactica Magna*:

> [...] the truth and certainty of science depend more on the witness of the senses than on anything else. For things impress themselves directly on the senses, but on the understanding only mediately and through the senses. [...] We do not trust a conclusion derived from reasoning unless it can be verified by a display of examples (the trustworthiness of which depends on sensuous perception). No one could have such confidence in the testimony of another person as to disbelieve the experience of his own senses. Science, then, increases in certainty in proportion as it depends on sensuous perception. It follows, therefore, that if we wish to implant a true and certain knowledge of things in our pupils, we must take especial care that everything be learned by means of actual observation and sensuous perception.[12]

This transformation in the value of sensory information is something which could never have happened without a greater level of confidence in visual evidence than had been experienced previously. Visual scrutiny provided a new kind of information that could not be recorded in mathematical tables or formulae, which could not be captured appropriately in a diagram, and which had little precedence in ancient authority. It was

[11] Galilei, p. 48.
[12] John Comenius, *The Great Didactic of John Amos Comenius; Now for the First Time Englished*, ed. by M. W. Keatinge (London: Adam and Charles Black, 1896), p. 337. Comenius originally wrote this book in Czech in 1627, and it was first published in Latin in 1657.

not automatically trusted by everybody, but the weight of acceptance swung towards it as the century progressed. In 1638, as Steven Dick argues, 'observation was nevertheless the new knowledge toward which Wilkins turned' in *The Discovery of a World in the Moone*; and it was this new knowledge that allowed him to take a fresh look at the state of contemporary astronomical expertise.[13]

As well as outlining the visual doubt that was in place at the dawn of the seventeenth century, Clark has briefly examined how a greater level of visual confidence was established. He cites the steering of a 'middle path between dogmatism and doubt by securing scientific truths on the pragmatic and anti-metaphysical grounds provided by experience and the verification or falsification of hypotheses [...] This kind of certainty was *good enough* for science'.[14] In other words, taking the approach advocated by Francis Bacon, which he began to formulate as early as 1605 in his *Advancement of Learning*, led to a methodology based on the practicalities of seeking to understand the external world. Human beings only had their senses to use in order to connect with that world. If no trust could be placed in those senses, there was simply no way to have any comprehension of the world at all. One of the post-sceptical ideas that perhaps helped in adjusting to this 'good enough' type of approach was that 'whatever their weaknesses and failings, the senses had not been providentially provided to cause only error and that, within suitably acknowledged limits [...] they were reliable enough sources of information to justify ocular enquiry and demonstration'.[15] In the preface to his 1665 *Micrographia*, Robert Hooke argues that the only way for natural philosophy to progress is by returning to the first principles of '*the plainness and soundness of* Observations *on* material *and* obvious *things*', rather than relying merely on '*a work of the* Brain *and the* Fancy'.[16] However, in doing so, he cautions that there must be *'a* watchfulness over the failings *and an* inlargement of the dominion, *of the Senses'*, as well as '*a* scrupulous *choice, and a* strict examination*, of the reality, constancy, and certainty of the Particulars that we*

[13] Dick, p. 13.
[14] Clark, p. 347. Emphasis is mine.
[15] Ibid, p. 348.
[16] Robert Hooke, *Micrographia, or, Some Physiological Descriptions of Minute Bodies Made by Magnifying Glasses with Observations and Inquiries Thereupon* (London: Printed by Jo. Martyn and Ja. Allestry, 1665), sig. b^{r}.

admit'.[17] In doing so, Hooke is demonstrating Bacon's desire for a return to making first-hand observations of the natural world, albeit within the careful conditions necessary to avoid wrongly labelling errors, or mere appearances, as verified reality. The automatic referencing to the 'truths' of ancient philosophical authorities, such as Aristotle, had no place in Hooke's style of natural philosophy.

Part of the doubt surrounding the reliability of sight involved the element of hallucination: 'seeing' things in the mind that were not really there or, in other words, imagining them. This is one of the failings that Hooke was keen to guard against. The connection between mental imagery and the imagination has been the subject of long scholarly debates in more recent times. These debates, to date, have still not been satisfactorily resolved. Some critics argue that no imagery is involved in the human imagination, others that it is an essential part of imagining.[18] Experiments have shown that a large area of brain activity involved in perceiving actual objects overlaps with the activity recorded when the same participants are asked to imagine an object.[19] This would lead to the conclusion that the brain is doing a large proportion of the same work when it receives visual input from the eyes as it does when imagining and, therefore, that the existence of mental imagery is more likely than not. Others have disputed the results of these experiments and 'have increasingly attempted to explain away mental images, refusing to countenance them in their mental ontology'.[20] However, for the purposes of this research, the validity of the various arguments on mental imagery does not matter. What is far more significant is the general perception of humans as to their own reliance on visual material, and of the involvement of mental images in their imaginative and creative processes. The fact that, as Amy Kind puts it, 'imagining feels like perception from the inside' regardless of whether it can be scientifically recorded and quantified.[21] This inner picturing was described by Descartes in the sixth discourse of his 1637 *La Dioptrique*: 'it is the soul that sees, not the eye; and only by means of the brain does the

[17] Ibid., sig. a2^{r}.
[18] Amy Kind, 'Putting the Image Back in Imagination', *Philosophy & Phenomenological Research*, 62.1 (2001), 85–109 (pp. 85-87).
[19] Stephen M. Kosslyn, William L. Thompson and Nathaniel M. Alpert, 'Neural Systems Shared by Visual Imagery and Visual Perception: A Positron Emission Tomography Study', *NeuroImage*, 6.4 (1997), 320–34. In this study, Kosslyn et al. found that 'two-thirds of the activated areas were activated in common' (p. 320).
[20] Kind, p. 86.
[21] Kind, p. 94.

immediate act of seeing take place'.[22] Despite the possible discomfort of using the word 'soul' for a modern reader it is, nonetheless, a fairly accurate description. The eyes are simply conduits for the light reflecting off objects around us; it is only once the information has reached the brain, or the soul, that it is processed. I would suggest that Descartes's equation of this processing area with the soul is, in reality, entirely appropriate as it implies an individuality that the modern interpretation of 'brain' does not. This is important because what we perceive is not simply a case of translating light into objects and movement, but more a simultaneous translation and personal interpretation of that light. All our knowledge and experience of the objects we are seeing is brought to bear when we see them. In other words, it is impossible *just* to perceive, for example, an apple. Along with seeing 'an apple', we know that it is a piece of fruit that grows on a tree, we know what it might taste like, or we might even associate it with any previous experiences of apples that we happen to have had – a favourite dessert, or losing a tooth in a particularly crunchy specimen, for example. The culture to which we belong can also strongly influence how we perceive an object. Michael Baxandall has discussed his concept of the 'period eye' in his book on pictorial style.[23] This is the idea that different cultures, geographically and historically, will be particularly attuned to recognising specific visual concepts and relationships due to the unique set of influences that make up that individual culture. In other words, 'the physical act of seeing is culturally conditioned in ways that determine cognitive perception'.[24] To apply this back to the apple, we may make culturally based associations with this fruit as an object of evil: the poisoned fairy-tale apple, or the Biblical object of temptation, for example. Obviously, different cultures will evolve different structures that shape the visual perception of its participants. Clark has commented that 'in *any* age visual experience, like its linguistic equivalent, can only mean something in relation to pre-existing cultural and social formations'.[25] So, the mixture of cultural constructions and individual experiences combine to make visual cognition a highly personal matter.

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[22] Rene Descartes, *Descartes: Philosophical Writings*, trans. by Elizabeth Anscombe and Peter Thomas Geach (Indianapolis: Bobbs-Merrill Educational Publishing, 1971), p. 253.
[23] Michael Baxandall, *Painting and Experience in Fifteenth Century Italy: A Primer in the Social History of Pictorial Style* (Oxford ET - 2nd: Oxford University Press), p. 29.
[24] Spiller, p. 194.
[25] Clark, p. 6.

The individuality of perception is particularly important from the point of view of creativity and is what allows somebody to build new creations from their existing knowledge and experiences. This applies at least equally well in terms of objects or experiences that are not physically perceived and are, instead, received by the imagination rather than the eyes. This is because, as Alvin Goldman has stated: 'imagining the episode and really experiencing the episode trigger the same psychological mechanisms [...] imagination simulates, or replicates, in many important respects, the hypothetical situation as it would transpire'.[26] However, imagining the situation allows for more immediate 'personalisation' than does physical experience: the requirement to construct a picture of a situation, or object, in the imagination will necessarily make use of the building blocks already available. What is produced will depend on the pre-existing knowledge and experience used, combined with the external stimulus. For example, the outline of a story may be given in a novel, but the imagination of the reader will fill in the details, such as what the protagonist may look or sound like. Chapter 6 demonstrates why this is particularly significant in terms of seventeenth-century moon literature.

The telescope: a hinge between vision and imagination

The telescope, appearing near the start of the seventeenth century as a device designed for the observation of distant terrestrial objects, quickly made a mark on the highly visual culture of England during this period. Despite being considered as a scientific instrument from a modern point of view, the telescope's early status was far less straightforward. The true origins of the telescope are shrouded in mystery. The birthplace of the telescope is often given as The Hague in September 1608, but investigations since that date have not always agreed on the name of the instrument's inventor. However, Dutchman Hans Lipperhey submitted a patent application for 'a certain device by means of which all things at a very great distance can be seen as if they were nearby, by looking through glasses' to the States-General at The Hague in the autumn of 1608.[27] Therefore, while the true first inventor of the physical device will never be known, Hans Lipperhey has established himself as the person who appreciated that it was more than a simple

[26] Alvin Goldman, 'Imagination and Simulation in Audience Responses to Fiction', in *The Architecture of the Imagination*, ed. by Shaun Nichols (Oxford: Oxford University Press, 2006), pp. 41–56 (p. 48).
[27] Albert Van Helden, 'The Invention of the Telescope', *Transactions of the American Philosophical Society*, New Series, 67.4 (1977), 1–67 (p. 36).

amusement and created the concept of the telescope. In that sense he was, indeed, the inventor of the telescope and as Dunn has stated: 'Even if he wasn't the first to discover the correct lens combination, he deserves credit for appreciating its importance'.[28]

Albert Van Helden has analysed the strengths of lenses that would commonly have been available in spectacle-makers' shops at the beginning of the seventeenth century, together with the magnification information that Galileo revealed about his first attempt to construct a telescope. His conclusion is that 'around the turn of the seventeenth century it had just become possible to construct a weak but usable Galilean telescope from lenses available in the shops of spectacle-makers'.[29] In other words, had Galileo tried to build, or improve upon, a telescope much before the time he did, it would have been a failure – and the history of the device may have been very different. However, Clark's work shows that, until this point, European visual culture was equally unready for the changes that the telescope was to initiate. It appears that the timing of the telescope's invention may have been absolutely crucial.

By the point of the telescope's creation, natural philosophy had already begun its first forays into the territory that is considered to be modern science. That is, rather than simply relying on ancient authority, activity in this area had begun to turn towards mathematics and measurement as a trustworthy way to collect information about, and to understand, the world. In particular, astronomy had become characterised by two specific elements. Firstly, measurement using instruments such as the astronomical quadrant, which determined the altitude of a celestial body above the horizon. Secondly, increasingly accurate recording and calculation of angles, distances and periods of time, a good example of which can be seen in the painstaking work of Danish astronomer Tycho Brahe (1546-1601). Brahe's work was eventually published as the *Rudolphine Tables* in 1627. The telescope, however, offered a transformation of astronomy from 'an angle-measuring science' into a descriptive, narrative practice in the early part of the century.[30] The telescope could make no measurements. Neither could it provide a shared

[28] Dunn, p. 23.
[29] Van Helden, *Invention*, p. 12.
[30] J. Hamel, 'Kepler, Galileo, the Telescope and Its Consequences', *Astronomische Nachrichten*, 330.6 (2009), 526–35 (p. 528).

observational experience: use of the telescope was essentially 'a private act'.[31] Both of these factors meant an imaginative approach to sharing the results of telescopic observation was required. Galileo's telescopic observations of the moon, and other astronomical phenomena, were experiences that were as personal and exclusive as if they had only taken place in his imagination. Additionally, Galileo's improvement of the telescope had made his own instruments the most powerful available at the time. This meant that his observations could not immediately be re-created by anyone else who might wish to do so. Once Galileo realised the importance of his observations and decided to dedicate their outcome to Cosimo de' Medici, the fourth Grand Duke of Tuscany, he needed to find a way to convey their implications to a lay audience: an educated audience, but one without any specialist astronomical knowledge. Galileo chose to do this via *Sidereus Nuncius*. Throughout the work, it is obvious that Galileo is acutely aware of the purpose of his text: to convey the outcome of his observations, certainly, but also, and perhaps more importantly for him at the time, to persuade his would-be patron of the significance of his discoveries, and of his own importance in bringing them to the world. After a flattering introductory address to the Grand Duke, Galileo immediately sets out why his discoveries are significant in the very first paragraph of *Sidereus Nuncius*:

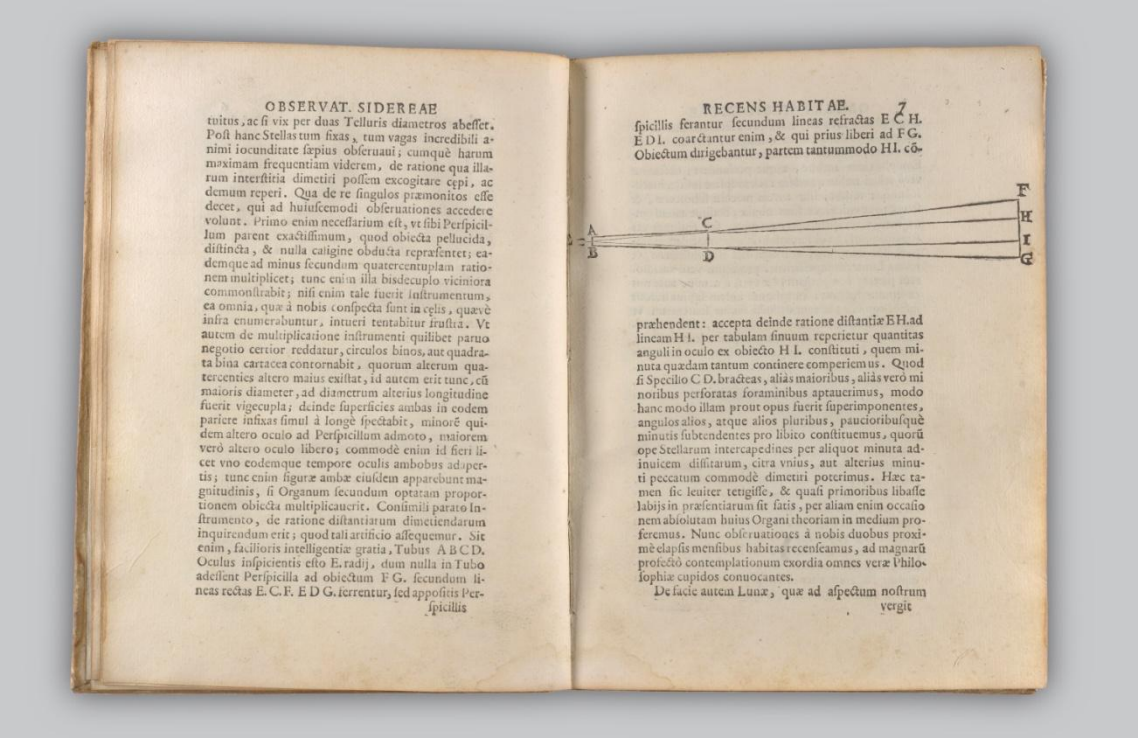
> They are of great interest, I think, first, because of their intrinsic excellence; secondly, because of their absolute novelty; and lastly, also because of the instrument by the aid of which they have been presented to our senses.[32]

He continues by giving a very brief synopsis, almost a taster, of each discovery, before launching into a first-person narrative on how he came to use the telescope. Galileo's talent for showmanship is clear in these first few passages of *Sidereus Nuncius*. He seeks to capture the interest of his audience by illuminating the wonders that are to come: his 'decidedly great feat' of swelling the number of fixed stars and adding more 'which have never been seen before, and which surpass the old, previously known, stars in number more than ten times'; the 'most beautiful and delightful sight' of the moon which shows that it 'certainly does not possess a smooth and polished surface, but one rough and uneven, and, just like the face of the earth itself'; his settling of the 'disputes about the

[31] Albert Van Helden, 'Telescopes and Authority from Galileo to Cassini', *Osiris*, 9 (1994), 9–29 (p. 9).
[32] Galilei, p. 48.

galaxy or Milky Way' which 'seems by no means a matter that ought to be considered of slight importance'; and the 'greatest astonishment by far [...] is this: I have discovered four wandering stars, neither known nor observed by any one of the astronomers before my time'.[33] The audience, whether astronomer or not, can hardly fail to be enthralled at the prospect of what is about to be revealed, as Galileo invites them to lean in and hear his tale of amazement and discovery.

Yet, Galileo did not rely on his prose alone to convey his message, but made use of a number of diagrams and drawings throughout the text to illustrate his points. These are as fascinating as the text. For example, the first diagram he uses is a figure to demonstrate his method for measuring distances using the telescope. In a standard modern printing of the book this fits neatly in line with the text and looks like a rather unexciting line drawing of a telescope. However, the original design for this diagram sees it stretching across the entire width of the page, well beyond the text block (Figure 3).[34]


OBSERVAT. SIDEREAE

tvitus, ac ſi vix per duas Telluris diametros abeſſet. Poſt hanc Stellas tum fixas, tum vagas incredibili animi iocunditate ſæpius obſeruaui; cumquè harum maximam frequentiam viderem, de ratione qua illarum interſtitia dimetiri poſſem excogitare cepi, ac demum reperi. Qua de re ſingulos prænonitos eſſe decet, qui ad huiuſcemodi obſeruationes accedere volunt. Primo enim neceſſarium eſt, vt ſibi Perſpicillum parent exactiſſimum, quod obiecta pellucida, diſtincta, & nulla caligine obducta repræſentet; eademque ad minus ſecundum quatercentuplam rationem multiplicet; tunc enim illa bisdecuplo viciniora commonſtrabit; niſi enim tale fuerit inſtrumentum, ea omnia, quæ à nobis conſpecta ſunt in cælis, quævè infra enumerabuntur, intueri tentabitur fruſtrà. Vt autem de multiplicatione inſtrumenti quilibet paruo negotio certior reddatur, circulos binos, aut quadrata bina cartacea contornabit, quorum alterum quatercenties altero maius exiſtat, id autem erit tunc, cũ maioris diameter, ad diametrum alterius longitudine fuerit vigecupla; deinde ſuperficies ambas in eodem pariete infixas ſimul à longè ſpectabit, minorẽ quidem altero oculo ad Perſpicillum admoto, maiorem verò altero oculo libero; commodè enim id fieri licet vno eodemque tempore oculis ambobus adapertis; tunc enim figuræ ambæ eiuſdem apparebunt magnitudinis, ſi Organum ſecundum optatam proportionem obiecta multiplicauerit. Conſimili parato Inſtrumento, de ratione diſtantiarum dimetiendarum inquirendum erit; quod tali artificio aſſequemur. Sit enim, facilioris intelligentiæ gratia, Tubus A B C D. Oculus inſpicientis eſto E. radij, dum nulla in Tubo adeſſent Perſpicilla ad obiectum F G. ſecundum lineas rectas E C F. E D G. ferrentur, ſed appoſitis Perſpicillis

RECENS HABITAE. 7

ſpicillis ferantur ſecundum lineas refractas E C H. E D I. coarctantur enim, & qui prius liberi ad F G. Obiectum dirigebantur, partem tantummodo H I. cõ-

prehendent: accepta deinde ratione diſtantiæ E H. ad lineam H I. per tabulam ſinuum reperietur quantitas anguli in oculo ex obiecto H I. conſtituti, quem minuta quædam tantum continere comperiemus. Quod ſi Speciliо C D. bracheas, aliàs maioribus, aliàs verò minoribus perforatas foraminibus aptauerimus, modo hanc modo illam prout opus fuerit ſuperimponentes, angulos alios, atque alios pluribus, paucioribuſque minutis ſubtendentes pro libito conſtituemus, quorũ ope Stellarum intercapedines per aliquot minuta adinuicem diſtitarum, citra vnius, aut alterius minuti peccatum commodè dimetiri poterimus. Hæc tamen ſic leuiter tetigiſſe, & quaſi primoribus libaſſe labijs in præſentiarum ſit ſatis, per aliam enim occaſionem abſolutam huius Organi theoriam in medium proferemus. Nunc obſeruationes à nobis duobus proximè elapſis menſibus habitas recenſeamus, ad magnarũ profectò contemplationum exordia omnes veræ Philoſophiæ cupidos conuocantes.

De facie autem Lunæ, quæ ad aſpectum noſtrum vergit

Figure 3: The diagram of the telescope in the first edition of *Sidereus Nuncius* extends across the page

[33] All quotations in this section are from Galilei, pp. 48-49.

[34] Galilei, *Sidereus Nuncius*, p. 7[r]. This copy is held by Stanford University Library. Image supplied and reprinted by kind permission of Octavo Corp.

The effect of this is to make the sketched telescope seem as though it is gazing off into the far distance, beyond the realm of the known.

Whereas, in a copy of the first edition of *Sidereus Nuncius* held in The Warnock Library's collection, the diagram even extends beyond the edge of the page, so that the letters indicating the different light rays entering the instrument are attached outside the edge of the leaf (Figure 4).[35] It is possible that this is a result of the paper being trimmed during a later re-binding process, but it only serves to emphasise the extension of the light rays still further.

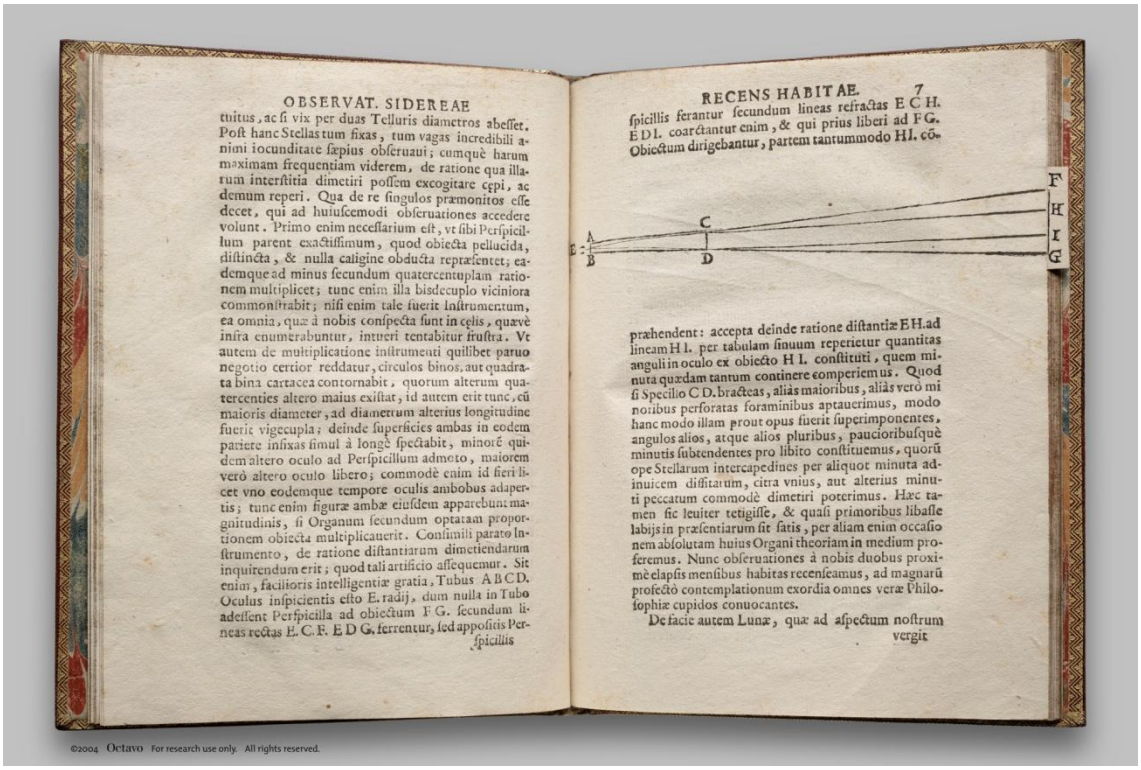
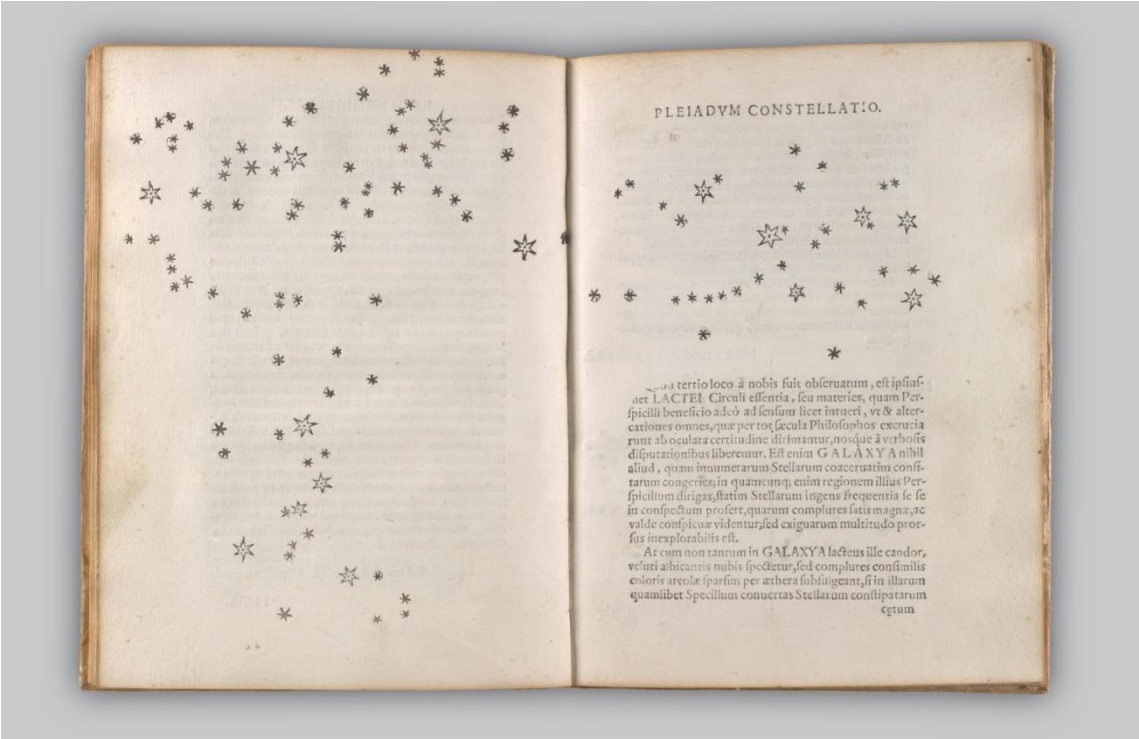


Figure 4: Diagram of the telescope in The Warnock Library's first edition of *Sidereus Nuncius* extends beyond the page

Another example of Galileo's effective use of illustrations is his drawings of the constellations of Orion's Belt and Sword, and the Pleiades. Again, a standard modern printing indicates only the content and layout of each individual diagram. However, the first edition displays them as Galileo intended: alongside each other and extending over three quarters of a double-page spread. They almost merge together and, as with the first example, stretch out beyond the text block to fill, and virtually enlarge, the page.

[35] Galilei, *Sidereus Nuncius*, p. 7[r]. This copy is held by The Warnock Library. Image supplied and reprinted by kind permission of Octavo Corp.



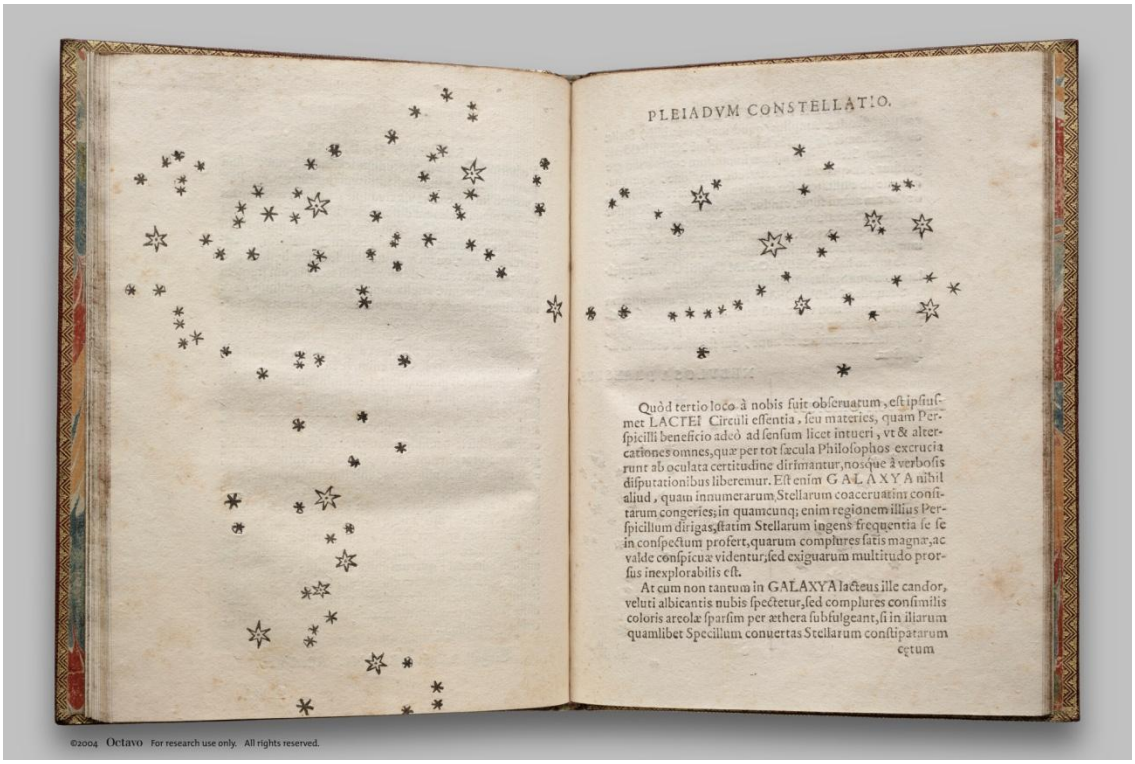


Figure 5: Diagram of the constellations of Orion's Belt and Sword and the Pleiades in the first edition of *Sidereus Nuncius*. Top copy is in Stanford University Library, bottom copy is in The Warnock Library

The effect is one of gazing at the night sky, with a slightly odd feeling that, if the reader were to adjust their gaze slightly, they would see still more of the heavens laid out beyond the edge of the page. Figure 5 shows these drawings in the same two copies of the first edition of *Sidereus Nuncius*.[36] Slight differences can be seen in the way these two drawings are laid out, both in relation to the page edge and to each other, but the same effect is maintained in both copies. It is interesting to note that the differences here are not necessarily down to any re-binding of the copy belonging to The Warnock Library. For example, The Warnock Library copy (lower image) has *more* blank space between the top star in the drawing of Orion's Belt and Sword and the edge of the page, than has the Stanford Library copy. Additionally, the alignment of the two drawings differs: note how closely the largest star on the right of the drawing of Orion's Belt and Sword sits to the two medium stars in the lower left of the drawing of the Pleaides. In the Stanford Library copy, the large star sits above the two medium stars, whereas The Warnock Library copy shows them forming a single line across the page. This would indicate that, although both first editions, each of these copies came from a different printing. Indeed, a careful inspection of the text block that follows the drawing of the Pleaides would support this: the Stanford Library copy (upper image) has a small amount of the text missing in the top left corner of the block, which obscures the words 'Quod' on the first line and 'met' on the second line. These are clearly visible in the copy held in The Warnock Library.

It is particularly significant that what Galileo reported to his audience via *Sidereus Nuncius* was 'beyond the range of the perceivable'.[37] Indeed, using any means other than the telescope, it was entirely unverifiable. The only way that Galileo's audience could come to some understanding of what *Sidereus Nuncius* related was through using their imaginations to recreate what was written, or drawn, on the page. Even many of those who, later, tried to use the telescope to recreate Galileo's observational experiences were unable to see anything of relevance and they, too, either had to use their imaginations or disbelieve what Galileo told them. Martin Horky was one of the non-believers. He was

[36] Ibid., unnumbered pages between p. 16 and p. 17. Images supplied and reprinted by kind permission of Octavo Corp.
[37] Edward S. Casey, 'Imagination: Imagining and the Image', *Philosophy and Phenomenological Research*, 31.4 (1971), 475–90 (p. 490).

present during a telescope demonstration Galileo gave in Bologna towards the end of April 1610 and later wrote in a letter to Kepler:

> I tested this instrument of Galileo's in a thousand ways, both on things here below and on those above. Below, it works wonderfully; in the sky it deceives one, as some fixed stars are seen double. I have as witnesses most excellent men and noble doctors [...] and all have admitted the instrument to deceive.[38]

In contrast, Kepler immediately believed what Galileo had said, even without being able to confirm the findings in *Sidereus Nuncius* for himself: 'I may perhaps seem rash in accepting your claims so readily with no support from my own experience. But why should I not believe a most learned mathematician, whose very style attests the soundness of his judgement?'.[39]

Yet, once released to his audience's imagination, Galileo no longer had any control over how other people experienced his observations. It is at this point that the individuality of perceptual experience becomes particularly important. Each person who encountered the virtual version of Galileo's observations through *Sidereus Nuncius* would have experienced them slightly differently, depending on the associations, experiences and knowledge that they combined with Galileo's words and descriptions. It is this that led to the differing moon-worlds created in the early part of the seventeenth century. Whereas Galileo made no reference to even the possibility of life on the moon in *Sidereus Nuncius*, his description of the moon's surface, together with his comparison of the moon to the Earth, was all the impetus that was needed to bring a fictional spark of life to the moon in the imagination of so many of his readers.

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[38] Letter from Martin Horky to Kepler, 1610, quoted in G. Daniel Goehring, 'The Reception of the Telescope', *Astronomy Quarterly*, 2.7 (1978), 139–52 (pp. 145-146).
[39] Kepler, *Conversation*, pp. 12-13

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Chapter 6

'[W]e must tell you a tale of the Man in the Moone'[1]

As I argued in Chapter 5, vision and imagination are closely linked and the telescope provides a particularly strong hinge between these two elements.[2] *Sidereus Nuncius* united all of these, and brought the telescope, and its potential, to popular attention. Part Two demonstrated that 1610, the year this work was published, marked significant changes in literary and philosophical representations of life on the moon. This chapter will explore the depth of the impact of both the telescope, and *Sidereus Nuncius*, on English moon literature by examining the evidence to be found in the texts themselves.

Galileo's communication of telescopic experience

Sidereus Nuncius is a work that simultaneously combines the epic and the familiar. The grandeur of Galileo's observations of millions of previously invisible stars in the Milky Way and the 'Medicean Stars' orbiting around Jupiter pulls the reader's imagination out into the endless heavens to display the brilliant wonders to be found there. Even if the concept of infinity is not one Galileo deals with in this treatise, the universe suddenly feels a much larger place and the idea is introduced that there is much more 'out there' surrounding the Earth than meets the unaided human eye. At the same time, an absolutely key passage is his comparison of the moon to the Earth, to describe the roughness of its surface. The moon is suddenly no longer an ethereal, spiritual globe of light, but a material, geographical place that could be a second Earth, with all the implications that this would entail. This is a striking change from the portrayal of the moon in the recent history of that period. As outlined in Chapter 1, the moon had typically been cast in the late sixteenth century as, for example, a personified goddess. This change was all the more striking for having a very strong element of familiarity; it cast a remarkable new light on both the moon and the Earth. It is unsurprising that

[1] Lyly, *Endimion*, sig. A2^{r} (The Prologue).

[2] This chapter forms the basis of a paper I gave at the 2016 Annual Conference of the British Society for Literature and Science, titled 'Perfecting Early Scientific Experience through Literature: *Sidereus Nuncius* and *The Man in the Moone*'.

something so memorable should become one of the myriad building blocks available to an author for use in the imaginative, or creative, process.

Yet, those who read *Sidereus Nuncius*, and even those who merely heard about its contents, did not have this visual experience for themselves. Surely the lack of immediacy inherent in a post-event report would have made it rather less striking than if they had shared Galileo's physical experience? This is not necessarily so. In fact, I would argue that, in many respects, *Sidereus Nuncius* actually provided its readers with a *better* experience than a physical repetition of Galileo's multiple observations would ever have been able to. In 1610, using a telescope to make any kind of astronomical observation was extremely difficult and time-consuming. Galileo had made huge leaps forward with telescope technology in terms of both increased magnification and creating a method for only making use of the central, very best, part of a lens through his introduction of aperture stops. Despite this, however, his version of the telescope was still not really suited to the astronomical task he set it. To make an observation, viewers had to contend with a myriad of issues. To begin with, there were problems in the design of the equipment and the materials used to make it. Even the best glass available for lens-making during this period was poor quality, and, as Silvio A. Bedini remarks, 'frequently marred by bubbles, striae, and small black specks from impurities'.[3] Additionally, refraction of light through the dense glass caused chromatic aberration, which resulted in coloured haloes around viewed objects. This effect is particularly noticeable if an object can only be viewed in the form of white light, so it is easy to imagine the impact this had on Galileo's study of the moon and stars.

Spherical aberration was also a problem. This particular obstacle was caused by grinding the lens as a section of a sphere, the only way to grind lenses with seventeenth-century technology. It meant that rays of light passing through the lens never came to an exact focus and led to permanently blurry images. On top of this, Galileo's telescope had only a very limited field of view, which meant he would have been able to see only around a third of the moon's surface at any one time.

[3] Silvio A. Bedini, 'Lens Making for Scientific Instrumentation in the Seventeenth Century', *Applied Optics*, 5.5 (1966), 687–694 (p. 687).

In addition to these 'features' of the equipment, an observer would need to cope with a number of other challenges. Tracking changes in the night sky required multiple observations to be taken over consecutive nights. However, cloud and rain could make astronomical observation impossible until the weather had cleared again, while condensation caused by humidity would prevent anything being seen through the telescope at all until it had dried out. Additionally, the telescope-user needed a steady hand to avoid shaking the instrument around and the ability to control their breathing to avoid fogging up the glass. Moreover, aspiring observers would need plenty of time in which to practice using the telescope in order to learn how to see with it and interpret the results appropriately.[4] What Galileo saw through the telescope was brand new and, due to the idiosyncrasies of the instrument, often ambiguous and indistinct. This meant his first task was to work out what was real, rather than simply the effect of looking through the telescope. Only then could observational results be interpreted to bring some meaning to the shifting patterns of dark and bright spots on the surface of the moon. The translation of those spots into mountainous shadows, moving across the moon's surface as the light changed, may not appear to be a great feat of interpretation to modern readers. Yet, others observing at about the same time as Galileo could not make the connection between lunar spots and lunar shadows. Sir William Lower wrote to his friend Thomas Hariot, on 11th June 1610:

> Me thinks my diligent Galileus hath done more in his threefold discoverie than Magellane in opening the streights to the South Sea [...] In the Moone I had formerlie observed a strange spottednesse al over, but had no conceite that anie parte thereof might be shadowes.[5]

If we take into account the accepted wisdom of the day that the heavens were immutable and the moon smooth, together with the fact that Galileo had no precedent to refer to other than his experience of perspective in art, then his interpretation begins to look far more radical.

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[4] This was borne out for me while using an early twentieth-century field telescope with a group of Level 6 students, as part of a seminar I developed and delivered on Francis Godwin's *The Man in the Moone*. None of the students had used a telescope before and, while this instrument was much easier to use than an early seventeenth-century specimen, it took some time and sharing what they were seeing with each other, before they could begin to pick out the objects they were looking at; even though, in this case, they could view the same objects without the telescope and so knew what the telescope was pointing at.

[5] Quoted in Montgomery, p. 112.

In stark contrast to the demands facing Galileo, *Sidereus Nuncius* offers the reader what can be considered the 'perfect' telescopic encounter: an observational experience that can be enjoyed in a reasonably short period of time, at any time of day and in practically any location. In contrast to using a telescope physically, the technological, meteorological, temporal and optical barriers to repeating Galileo's experience are all removed: all his audience had to do was read. Moreover, where Galileo had to call upon his knowledge, experience and intuition to formulate his interpretation of what he saw, this requirement is removed for his readers. Instead, Galileo could use his text to guide their interpretations and explain observed phenomena as he wished them to be understood. Indeed, Montgomery has suggested that Galileo 'chose to edit the lunar surface so that it would look more Earth-like than it was, removing the most alien features' in order to ensure that his readers were guided in the direction he wished.[6]

While calling this literary telescopic encounter an *observational* experience may be disputed by some, there is no doubt that *Sidereus Nuncius* places the results of Galileo's work into the mind of his readers: they, too, can 'see' in their imaginations what Galileo saw with his eyes. His descriptive, enticing text and striking images bring his work to life for the reader, and his use of the first-person eye-witness viewpoint in his narrative recreates the element of immediacy that his report may otherwise have lacked. Moreover, while there is a sense that the details given in *Sidereus Nuncius* are just beyond the grasp of the average person, this almost immaterial aspect only increases the enchantment in Galileo's writing. There is an intriguing grain of possible truth wrapped up in the wonder, much like a good fairytale. In fact, in terms of the fictional works which sprang from the inspiration of *Sidereus Nuncius*, it did not matter in the slightest whether Galileo's reports were actually true. It was the thought-provoking ideas and astonishing images which were of primary importance.

The type of eyewitness reporting that Galileo used is a common one in the texts studied, particularly amongst the English texts written in the earlier part of the century, within roughly 30 years of *Sidereus Nuncius*: those works by Donne, Jonson and Godwin. It also appears in Kepler and Cyrano de Bergerac, although the latter is, perhaps, not surprising

[6] Montgomery, p. 125.

as his use of Godwin's *The Man in the Moone* as a template to be moulded for his own requirements would lead the reader to expect a certain level of similarity in presentation. However, these occurrences of the testimonial form are unlikely simply to be modelled on Galileo's work, regardless of how influential *Sidereus Nuncius* itself may otherwise have been on these texts. There are other reasons to make use of an eyewitness narrative which are particularly appropriate in this case. An eyewitness account gives a narrative an immediacy which, in effect, allows the events described to happen in the imagination of the reader as they unfold. Despite being told in the past tense, this brings the episode into the present for the reader allowing them access to a certain way of experiencing those happenings for themselves. In a situation where not only the reader, but also the author, could never possibly experience those phenomena, this is a powerful technique. If you can, in some way or another, experience a set of events, then that instantly gives them the quality of 'possibility': it just *might* be true, it just *might* be possible that this is real. Where narrative moon literature has been used, at least in part, to prove to the reader that the new cosmological theories were true, this immediacy of the eyewitness form lends the text an extra element of persuasiveness. A good example of this occurs in the portion of Godwin's work describing Gonsales's observation of the Earth's rotation. Additionally, it has the effect of making the narrator seem inherently trustworthy to the reader, brought about by the intimacy of seeing events through another's eyes. It is interesting to note that both Godwin and Cyrano, perhaps by imitation of Godwin again but more likely for his own satiric purpose, deliberately complicated this relationship between narrator and reader, as highlighted in Chapter 2. This prompts the reader to reassess the narrator, to think more carefully about what is said. In turn, this leads the reader to consider everything in that narrative more closely and, therefore, engage more actively with the text. In a narrative which aims to persuade, a greater level of reader engagement can only be a useful tool in accomplishing the author's intent, regardless of what stimulates this level of involvement.

Textual evidence

In addition to the imaginative building blocks provided by *Sidereus Nuncius*, and the common testimonial technique, there is concrete evidence in English moon literature which indicates the influence of the telescope on their creation, particularly in those

works written between the publication of *Sidereus Nuncius* and the start of the Civil War. Firstly, there are a number of instances where the telescope physically features in the text: Donne's *Conclave Ignati* and Jonson's *News from the New World*, for instance. In the first of these, the telescope is suggested as the means to haul the moon towards the earth 'like a boate floating upon the water', in order to effect the transfer of the Jesuits to the world there.[7] Secondly, the influence of *Sidereus Nuncius* can be felt in the geographical nature of the moon's portrayal: it is somewhere that Loyola and his Jesuits could go and set up their own college, making it their second home, so to speak. This material presentation of the moon is a real echo of the earthly nature of Galileo's moon and a sharp contrast to late sixteenth-century representations of the moon as a spiritual place or personified being. Such representations are found not only in the Drayton and Lyly texts examined in Chapter 1, but also in *Nouvelles des regions de la Lune* which critics have been keen to pinpoint as a model for Donne's *Conclave Ignati*, as discussed in Chapter 3. Jonson's *News from the New World*, while ten years later than *Conclave Ignati*, displays the same influences in a broadly similar fashion. The telescope is cited, although for the purposes of comedy, as a means to bring news from the moon to Earth; and, despite all the wonder and fantasy of Jonson's moon-world, it is still very much as solid and material as the moon of *Sidereus Nuncius*.

The telescope's influence on the 'Digression of the Aire' section of Burton's *Anatomy of Melancholy* is even more direct. He mentions Galileo and *Sidereus Nuncius* by name several times as part of his exploration of the latest astronomical discoveries. Despite Burton's discussion of lunar inhabitants appearing to be inspired in great part by Kepler's writings, such as his *Dissertatio cum Nuncio Sidereo*, and particularly his questioning of what such inhabitants might actually be like, Burton makes direct reference to Galileo's work. He writes: 'those severall Planets haue their severall moones about them, as the earth hath hers, as *Galileus* hath already evinced by his glasses' and 'for so they find by their glasses that *Maculae in facie Lunae* [...] and manifestly discerne hils and dales, & such like concavities, if we may subscribe to and believe *Galelies* observations'.[8] This section of Burton's work would have been extremely different without the publication of

[7] Donne, p. 117.
[8] Burton, p. 327 and p. 328. 'Maculae in facie Lunae' translates into English as 'Spots in the face of the Moon'

Sidereus Nuncius and the later astronomical work, such as Kepler's, which responded directly to Galileo's text. Indeed, it is likely that these particular passages could not have been created *without* Galileo's use of the telescope, a proposition which will be examined more closely in due course.

The direct influence of the telescope and *Sidereus Nuncius* is less apparent in Francis Godwin's *The Man in the Moone*. There is a single explicit reference to Galileo and his work which appears in the introductory epistle to the Ingenious Reader: '[...] this our discovering age: In which our *Galilæusses*, can by advantage of their spectacles gaze the Sunne into spots, & descry mountaines in the *Moon*'.[9] While the identity of E.M., the epistle's author, is unknown, the letter sets the tone for the tale that follows; indeed, while not quite on a mountain, it is on a 'very high hill' that the gansas set Gonsales down on the moon for the first time.[10] Additionally, on his approach to the lunar globe, Gonsales sees the bright part of the moon 'besprinckled heere and there with *Islands*, which for the littlenesse, so farre off we cannot discern'.[11] In the same way, Galileo observed that 'a great quantity of small blackish spots [...] sprinkle everywhere almost the whole space that is at the time flooded with the sun's light', despite an opposite interpretation of which parts of the moon were land and which were water.[12] Both Gonsales and Galileo note the larger proportion of features on the moon in comparison to the Earth. Galileo does so in terms of the landscape: 'the magnitude, however, of such prominences and depressions in the moon seems to surpass the ruggedness of the earth's surface';[13] Gonsales in terms of everything on the surface of the moon:

> [...] all manner of things there were of largenesse and quantity, 10. 20. I thinke I may say 30 times more then ours.
>
> Their trees at least three times so high as ours, and more then five times the breadth and thicknesse. [...] a kind of people most strange [...] their stature was most divers but for the most part, twice the height of ours [...][14]

[9] Godwin (1638), sig. A4^{r}-A4^{v}.
[10] Poole, 'Introduction', pp. 56-60, and Godwin (1638), p. 66.
[11] Godwin (1638), p. 64.
[12] Galilei, p. 52.
[13] Galilei, p. 53.
[14] Godwin (1638), pp. 67-70.

As with Donne's and Jonson's work, though, the influence of *Sidereus Nuncius* on Godwin's text can also be clearly seen in the utter materiality of the world in which Gonsales finds himself. However, in his significantly longer volume, Godwin has the opportunity to really expand on this theme and weave it through his story. Godwin takes the notion of a second Earth and uses it as a way to build a utopian comparison to contemporary society, as discussed in Chapters 1 and 3.

John Wilkins's *The Discovery of a World in the Moone* is a rather different work from those considered above. Whereas Donne's, Jonson's and Godwin's texts are stories, and Burton's piece is just a small section within a philosophical work of tremendous scope, *The Discovery of a World in the Moone* is a work that focuses exclusively on proving the probability that the moon is, indeed, a material world. As such, Wilkins gathers together and discusses a variety of evidence on the topic. This gives him the opportunity to state unequivocally what his influences are and to discuss his opinions on the evidence he is presenting. Therefore, it is possible to make a reasonably precise assessment of the influence that Galileo's book had on his own. Wilkins refers to Galileo and his work numerous times throughout *The Discovery of a World in the Moone*, but it is in Proposition 6 that he provides most direct evidence of its impact. He begins by numbering Galileo amongst a small selection of 'famous Men for their singular Skill in Astronomy'[15] and he goes on to state that:

> [...] in my following Discourse I shall most insist on the Observation of *Galilaeus*, the Inventour of that Famous Perspective, whereby we may discerne the Heavens hard by us; whereby those things which others have formerly guest at are manifested to the Eye, and plainely discover'd beyond exception or doubt [...][16]

This is an extremely unambiguous statement of debt to Galileo's work, as well as revealing Wilkins's absolute trust in the visual evidence of the telescope. If any doubt were left as to Galileo's influence on Wilkins's text, later in the same Proposition, after a discussion of the telescope's reception and Galileo's various demonstrations, Wilkins declares:

[15] Wilkins, *Discovery*, p. 55.
[16] Ibid., p. 58.

> Thus you may see the certainty of those Experiments which were taken by this Glass. I have spoken the more concerning it, because I shall borrow many things in my farther Discourse, from those Discoveries which were made by it.[17]

The influence of both the telescope and *Sidereus Nuncius* on *The Discovery of a World in the Moone* is indisputable.

It is unquestionable that John Wilkins's work would have been entirely different without *Sidereus Nuncius*. Or, more probably, it would never have existed at all, given Wilkins's stated reliance on the telescope's evidence throughout his text. In light of this, and the indications of the impact of *Sidereus Nuncius* on the other texts discussed above, a further question arises: that is, whether the creation of these other texts would still have been possible without the influence of the telescope and Galileo's work. Seeking to answer this question will assist in assessing the strength of the telescope's influence on these texts and, indeed, determining whether such features could possibly be ascribed to other influences.

Beginning with Burton's *Anatomy of Melancholy*, it is important to remember that the 'Digression of the Aire' section is only a small part of the whole. In this case, it is not worth considering how instrumental the telescope and *Sidereus Nuncius* are throughout the entire work, but only within that smaller section focusing on astronomical subject matter and, in particular, the idea of other inhabited worlds. It has been established above that, without Galileo's work, these particular passages would certainly have been very different and I have speculated that it is possible that they simply could not have been created. There are two segments where I would argue that this is indeed the case. These are the points at which Burton refers directly to Galileo's work and which were quoted earlier, but they stand closer inspection for this purpose. The first segment comes roughly half way through the 'Digression of the Aire' and discusses the idea of Earth being a planet and all planets being inhabited. For Burton, Earth's planetary status is confirmed by Galileo and Kepler, amongst others: 'shine she doth, as *Galelye*, *Kepler*, and others proue', so Galileo's work is obviously a direct influence here, but not solely.[18] Burton has

[17] Ibid., p. 60.
[18] Burton, p. 327.

found evidence from other writers as well. Burton then goes on to cite Kepler's *Dissertatio cum Nuncio Sidereo* as confirming that the planets and the moon are inhabited: 'then *per consequens* the rest of the Planets are inhabited, as well as the Moone, which hee grants in his dissertation with *Galelies Nuncius Sidereus, that there be Iouiall and Saturnine inhabitants*'.[19] Despite using Kepler's work as his evidence here, it is important to note that without *Sidereus Nuncius*, Kepler's *Dissertatio*, his immediate response to *Sidereus Nuncius*, would never have been written. The segment continues on to address the topic of planetary moons: 'those severall Planets haue their severall moones about them, as the earth hath hers, as *Galileus* hath already evinced by his glasses [...] and *Kepler* the Emperors Mathematician, confirmes out of his experience, that he saw as much by the same helpes'.[20] Here, again, the influence of Galileo's work with the telescope is much more obviously direct: *Sidereus Nuncius* records his observations of 'Four Planets Never Before Seen, Which Have Been Named Medicean Stars'; and Kepler used a Galilean telescope (that is, one of hugely improved magnification over the original Dutch telescope) to make a confirmation of those observations.[21]

The second segment is shorter and appears one page later in the first edition of 1621. In this portion, Burton discusses the comparison of material features between the Earth and its moon. Firstly, he cites Galileo as one of six named authorities who 'maintaine of the Earths motion'; secondly, Burton goes on to consider the features of the moon as seen through the telescope: 'so they find by their glasses, that *Maculae in facie Lunae* [...] and manifestly discerne hils and dales, & such like concavities, if we may subscribe to, and belieue *Galelies* observations'.[22] This is another instance where Galileo's work has had a mixed impact on this part of Burton's text. In the first quotation, Galileo is directly referenced but is only one of a number of names that Burton is citing for evidential purposes; in the second, there is a reliance on the Galilean telescope, not only as a means for others to examine the moon's surface, but also as the vehicle for Galileo's original observations as recorded in *Sidereus Nuncius*. Taking an overview of both these segments, the conclusion can be drawn that, in terms of Burton's discussion of other

[19] Ibid.
[20] Ibid.
[21] Galilei, p. 48.
[22] Burton, p. 328.

inhabited worlds within the 'Digression of the Aire' section, the influence of the telescope and *Sidereus Nuncius* is certainly pervasive. Additionally, there are points within the segments that have been examined more closely which show an absolute dependence on Galileo's work and, therefore, I would conclude that these segments could not have been created without the existence of this specific text. It also prompts the speculation as to whether the thread of the *Anatomy of Melancholy*, despite Burton's references to earlier and ancient authorities, would even have turned in such a direction without the recent impetus of Galileo's work.

This leaves Donne's *Conclave Ignati*, Jonson's *News from the New World* and Godwin's *The Man in the Moone*, all of which exhibit the influence of the telescope and *Sidereus Nuncius* in broadly similar ways, as discussed above. Earlier in this Part, it was shown that all of these titles demonstrated influences by travel and travel literature, as well as contemporary social changes. Donne's *Conclave Ignati* obviously encompasses the concept of colonialism in the idea of transferring the Jesuit population to a new world. However, this would not account for the portrayal of the moon as a material location, capable of receiving and sustaining a human population. Neither would it account for the suggested telescopic mode of transport. Even if the novelty of the moon as a new 'earthly' world is put aside, some kind of flying ship, similar to that in Lucian's *A True Story*, would be a rather more expected conveyance. As previously discussed, Donne's work does not give any consideration to who or what might be awaiting the Jesuits on the moon – a subject that might be expected if colonialism was a stronger influence in this respect. This would suggest that the 'connection and resemblance between the moon and the earth' suggested by *Sidereus Nuncius* was a greater influence in this text than the 'new worlds' frequently encountered in contemporary travel literature.[23] Equally, other contemporary literature does not appear to have provided much of a model for *Conclave Ignati*. Contemporaneous texts contain a conspicuous lack of material representations of the moon, even *Nouvelles des regions de la Lune*, which so many critics have previously cited as a clear precursor. It is just possible that Plutarch's *Concerning the Face which Appears in the Orb of the Moon* could have provided some background for Donne in terms of the moon as a material place, although there is some evidence to indicate that

[23] Galilei, p. 60.

he had only a reasonably small knowledge of Greek. Donne studied languages, alongside other subjects, at the Inns of Court in London from his admittance in 1591.[24] However, an examination that Don Cameron Allen made of Donne's sermons in 1943 led to the conclusion that his limited use of Greek indicated that:

> [...] his scholarship is far below that of the average preacher of his age. It is not impossible that his knowledge of Greek was very limited, for it has long been observed that there is virtually no Greek influence on his secular verse.[25]

This is borne out by an examination of the list of books believed to have belonged to Donne. Unfortunately, this is a necessarily incomplete list as evidence suggests that 'most of Donne's library was sold soon after his death and was thus dispersed gradually through the booksellers'.[26] Despite a number of books in a range of languages, there is only one listed that has its title written in Greek and can, therefore, be assumed to be written in the same language.[27] Moreover, in the 1603 copy of Zehnerus' *Pythagorae Fragmenta*, which also appears on the list and is written in both Greek and Latin, marginalia is only found alongside the Latin text.[28] This means that while it is unlikely that Donne read Plutarch in the original Greek, it does not rule out the possibility that he could have read a copy of the first English translation of *Concerning the Face which Appears in the Orb of the Moon* which was published in 1603. Similarly, Donne's anti-Catholic sentiment was already present before 1611: not only had he 'quietly abandoned Catholicism' by the mid 1590s, but he had also published his anti-Catholic treatise *Pseudo-Martyr* in 1610, the year before *Conclave Ignati*.[29] Therefore, even if Donne had already been exposed to the notion of the moon as a material place, there was obviously still some other ingredient missing. The inclusion of references to Galileo and his *Sidereus Nuncius*, and the use of the telescope as Lucifer's solution to the problematic Ignatius, coming so soon after the publication of *Sidereus Nuncius*, strongly suggests that these

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[24] *The Complete Poetry and Selected Prose of John Donne*, ed. by Charles M. Coffin (New York: Modern Library, 2001), p. v.
[25] Don Cameron Allen, 'Dean Donne Sets His Text', *ELH*, 10.3 (1943), 208–29 (p. 222).
[26] Geoffrey Keynes, *A Bibliography of Dr. John Donne, Dean of Saint Paul's*, 4th edn (Oxford: Clarendon Press, 1973), p. 259.
[27] Keynes, p. 266. Entry L37, which is a 1613 copy of *Ἑλληνισός* by Angelus Caninius. Hugh Adlington's recent additions to the list of Donne's books do not contain any Greek items: Hugh Adlington, 'More Books from the Library of John Donne', *The Book Collector*, 61.1 (2012), 55–64.
[28] Keynes, p. 278. Entry L197.
[29] Coffin, *Complete Poetry*, p. vi.

were those missing ingredients. This leads to the conclusion that *Conclave Ignati* would not have been written without them and certainly not in its extant form.

Such a case is harder to argue for Jonson's *News from the New World* and Godwin's *The Man in the Moone* due to the greater length of time which had elapsed between the publication of *Sidereus Nuncius* and their composition. The mention of the telescope in Jonson's masque is obviously just a comedic touch and is unlikely to be a specific reference to Galileo's instrument. By the time that *News from the New World* was first performed, knowledge of the device had spread widely and already led to further developments in the technology: for example, by 1617 collapsible telescopes, which were light enough to be held in the hand, were being produced commercially.[30] On the other hand, the material nature of Jonson's moon-world is an undeniable connection to Galileo's work. The world in the moon was a concept that had been in Jonson's mind for a number of years, as evidenced by his masque *Love Freed from Ignorance and Folly* which he prepared for Christmas 1611. During the first part of this masque, Love is trying to solve the Sphinx's riddle: 'I say you first must cast about / To find a world the world without'. Without hesitation, Love gives the answer of 'the new world i' the moon'.[31] A few lines later, there is even a passing reference to the telescope:

> *Sphinx* Cupid, you do cast too far;
> This world is nearer by a star.
> So much light I'll give you to't.
>
> *Love* Without a glass? Well, I shall do't.[32]

As with Donne's *Conclave Ignati*, Jonson created *Love Freed from Ignorance and Folly* only a short time after the publication of *Sidereus Nuncius* and this exchange between Love and the Sphinx indicates that Galileo's text was in his mind. Less than ten years later, Jonson expanded this concept to produce his own world in the moon. Ian Donaldson, in his 2011 biography of Jonson, has suggested that a comet which appeared in the skies towards the end of 1618 may have been responsible for a reawakening of the conversations and debates which initially took place earlier in the decade. His conclusion

[30] Dunn, p. 33.
[31] Ben Jonson, 'Love Freed from Ignorance and Folly', in *The Yale Ben Jonson*, ed. by Stephen Orgel (New Haven: Yale University Press, 1969), pp. 174–85 (p. 179, lines 158-9 and 161).
[32] Ibid., (lines 162-165).

is that this 'might well have prompted [Jonson's] choice of topic for the Christmas masque' in 1620.[33] Regardless of this, however, his inclusion of the concept in the 1611 masque and the Earth-like nature of his moon-world in 1620 both point strongly towards the model of Galileo's moon, rather than any earlier examples. Having an 'earthly' moon was essential for Jonson's gentle social satire. He made use of its blank canvas to reveal his 'ladies [...] knights, and squires'[34] as a reflection of contemporary English society without having to incorporate them into any real structures which would have been present in a pre-existing setting, such as the New World on Earth. This indicates the necessity of Galileo's work in the construction of Jonson's *News from the New World*.

The Man in the Moone was written still later after the publication of *Sidereus Nuncius*. However, Godwin's story has as much reliance on a material moon as does Jonson's masque. Due to the timespan between *Sidereus Nuncius* and *The Man in the Moone*, it is possible that Godwin obtained this material model in a second-hand way, perhaps taking inspiration from other moon-world accounts written in the meantime, such as Jonson's. Yet, even if this were the case, Galileo's work would still have been an essential primary model for the material world Godwin described. However, the absolute insistence of Godwin's narrator, Gonsales, on the evidence of his own eyes throughout the story is particularly interesting in this text. I have briefly touched on this occurrence in Godwin's tale, both above and in Chapter 2, but it is valuable to mention it again here in terms of the importance of the telescope to this specific work. The only thing that both Galileo and Gonsales had to show for their experiences of the moon was the evidence of their own eyes. Despite his gansas, harness, and the precious gifts 'such as a Man would forsake mountaines of Gold for' that he had collected from Irdonozur, Gonsales ends up with no physical proof of his trip shortly after his return to Earth.[35] At this point, he held nothing more substantial in his hands than did Galileo after his celestial observations. The solution, in both cases, was to write an account of the experience to persuade readers about the events that had taken place. This parallel between the two texts indicates a more direct influence from *Sidereus Nuncius* than simply the use of the

[33] Ian Donaldson, *Ben Jonson: A Life* (Oxford: Oxford University Press, 2011), p. 385.
[34] Jonson, *News*, p. 300 (lines 218-219).
[35] Godwin (1638), p. 97.

material moon model. Gonsales is Godwin's 'little eye-witnesse',[36] a status that seems to echo Galileo's own in *Sidereus Nuncius*: 'it is a most beautiful and delightful sight to behold the body of the moon', Galileo says on the first page of his Astronomical Message; the 'latter spots have never been observed by anyone before me', he continues later; and his statement that 'I often observed', all stress his position as the visual protagonist in his treatise.[37] Additionally, it is interesting to note that both Galileo and Gonsales promise their readers that they will provide further details in a second publication. Gonsales mentions four times in *The Man in the Moone* that he plans to elaborate on a particular item in the 'second part of this worke'.[38] This is exactly the same number of times that Galileo promises to provide more detail in a follow-up text: three times promising to 'treat more fully of this matter in my book *On the System of the World*' and once referring to an unnamed text on the detail of the telescope: 'But let it suffice for the present to have thus slightly touched, and as it were just put our lips to these matters, for on some other opportunity I will publish the complete theory of this instrument'.[39] Godwin's joke about a second part which never existed has been identified as mimicry of the same joke Lucian included in his *A True Story.*[40] However, I would propose that it may actually be an imitation of Galileo's writing. While Galileo did eventually publish a treatise entitled *Dialogo sopra i Due Massimi Sistemi del Mondo, Tolemaico, e Copernicano*, the first copy was not finished and ready for presentation to his patron, the Grand Duke of Tuscany, before 22nd February 1632.[41] While the exact creation date of Godwin's work is unknown, in the introduction to his 2009 edition of the text, William Poole has concluded that 1625 is 'the *a quo* date of composition'.[42] Despite Poole's supposition relying to some extent on influences that Godwin may or may not have taken from works he may or may not have read, the overall evidence does strongly suggest that Godwin wrote *The Man in the Moone* towards the end of his life rather than towards the beginning of it. Supposing that this is the case, Godwin must have completed *The Man in the Moone* at

[36] Ibid., sig. A4^{v}.
[37] Galilei, p. 48, p. 52, and p. 59.
[38] Godwin (1638), p. 75.
[39] Galilei, p. 61 (the other occurrences can be found on p. 63, and p. 84), and p. 51.
[40] Godwin (2009), p. 101, n. 2, for example
[41] Semyon Grigorevich Gindikin, *Tales of Physicists and Mathematicians* (Boston: Birkhäuser, 1988), p. 62. The title of Galileo's treatise translates into English as *Dialogue on the Two Chief World Systems, Ptolemaic and Copernican.*
[42] Poole, 'Introduction', p. 19.

some point between 1625 and his death in April 1633. As Galileo's *Dialogo* was not completed in its original Italian until February 1632, Godwin would have had only roughly fourteen months in which to become acquainted with it. However, there were immediate questions and concerns about the content of the *Dialogo*. The Church forbade its circulation in August 1632, before handing the matter over to the Inquisition in September.[43] Following Galileo's trial, the *Dialogo* was prohibited in June 1633.[44] Additionally, the text was not translated into Latin until 1635, long after Godwin's death, which had followed a period of ill health.[45] From this evidence, it is extremely unlikely that Godwin would have become aware of, and been able to read, Galileo's *Dialogo* before he died and so would have taken to his grave the belief that Galileo had not fulfilled the promise to expand his work in a second volume. This makes an imitation of Galileo in Gonsales's own broken promise seem rather more likely. In viewing both Galileo and Gonsales as pioneers who, in their different but visually connected ways, are the first to visit and explore the moon, the reliance of the later work on the earlier one becomes much more apparent.

This extensive evidence demonstrates the ways in which the influence of the telescope and *Sidereus Nuncius* can be seen on the English texts published between 1610 and the beginning of the Civil War. However, there are three English texts examined in Part Two that have not yet been discussed: Butler's *The Elephant in the Moon*, Behn's *Emperor of the Moon*, and Settle's *The World in the Moon*. As previously established, it is possible to trace in these later texts a transformation of the concept of the 'new world in the moon' into a mere plot device, rather than the central tenet seen in earlier works. This, together with their temporal distance from the publication of *Sidereus Nuncius*, makes it far less likely that Galileo's work can be counted as directly influential. While *Sidereus Nuncius* can be considered a root cause of the popular creation of many material moon-worlds during this period, it would seem far more likely that these particular texts drew their

[43] Gindikin, p. 63.
[44] Ibid., p. 64.
[45] The exact length and nature of Godwin's illness is unknown, with a number of sources simply describing it as 'lingering'. Volume XVI of the new edition of *The General Biographical Dictionary*, ed. by Alexander Chalmers (London: J. Nichols and Son, 1814), states that he 'fell into a low and languishing disorder' (p. 61) after publishing a small treatise on Roman currency in 1630. Poole's introduction to Godwin (2009) tells us 'Godwin passed the last years of his life as an ill man; as he wrote to [William] Camden in as early as 1620, they were both growing "old and sickly"' (p. 15).

inspiration from the culture around them rather than from the concept's original stimulus.

Indeed, the telescope's cultural and physical development during the seventeenth century, which is discussed in more detail in Part Four, may well have been a contributing factor in these authors' decisions to make use of the moon-world concept in the way that they did. In Chapter 4, I touched on the growing popularity of the telescope and its uptake by the fashionable classes in the middle of the seventeenth century. It was also in this period that the Royal Society was founded in 1660 and began to publish its own journal, the *Philosophical Transactions*, from 1665. This journal, in effect, made a statement to the outside world about the day-to-day interests and concerns of the Society. While there were a great number of articles on serious matters of natural philosophy, such as astronomy and mathematics, there were also articles which covered rather more sensational or merely mundane subjects. For example, 'An Account of a Very Odd Monstrous Calf' or 'Some Communications, about an Early Swarm of Bees, as Also Concerning Cyder; Descent of Sap; The Season of Transplanting Vegetables'.[46] While this range of topics was easily encompassed by the Society's stated purpose 'to make faithful *Records*, of all the Works of *Nature*, or *Art*, which can come within their reach', the latter type of articles made it much harder for someone outside the natural philosophy community to recognise that Royal Society fellows were endeavouring 'to separate the knowledge of *Nature*, from the colours of *Rhetorick*, the devices of *Fancy*, or the delightful deceit of *Fables*' or that they were striving 'to preserve it from being over-press'd by a confus'd heap of vain, and useless particulars'.[47]

The idea of developing repositories of natural objects and other specimens, to assist with the study of natural philosophy, became highly fashionable in the latter part of the century. The Royal Society's collection, catalogued as the *Musæum Regalis Societatis* by Nehemiah Grew in 1681, provided a model for numerous private 'cabinets of curiosities', which could contain a huge range of objects. As Marjorie Swann remarks: '[a]ntique

[46] Robert Boyle, 'An Account of a Very Odd Monstrous Calf', *Philosophical Transactions*, 1.1-22 (1665),p. 10, and Richard Reed, 'Some Communications, about an Early Swarm of Bees, as Also Concerning Cyder; Descent of Sap; The Season of Transplanting Vegetables: Sent to the Publisher Out of Herefordshire by That Intelligent Gentleman, Richard Reed Esq;, In a Letter Dated March 14. 1670/1 at Lugwardine', *Philosophical Transactions*, 6.69-80 (1671), pp. 2128–32.
[47] Sprat, pp. 61-62.

coins, scientific instruments, minerals, medals, rare or unusual zoological specimens, plants, natural and manmade objects from Asia and the Americas, intricate carvings, portraits of historical figures – the early modern English cabinet of curiosities was an exuberant hodgepodge'.[48] However, this modish obsession with collecting such an apparently random assortment of objects, together with the contradiction between noble intentions and the ostensibly trivial or tedious reality, only contributed to the caricatures of natural philosophers that became popular in this part of the seventeenth century. Nor did the telescope escape this caricaturisation. As telescopes became longer and longer, to combat the problem of spherical aberration, they also became more unwieldy and more difficult to use, providing a spectacle that was easy to ridicule.[49] The early promise of the telescope had caught the seventeenth-century imagination but, again, reality had proved to be rather different. In half a century, there had been no new developments to match the wonders suggested by *Sidereus Nuncius* and the moon literature that followed in its wake. That is not to say that the telescope had not developed and produced further revelations – indeed it had. Magnification continued to increase, lens grinding techniques were improving and in 1659 Christiaan Huygens not only announced the discovery of Saturn's ring but also published the first account of an eyepiece micrometer in his *Systema Saturnium.*[50] The micrometer is a type of telescopic sight or crosshair, placed inside the telescope, which facilitated the measurement of very small angles.[51] This invention was a truly important progression that offered a way to unite the new visual astronomy of the telescope with the original astronomy of measurements and

[48]Nehemiah Grew, *Musæum Regalis Societatis, or a Catalogue & Description of the Natural and Artificial Rarities Belonging to the Royal Society and Preserved at Gresham Colledge* (London: W.Rawlins, 1681) , and Marjorie Swann, *Curiosities and Texts: The Culture of Collecting in Early Modern England* (Philadelphia: University of Pennsylvania Press, 2001), p. 2.

[49] Lengthening the 'tube' of the telescope allowed the rays of light passing through the lens to approach a point of focus as closely as possible. It would never completely solve the problem of spherical aberration, but it reduced the blurriness of images to a more acceptable level.

[50] Cristiani Huygenii, *Systema Saturnium, Sive De Causis Mirandorum Saturni Phænomenôn, et Comite Ejus Planeta Novo* (Hagæ-Comitis: Adriani Vlacq, 1659).

[51] The micrometer was first invented by Englishman William Gascoigne in 1639. He did not publish his ideas before his death during the Civil War at the Battle of Marston Moor, and it was independently re-invented by Huygens. However, Gascoigne's priority as inventor of the micrometer was re-established when some of his papers came to light after his death and caught the attention of John Flamsteed, the first Astronomer Royal. Flamsteed describes how Gascoigne's story came to his notice in a letter to William Molyneux dated 10 May 1690, see: *The Correspondence of John Flamsteed, First Astronomer Royal*, ed. by Eric G. Forbes, Lesley Murdin, and Frances Willmoth, 3 vols. (Bristol: Institute of Physics Publishing, 1997), 2; 1682–1703,pp. 418-421.

calculations. Yet, while this was significant to the world of natural philosophy, I would suggest that it held little interest for the rest of society, who had been 'promised' a world in the moon but had not been given one. As such, the telescope became literary and dramatic shorthand for the ridiculous obsession and perceived ineffectuality of Royal Society fellows, as well as of their high society counterparts, the virtuosi.

It is in this manner that the telescope appears in the works of both Butler and Behn. Butler's poem is superficially all about using a telescope to mistakenly 'discover' a new world on the moon, but the closer reading of Chapter 1 demonstrated that the true purpose was simply a mocking of the Royal Society. As such, the adornments of astronomy are not strictly necessary: Butler could have achieved his aim in a number of ways. However, for several reasons, Butler's choice of the telescope and a moon-world is perfect for his intent. Firstly, the telescope had the power to symbolise instantly the absurdity and nonsense associated with the Royal Society. Secondly, the instrument's well-known flaw of producing visual distortions and optical illusions could also be employed as a succinct metaphor for the refusal, or inability, of the Royal Society members to really see what was in front of their eyes. As such, although the telescope of Galileo and *Sidereus Nuncius* is not necessarily a vital part of Butler's poem, its cultural descendant is a fundamental ingredient in the success of *The Elephant in the Moon*.

Behn's use of the telescope and visual astronomy in *Emperor of the Moon* matches Butler's precisely. The farce hinges on Doctor Baliardo's preoccupation and the fact that he is either incapable of seeing, or simply unwilling to see, what is happening around him. It was not essential for Behn to use the telescope as the source of this preoccupation. However, the instrument not only added its symbolic meanings to the situation and characters Behn was depicting, but also provided a golden opportunity for physical comedy. In the second scene of Act I, Doctor Baliardo makes his first entrance, with the following stage directions:

> *Enter* Doctor*, with all manner of Mathematical Instruments hanging at his Girdle;* Scaramouch *bearing a telescope twenty (or more) Foot long*.[52]

[52] Behn, sig. B4[r] (I.2).

Despite the fact that the Doctor has a number of instruments to hand, it is the telescope that, literally, takes centre stage. A telescope of such a size would have taken up a large part of the stage and would have looked extremely clumsy in the hands of just a single person. As Scaramouch carried it into the scene, there would have been plenty of chances for spectacular collisions and near-misses behind the Doctor's back, perhaps even swinging the instrument out towards the spectators. Behn invites the audience to begin laughing long before Doctor Baliardo speaks his opening line. Moreover, I would suggest that Behn's choice to include a masque in the final scene of the play, despite the form's decline in popularity by this time, is particularly apt. The reason for this is the telescopic nature of what Clarissa Castaneda has termed the 'spatial orientation of the masque setting'.[53] The whole performance of a court masque was designed for the monarch to have the single, perfect, view. No-one else in the audience would have had the same visual experience, essentially transforming the performance into a private observational act, in exactly the same manner as using a telescope during this period, as discussed in Chapter 5. In Behn's masque, the monarch is replaced by Doctor Baliardo, as the subject of the lovers' plot. The masque's purpose as an instrument of flattery is equally useful here in persuading the Doctor to agree to the marriages of Elaria and Bellemante, but it seems particularly fitting that the moonstruck Doctor is ultimately duped by a 'telescopic' observation.

The final English text examined in Part Two was Elkanah Settle's *The World in the Moon*. This play is different from the works discussed above as it exhibits no features that would indicate Galileo's work or the telescope as vital in any way. The telescope makes no appearance, unlike Behn and Butler's works, and on the intermittent occasions where a moon-world is actually depicted, it is essentially a pre-Galilean, ethereal world full of gods and goddesses. Here, materiality has been swapped for theatricality.

This Part has demonstrated that an assortment of factors combined to produce the literary and philosophical moon-worlds of seventeenth-century England. Galileo's work and the telescope were, in the vast majority of cases examined, crucial to their composition. However, to draw only this conclusion provides a rather lopsided picture of

[53] Clarissa Castaneda, 'Archival Principles, Performative Flowerings, and Counterpoint in Ben Jonson's Masques', *The Ben Jonson Journal*, 21.1 (2014), 38–52 (p. 44).

the complex cultural relationship between the telescope and moon literature during this period. This asymmetry is addressed in the next Part.

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PART FOUR

Influences on the Telescope

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Chapter 7

'Oh, by a trunk! [...] your perplexive glasses are common'[1]

To modern sensibilities, the idea that literature and literary philosophy could have any influence on science may seem distinctly odd. Here, in the early part of the twenty-first century, despite a large academic concentration on multidisciplinary and interdisciplinary approaches, we are accustomed to divisions and boundaries between intellectual disciplines. In fact, these very approaches, designed to bring academic disciplines together, only serve to highlight their more usual state of separation.

Catherine Belsey and Howard Marchitello have both outlined the parity of literature and other discourses, including science, in cultural terms.[2] In particular, Marchitello, in his 2006 article, describes recent scholarship on the topic as exhibiting an understanding 'in which not only the scientific [...] can be said *to produce* the literary, but [...] equally [...] the literary, for its part, can be said *to produce* the science'.[3] Chapter 6 explored the first half of Marchitello's statement in terms of the telescope and Galileo's work *producing* the literary and philosophical depictions of life on the moon that were written in seventeenth-century England. The chapters in this Part take the second half of his statement and seek to investigate whether or not it holds true that representations of life on the moon can also be said to have *produced* the telescope.

At this point, it is necessary to note that tracing influence within scientific works and products is not an easy or straightforward process. Although seventeenth-century practices were notably different from those of today, it is still rare to find natural philosophers of the period explicitly referencing any wider cultural influences on their work.[4] Neither is it possible to look to the writing itself to provide clues as to its possible derivation. Elements such as writing style and the topic, or shape, of a narrative cannot

[1] Jonson, *News*, p. 295 (lines 77 – 82).
[2] Catherine Belsey, 'Reading Cultural History', in *Reading the Past: Literature and History*, ed. by Tamsin Spargo (Basingstoke: Palgrave, 2000), pp. 103–117; Catherine Belsey, 'The Poverty of (New) Historicism', in *Literature as History: Essays in Honour of Peter Widdowson*, ed. by Simon Barker and Jo Gill (London: Continuum, 2010), pp. 7–17.
[3] Marchitello, p. 352.
[4] Leaving aside explicit citations which note other scientific texts upon which the work in question builds.

provide any indications here, in the way that they can in literary or philosophical writing. Taking this into account, Chapter 7 examines more concrete and recognisably linked influences on the telescope: exploration and conflict, the growth of experimentalism, and the practice of astronomy. Chapter 8 looks more closely at the impact of the cultural imagination, and how ideas encapsulated in moon literature may have motivated key figures, such as Robert Hooke and Isaac Newton, who were responsible for developing the telescope during the seventeenth century.

How the telescope developed

In examining the development of the telescope, it is useful to consider the ways in which this instrument changed in a little more detail. Firstly, and most obviously, the telescope evolved physically during the seventeenth century. A number of different designs emerged during the period, for a range of purposes and with varying levels of effectiveness. As part of this drive for change, new techniques and methods were developed, resulting in the telescope of 1700 ending up as quite a different object from the perspective glass that made its first appearance at The Hague in 1608.

What began as a simple tube holding two spectacle lenses quickly became, in Galileo's hands, a purpose-made tool with lenses ground and arranged to provide a level of magnification that, at the time, was simply astounding. Lipperhey's original glasses must have provided the ability to see things at perhaps 1.5 or 2 times the size that they really were.[5] Within a very short space of time after hearing of the invention, Galileo had achieved a 'nine-powered device', and by the time he was making his series of moon observations he had created a telescope that showed objects 'more than 30 times nearer than if viewed by the natural powers of sight alone'.[6]

The original purpose of the telescope was terrestrial, as mentioned in Chapter 5. Its presentation to the States-General occurred in the middle of peace talks between the Dutch and the Spanish and it was ensured that Spinola, commander-in-chief of the Spanish forces, was fully aware of the new instrument and its military implications prior

[5] Van Helden, *Invention*, p. 19.
[6] Ibid., p. 26, and Galilei, p. 50.

to his departure.[7] Yet, even before Hariot and Galileo raised their telescopes to study the moon more closely, the idea of pointing telescopes towards the sky had already emerged. A French newsletter reporting on a diplomatic embassy to The Hague in September 1608 included a brief account of the presentation and testing of Lipperhey's device. It describes the uses of the new glasses, listing the obvious military applications first, but goes on: 'even the stars which ordinarily are invisible to our sight and our eyes, because of their smallness and the weakness of our sight, can be seen by means of this instrument'.[8] Bedini points out that it 'is quite clear from the writings of Galileo himself, as well as from the accounts of his contemporaries on the scene, that the first two telescopes which Galileo produced were terrestrial telescopes designed for viewing objects at a distance'.[9] This is hardly surprising. Despite managing to make a leap forward in terms of magnification, Galileo's design and selection of lenses – that is, a convex objective and a concave eyepiece – remained absolutely based on the original Dutch telescope that had inspired his work. It was Kepler who first suggested a fundamental change to the Dutch, or Galilean, telescope design, although he did not actually make the new version himself.[10] Kepler's idea was to use a convex eyepiece as well as a convex object glass. This had the effect of increasing the performance of the instrument and the field of view, but with the drawback that the image became inverted. His realisation that greater magnifications could be obtained by using smaller convexities in the objective, while increasing the distance between the two lenses, has been hailed by Antoni Malet as 'the single most important recipe during the first fifty years of telescope making'.[11] It was certainly this that paved the way for the development of the astronomical telescope.

Secondly, the telescope's cultural position and its representations underwent an enormous change in this relatively short period of time, from a fresh item of curiosity to an embarrassing symbol of academic and social uselessness. This transformation is charted beautifully by the texts examined in Part Two. The almost magical aura given to

[7] Duun, p. 23.
[8] Van Helden, *Invention*, p. 42.
[9] Silvio A. Bedini, 'The Instruments of Galileo Galilei', in *Science and Instruments in Seventeenth-Century Italy*, Variorum Collected Studies, 449 (Aldershot: Ashgate, 1994), pp. 256–92 (p. 276).
[10] Kepler published this idea in his 1611 *Dioptrice*.
[11] Antoni Malet, 'Kepler and the Telescope', *Annals of Science*, 60.2 (2003), 107–36 (p. 124).

the instrument in Donne's *Conclave Ignati* and Jonson's *News from the New World* gives way to the broad comedic shorthand of Doctor Baliardo's unwieldy apparatus in his introductory scene of Behn's *Emperor of the Moon*. The telescope no longer has the power of transportation to other worlds but, instead, denotes an owner who is too wrapped up in a world of fantasy to see what is happening in front of his face.

Finally, the telescope underwent a period of development in terms of its status within the world of natural philosophy, shifting from a novelty that was full of potential to an essential scientific instrument. The first hurdle to be overcome, as I have discussed in Chapter 5, was the fundamental status of visual evidence derived from astronomical observations, which could not be replicated without the use of the telescope. Once the natural philosophy community had come to terms with how to deal with such material, there was a drive to increase the reliability and quality of the telescopic visual experience. Moreover, the invention of the micrometer in the middle of the century permitted a real merging of traditional and telescopic astronomy for the first time. It allowed measurements to be taken that had simply never been possible before. By the time Johannes Hevelius, 'the last of the great naked-eye observers' died in 1687, there remained no astronomer who preferred to observe the heavens without the aid of a telescope.[12]

Exploration and conflict

There were a number of factors which influenced the different ways in which the early telescope developed. In this conglomerate category of 'exploration and conflict', I would like to consider a number of separate elements which can loosely be grouped together as 'terrestrial' uses of the telescope. This would include aspects such as colonialism, navigation and war. In fact, the instrument's potential in these arenas was the original driver behind its 'discovery' and Lipperhey's patent application of 1608. Without this, the significance of the marginal magnifications produced by existing ocular lenses in the earliest part of the seventeenth century is unlikely to have been identified. It would have remained simply an entertaining effect or, at most, an amusing toy. Indeed, Van Helden has described the reaction of Giambattista Della Porta, author of *Natural Magic* (1588), to

[12] Montgomery, p. 175.

the early telescope. In comparison to the stories of powerful, quasi-magical, lenses belonging to the ancients with which he was familiar, Porta believed that 'the invention is a hoax, that is, *it is not an invention at all!*'.[13] However, the particular environment of conflict between the Dutch and the Spanish provided the motivation for citizens to be alert to any advantage that could be given to their own countries. It was certainly recognised as such by both the ruling authorities and the Spanish commander-in-chief. On seeing the apparatus demonstrated during his peace talks with the Dutch, Spinola reportedly said: 'from now on I could no longer be safe, for you will see me from afar'.[14]

The birth of the telescope as a recognised object was unquestionably dependent on this loose group of terrestrial uses, particularly in connection to conflict. Moreover, I would suggest that some of its later development can also be traced back to these sources. While the terrestrial and astronomical telescopes diverged into two separate, specialised, instruments, they both spring from the original Dutch perspective. Yet, the claims Galileo made for his astronomical observations in *Sidereus Nuncius* could easily be disputed. Early seventeenth-century doubts around vision, together with accepted wisdom that the heavens and Earth were made of different substances and, therefore, subject to different rules, meant Galileo was undoubtedly breaking new ground with his hypotheses. However, the terrestrial use of the early perspective had the major advantage that the accuracy of observations could be checked. While not an instant solution for the issue regarding astronomical use, this paved the way for a greater level of trust in the accuracy of astronomical observations, particularly as acceptance of the 'earthly' nature of the heavens spread. Additionally, the varying terrestrial uses of the telescope meant that the sight of such an instrument soon became increasingly common. As well as their military uses noted above, telescopes could be used as a navigation aid, providing the ability to sight and identify land much earlier in a sea journey than with even the best unaided human eyes. As the century wore on, the shorter perspectives became popular amongst the well-to-do. King Gustavus Adolphus of Sweden was known to use one so short he could conceal it in his hand and Samuel Pepys noted in his diary on Sunday, 26th May, 1667 that: 'I did entertain myself with my perspective glass up and down the church, by

[13] Van Helden, *Invention*, p. 19.
[14] Ibid., p. 42.

which I had the pleasure of seeing and gazing [at] a great many very fine women'.[15] I would suggest that this growing familiarity, gained in a terrestrial arena, naturally began to break down the barriers to trusting the telescope's use in astronomical observations, where accuracy and reliability could not be ascertained independently.

Growth of experimentalism

The seventeenth century witnessed the beginnings of experimental methods in natural philosophy, which went on to form the basis of modern scientific approaches. As Poole has noted:

> Traditionally this research [natural philosophy] had been conducted mainly by reading texts, but as the seventeenth century progressed, in the academe as well as in amateur contexts, reading was increasingly supplemented by and even subordinated to actual experiment, especially following the advocacy of organised and collaborative experimentation by the two great English natural philosophers William Gilbert (1544?-1603) and Francis Bacon (1561-1626).[16]

Bacon, in particular, was 'a figure of inspiration and emulation' for a number of leading natural philosophers of the period.[17] The collaborative and institutional model of natural philosophy described in his *New Atlantis* can be recognised in the formation of the Royal Society:

> *It was the Erection, and Institution of an* Order, *or* Society, *which wee call* Salomons House [...] *It is dedicated to the Study of the* Works, *and* Creatures *of* GOD [...] *for the finding out of the true Nature of all Things,* (*wherby* GOD *mought have the more Glory in the Workemanship of them, and Men the more fruit in the use of them,*) [...][18]

At the most basic level, the seventeenth-century growth in experimentalism was a move towards measuring, recording and discussing the world's phenomena, with as much precision as possible. This had a substantial impact on the development of the telescope. From Galileo's earliest work to increase the magnification of the original Dutch

[15] Dunn, p. 36, and Samuel Pepys, *The Diary of Samuel Pepys: 1667*, ed. by Robert Latham and William Matthews (London: HarperCollins, 1995), p. 236.
[16] William Poole, *John Aubrey and the Advancement of Learning* (Oxford: Bodleian Library, 2010), pp. 10-11.
[17] *English Science, Bacon to Newton*, ed. by Brian Vickers (Cambridge: Cambridge University Press, 1987), p. 5.
[18] Francis Bacon, 'New Atlantis: A Worke Unfinished', in *Sylva Sylvarum: Or a Naturall Historie in Ten Centuries* (London: W. Rawley, 1628), p. 18.

perspective, there was a drive throughout the century to improve the telescope: to enhance the power and clarity, to remove the flaws and striae from the lenses, to understand and combat spherical and chromatic aberration. One of the motivations behind this was to increase the precision and accuracy of observation that it was possible to achieve with the telescope.

The telescope began as an anomaly within the story of astronomy. Instead of assisting with the measurements and calculations which the practise consisted of before its invention, the telescope broke with this entirely. The telescope, as presented to the world by Galileo, could measure nothing. It was a tool that offered an exclusively visual experience without being able to provide any angles, distances or other data which had been the substance of astronomy for so long. Under the telescope, astronomy could only be a descriptive practice, at odds with the underlying motivation of the new experimental method. However, this changed with the invention of the micrometer: the telescope was suddenly able to assist in the overarching development of astronomy, rather than threaten to split it into separate practices or simply remain on the fringes.

Following the early doubts about the veracity of telescopic astronomical observation, it is interesting to note that this had completely reversed before the end of the century, at least among the younger members of the natural philosophy community. Until his death in 1687, renowned astronomer Johannes Hevelius was dedicated to using unassisted vision to make his observations and take measurements of the night sky. This was despite the creation of many of his own telescopes, and his work to decrease spherical aberration by developing telescopes of longer and longer focal lengths. He maintained that his naked-eye observations were as accurate as any using the latest telescopic technology. After this was disputed, somewhat undiplomatically, by Robert Hooke in 1674, Edmond Halley was sent by the Royal Society to visit Hevelius to compare techniques and results in 1679.[19] Despite Halley's vindication of Hevelius's methods in a testimonial letter to his host, the views he later expressed showed that 'his sympathies

[19] Hooke began his disagreement with Hevelius by casting doubt on the accuracy of his results in Robert Hooke, *Animadversions on the First Part of the Machina Coelestis of the Honourable, Learned, and Deservedly Famous Astronomer Johannes Hevelius, Consul of Dantzick* (London: John Martyn, 1674). This episode is quoted in Montgomery, p. 175.

were with Hooke'.[20] This episode demonstrates that a shift in attitude towards the authority of telescopic observation, even amongst the natural philosophy community, had taken place.

This continual demand for better and better results, together with the competitiveness that was common amongst natural philosophers during the period, had, perhaps, the most visible impact on the telescope.[21] Individuals across Europe were striving to solve the problems inherent in the Dutch perspective and to improve the outcomes of observations. Different designs were trialled, with different arrangements of lenses, and different focal lengths. There were tube-shaped telescopes, like those we are familiar with today, but also trumpet-shaped ones which took advantage of the fact that it was easier to perfect grinding in the centre of a large lens. There were enormously long telescopes, designed to reduce the impact of spherical aberration, and those without a tube at all.[22] Techniques for grinding and polishing lenses were developed and refined and, towards the later part of the century, applied to mirrors as the first reflecting telescopes were built and demonstrated. Isaac Newton built the first working reflective telescope in 1668, as a way to combat chromatic aberration.[23] As mentioned in Chapter 6, this effect is caused when light is refracted through a dense material, such as a glass lens. The different wavelengths in white light each refract by a different amount, splitting the white light into its component rainbow of coloured light rays. In telescopes, this leads to coloured distortions and haloes around observed objects, particularly so if that entity can only be seen in the form of white light, such as stars and other celestial phenomena. Newton discovered this reason for chromatic aberration in 1666 during his experiments with light and prisms. He erroneously concluded that it was an insoluble problem, although in terms of seventeenth-century technological advances, he was actually

[20] Angus Armitage, *Edmond Halley* (London: Thomas Nelson and Sons, 1966), p. 42.
[21] Competitiveness in natural philosophy is demonstrated by the frequent occurrence of claims for primacy in inventions and discoveries – for example, the long-running dispute between Newton and Leibniz as to which of them invented calculus, details of which can be found, for instance, in Gale E Christianson, *Isaac Newton*, Lives and Legacies (Oxford: Oxford University Press, 2005), Chapter 11 'War', pp. 110-121.
[22] For example, Christiaan Huygens' 125-foot long telescope which had the objective lens mounted on a pole and the hand-held eyepiece attached only by a long thread, see: Patrick Moore, *Eyes on the Universe; The Story of the Telescope* (London: Springer, 1997), p. 15. Also, see image of Hevelius's telecope in Figure 6; this image was put into the public domain by Houghton Library, Harvard University via Wikimedia Commons (source: Typ 620.73.451, Houghton Library, Harvard University).
[23] Isaac Asimov, *Eyes on the Universe: A History of the Telescope* (London: Andre Deutsch, 1976), p.63.

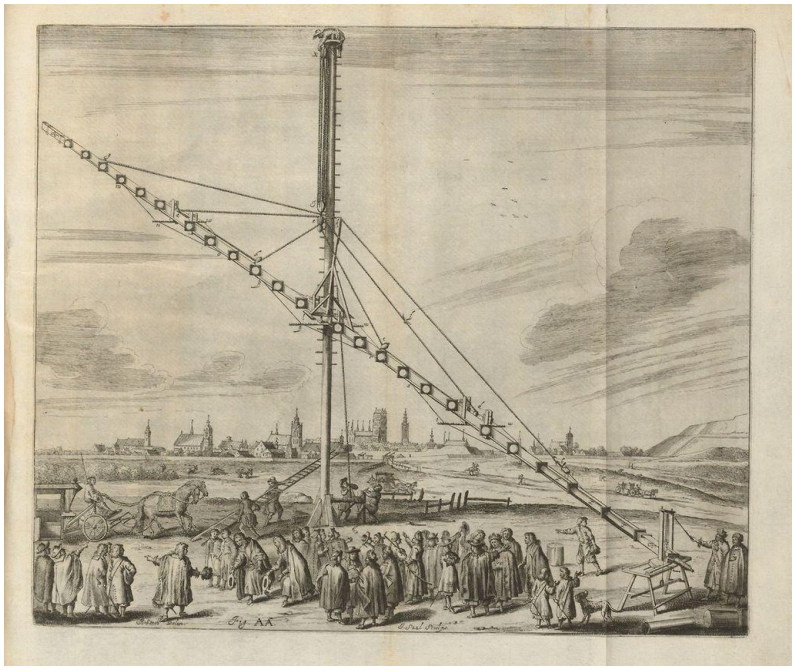


Figure 6: Image of a 150-foot telescope, taken from Johannes Hevelius's *Machina Coelestis* (1673)

correct: the achromatic lens was not developed until the following century.[24] Up until that point, it was believed that chromatic aberration was due to the poor quality of the glass. Since the reflecting telescope did not require two glass lenses to be separated by a distance large enough to produce a reasonable focus, it could be a much shorter and far more portable instrument than its refracting cousin, whilst still maintaining its effectiveness. For instance, Newton's first attempt was approximately 15cm long and achieved a 40 times magnification.[25] Conversely, early reflecting telescopes could not produce bright images as much more light was lost through reflection, than in using the glass lenses of refractors. Their reflecting surfaces also tarnished quickly and had to be re-polished regularly due to the high copper content in the speculum metal of which the mirrors were made.[26] Neither could micrometers be mounted in reflecting telescopes, reducing their usefulness in making measurements. As such, reflecting telescopes could not be used for serious astronomical observations during the seventeenth century.

[24] Bedini, 'Lens Making', p. 687.
[25] Asimov, p. 63.
[26] Moore, p. 22.

Astronomy

The telescope and the practice of astronomy are intimately linked. It is hard for us today to consider the development of one without the other but astronomy existed long before the invention of the telescope. When Galileo published *Sidereus Nuncius* in 1610, he was implicitly proposing a completely new way to practice astronomy. Galileo's new method was one in which measurements and numbers, the heart of astronomical practice until that point, had no place, and in which the unaided human eye was no longer powerful enough.

The strongest thread binding the various developments which took place in seventeenth-century astronomy is a striving for accuracy. This runs throughout the entire century. The motivation for this endeavour may have varied over time, but it was the strength of this consistent desire that drove astronomy forward during the period. The beginning of this aspiration to accuracy has been pinpointed as the lunar eclipse that took place on 28th October 1566. Tycho Brahe, whose involvement in astronomy stemmed from a strong interest in astrology, forecast from the eclipse that the Sultan of Turkey was about to die. When news arrived a few weeks later of the Sultan's death, it seemed Brahe's prediction had been correct. But, it soon became apparent that the ageing Sultan had died *before* the eclipse, making a mockery of Brahe's forecast.[27] Whilst Brahe remained confident in his methods, this event persuaded him that neither the Ptolemaic nor the Copernican tables of planetary positions were accurate enough for his astrological requirements. So began Brahe's lifelong task to use the best instruments available to make the most accurate possible observations of the heavens, with his goal being to 'chart the positions of the 1000 brightest stars to an accuracy of one arcminute'.[28]

In order to use these multiple observations to assist with his astrological forecasts, Brahe needed to find the patterns in them which would allow him to predict the movements of the planets. He began to develop his own model of the universe, to compete with Ptolemy and Copernicus: the Tychonic System, which had the sun and the moon orbiting a central, immovable Earth, while the other planets orbited the sun. This model only

[27] Peter Aughton, *The Story of Astronomy* (London: Quercus, 2011), p. 82.
[28] Couper and Henbest, p. 97. An arcminute is one sixtieth of a degree in the sky. Couper and Henbest liken this to attempting to measure positions accurate to one-hundredth the distance between each of the three stars that make up the Belt of Orion.

became possible once Brahe had realised that comets moved freely among the planets, rather than within the Earth's atmosphere, which proved that the planetary spheres of Ptolemy and Copernicus could not exist. However, more in-depth work was needed and Brahe invited the young mathematician, Johannes Kepler, to assist him – in particular by working on the orbit of Mars which seemed to pose the most difficulties for Brahe's model.[29]

Kepler struggled with the orbit of Mars for a number of years, even after succeeding Brahe, following his mentor's death in 1601, which meant he was no longer required to limit himself to the Tychonic System. A working model with a circular orbit and an error of up to 8 arcminutes was discarded because this was simply not accurate enough.[30] Eventually though, Kepler solved the puzzle when he realised that Mars orbits the sun in an ellipse. From this he was able to deduce his laws of planetary motion, published as *Astronomia Nova* in 1609. Such a significant breakthrough had only been possible because of the accuracy of Brahe's observations combined with Kepler's precise mathematics.

It seems impossible to attach any level of accuracy or precision to the next significant breakthrough which involved not a single measurement or equation: the publication of *Sidereus Nuncius* in 1610. Certainly, as I have suggested above, the early telescope was a visual watershed for the practice of astronomy, requiring description, whether verbal or pictorial, to share its results, rather than angles and distances. Taking that perspective, it could have had a major impact on the type of practice that astronomy had been developing into. Yet, the desire for accuracy was still very strong. I would suggest that this counter-balanced the novelty of a purely visual astronomy, warding off the possibility of a split discipline until the invention of the micrometer initiated a merging of the two elements in the second half of the century, as described in Chapter 6. Moreover, Huygens's independent reinvention of the micrometer encapsulates the striving for accuracy running though the astronomy of this period, demonstrating the drive to extract mathematical results from an ostensibly non-mathematical instrument.

[29] This is due to the fact that Mars deviates the most from a 'circular' orbit, which would have been very obvious when trying to fit it into a circular model such as the Tychonic System. See: Hoskin, p. 54.
[30] Ibid., p. 55.

Kepler quickly demonstrated his delight at Galileo's work in his *Dissertatio cum Nuncio Sidereo* and began to work out the theory of telescope optics. As he did so, he began to see ways to improve upon the instrument that Galileo had used. Whereas Galileo concentrated on refining the creation of lenses for his existing telescope, Kepler looked at the subject in a different way and published the design for a telescope that was much better suited to astronomical use in his *Dioptrice* (1611). The wider field of view and brighter images it supplied meant that a greater clarity and, therefore, accuracy of astronomical image was possible with the Keplerian telescope than with the original Dutch design.

As the clarity and accuracy of telescopic images improved, this presented an opportunity to begin mapping the moon's surface. Galileo's original drawings of the moon in *Sidereus Nuncius* were reasonably simple and, in most cases, were designed specifically to denote the changing shadows as sunlight moved across the moonscape. As telescopes gained in power, more detailed maps of the moon were created and features were named, in exactly the same way as terrestrial maps. One of the most influential moon maps of the period was published by Johannes Hevelius in his 1647 *Selenographia* and comprised detailed drawings of each phase of the moon, as well as intricate and meticulous maps of the full moon. Neverthless, his suggested nomenclature, naming lunar features 'by the law of the antichthon' after terrestrial ones, has not survived to the present day.[31] This act of exploring and mapping the moonscape provides an echo of the exploring and mapping of the terrestrial New World, which was happening during roughly the same period. It is possible to speculate that both these activities sprang from the same colonial instinct to de-mystify and 'claim' through naming objects and features. Indeed, as discussed in Chapter 3, Alexander has highlighted the distinct similarities between Thomas Hariot's early moon maps and the coastal maps he drew in his earlier role as cartographer to Sir Walter Raleigh in Virginia.[32]

[31] Montgomery, p. 186, quoting from Hevelius's *Selenographia*. For further information about the competition between Hevelius and Riccioli's suggested nomenclatures, see, for example, J Vertesi, 'Picturing the Moon: Hevelius's and Riccioli's Visual Debate', *Studies in History and Philosophy of Science Part A*, 38.2 (2007), 401–421.
[32] Alexander, passim.

As the century progressed, astronomy was a presented with an old problem to solve: the need to determine longitude at sea. The French Académie des Sciences was of the opinion, originally espoused by Galileo, that the Jovian moons could be used as a kind of celestial clock to assist in making the required calculations. However, even towards the end of the century, it was hard enough to view Jupiter's satellites from dry land without trying to do so from the pitching deck of a ship. Fellows of the Royal Society had an alternative plan in mind: to use the moon instead, a heavenly body which was much easier to see than Galileo's distant Medicean Stars. Nevertheless, this was not an easier solution, by any means. To accomplish this task, it was necessary to be able to predict the positions of the moon and measure the stars more accurately than ever before. Even *The Rudolphine Tables* were simply not accurate enough for such an immense undertaking. The sky needed to be measured once again but, by this time, telescopes had become so big that it was difficult for any single individual to be able to house the best of them appropriately. Besides, with navies and merchant fleets at risk, this was a problem with a wide significance. In 1675, the Royal Greenwich Observatory was founded and English astronomy became a state concern, as well as an interest of individuals.

A second thread binding astronomical practices together during the seventeenth century was faith in God. Italy and the Catholic Church struggled with the implications of Galileo's revelations. His friend, Giovanni Ciampoli, who was later to become Papal Secretary to Pope Urban VIII, warned Galileo about the danger of the analogy he drew between the Earth and the moon in *Sidereus Nuncius*:

> The Jesuit warned Galileo that when he "establishes some resemblance between the terrestrial globe and the lunar globe, another outdoes that, and says that he supposes there are men living on the moon, and that other begins to discuss how they can be descended from Adam, or emerged from Noah's Ark, and a great many other extravagances of which you never dreamed".[33]

English astronomers and other members of the Royal Society, however, viewed their endeavours rather differently. To them, the universe was God's creation, part of the Book of Nature wherein they could read of His omnipotence and wisdom, if only they worked hard enough to learn its language. Studying 'the heavenly sciences', as John

[33] Dick, p. 20.

Flamsteed described astronomy in a letter to Lord Brouncker, was a noble way to improve 'an appreciation of the wisdom and goodness of God'.[34] Indeed, Dick has surmised that 'the tendency toward belief in inhabited planets [...] was strongly reinforced by the growth of natural theology in the seventeenth century' which 'drew inferences about God from the study of nature'.[35] Even Isaac Newton, whose *Principia* perhaps did the most to reduce the seventeenth-century universe to a clockwork mechanism, wrote:

> This most beautiful system of the sun, planets, and comets, could only proceed from the counsel and dominion of an intelligent and powerful Being. And if the fixed stars are centres of other like systems, these, being formed by the like wise counsel, must be all subject to the dominion of One; [...] This Being governs all things, not as the soul of the world, but as Lord over all; and on account of his dominion he is wont to be called *Lord God* [...][36]

This is not to understate the theological concerns that astronomy inspired in other parts of the community. Chapter 2 examined how this anxiety was expressed in literature and philosophy written particularly in the early part of the seventeenth-century. However, for the natural philosophers who drove astronomy forward in this period, their work to uncover the secrets of the universe was, in itself, a celebration of God and His works.

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[34]Letter from Flamsteed to Lord Brouncker, 24 November 1669, in *The Correspondence of John Flamsteed, First Astronomer Royal*, ed. by Eric G. Forbes, Lesley Murdin, and Frances Willmoth, 3 vols. (Bristol: Institute of Physics Publishing, 1995), 1; 1666–1682, p. 12, and Knight, p. 158.
[35] Dick, p. 19.
[36] Isaac Newton, *Newton's Principia: The Mathematical Principles of Natural Philosophy*, trans. by Andrew Motte (New York: Daniel Adee, 1846), p. 504.

Chapter 8

'Lunatick we may call him [...] for he is always travelling to the Moon'[1]

Considering that the origins of the telescope are to be found in conflict, and the instrument's development was so very closely intertwined with experimentalism and astronomy, it may seem unlikely that there could have been anything more important in shaping the telescope during the seventeenth century. However, in this chapter, I will explore the role that the cultural imagination played. I suggest that literary and philosophical depictions of life on the moon were a key part of the seventeenth-century English cultural imagination and, as such, had a pervasive, though subtle, impact on the development of the telescope.

Culture and cultural imagination

Before proceeding further, I would like to take a moment to define 'cultural imagination'. In recent years, a number of academic works have used this term without explanation, implying that it is generally well understood, despite the subtle differences in usage.[2] However, for the purposes of this research, I will use Juliette Harrisson's clear definition:

> Just as cultural memory refers to historical stories shared by a group of people, cultural imagination refers to ideas (these may be stories, or concepts, or conceptualizations) shared by a group of people; shared, but not necessarily commonly believed in.[3]

Harrisson's clarification on the issue of belief is an important one. It is the accessibility of ideas within a culture that is significant, rather than any measurement of whether they are held as beliefs within that culture.

[1] Behn, sig. B2[v] (I.1).
[2] Juliette Harrisson, *Dreams and Dreaming in the Roman Empire: Cultural Memory and Imagination* (London: Bloomsbury, 2015), p. 13.
[3] Ibid.

Cultural imagination is an important element to consider when examining potential influence on scientific work as scientists do not produce their work in a cultural vacuum, in precisely the same way that literary authors do not. David Knight has pointed out that: 'Science is not something *sui generis*, independent of time and place, but is a part of culture'.[4] It is widely accepted that literary authors seek inspiration from the ideas they find around them, so it seems unexceptional to suggest that scientific authors may do likewise. This is particularly the case when looking at the seventeenth century, a period when the familiar intellectual divisions of today had not yet formed and in which, as Douglas Bush has stated:

> [...] almost all authors, scientists like other men, had had a thorough classical training, and the classical tradition was a unifying and humanizing force. [...] It was difficult for the seventeenth-century writer to be insular [...] He was an intellectual citizen of the world, the child of the whole past as well as of the present.[5]

To demonstrate that the ideas contained in representations of life on the moon were suffused throughout the cultural imagination of seventeenth-century England, these texts can first be examined to see if it is possible to consider them as a cultural product of the period. That is to say, not only an item created by, and of, various strands that comprised the cultural milieu of the period, but also an influential force that fed into creating other cultural products.

Firstly, is it possible to say that moon-life representations were created from pre-existing cultural elements? Part Three examined the factors which influenced the English representations of life on the moon at the heart of this thesis. It established that there were several cultural strands which combined together to produce the moon literature of the seventeenth century. Although I proposed that, in a number of cases, the most significant factor was the telescope and Galileo's *Sidereus Nuncius*, it does not mean that the other factors identified were not also important in shaping those representations. Indeed, the combination of these additional foundations gave them the unique identity that seventeenth-century moon literature enjoyed, as distinguished from earlier

[4] Knight, 'Religion and the "New Philosophy", p. 163.
[5] Douglas Bush, *English Literature in the Earlier Seventeenth Century: 1600-1660*, 2nd edn (Oxford: Clarendon Press, 1962), p. 32.

representations, as described in Part Two. So, it is possible to answer in the affirmative to this question.

Secondly, did seventeenth-century moon literature itself become one of those cultural strands that, in its turn, served to create and shape other cultural movements and products? Chapter 3 specifically examined literature as a factor which shaped these representations and was able to demonstrate that there is evidence to show that the earliest depictions of the century influenced and, in some cases, were directly cited by other works of literature, philosophy and drama. As such, it can be stated positively that representations of life on the moon were, indeed, a cultural product of the period. Therefore, the ideas and concepts that moon literature contains can be said to have been pervasive within the cultural imagination of the seventeenth century.

I would also argue that culture and the cultural imagination had an impact on the various ways in which the telescope developed. By this, I mean either that there was a particular cultural environment in which the telescope was pushed to develop in certain ways or, indeed, was restricted from developing in other ways; or, that the prevailing cultural imagination influenced the thinking of those individuals who were responsible for the ways in which the telescope developed.

That the cultural environment had a direct influence on how the telescope could or could not develop is something that was touched on in Chapter 5. I discussed the work done by Albert Van Helden and Stuart Clark which demonstrated that, not only the improvements Galileo made to the Dutch perspective, but also the adjustments in attitude towards vision and visual experience, were only just achievable at the time that they happened. This was a crucial piece of serendipity, but it can also be seen as a way that the cultural environment played an active part in shaping the telescope's development. There needed to be a point where the various elements, such as optical technology and prevailing attitudes towards vision, came together to produce a culture that was 'ready' for the telescope to emerge and in which it was physically possible for it to do so, in order for it to be a success. This is very similar to the situation that Koestler outlines in terms of the pause in astronomical development while the knowledge of the Greek philosophers, largely lost at the demise of the Greek empire, was preserved in the care of the Arabs:

> It is a curious fact that the Arab-Judaic tenure of this vast body of knowledge, which lasted two or three centuries, remained barren; whilst as soon as it was reincorporated into Latin civilization, it bore immediate and abundant fruit. The heritage of Greece was obviously of no benefit to anybody without some specific receptiveness for it.[6]

I would argue that this same idea of crucial serendipity can be applied to the cultural imagination: until the right building blocks are in place, it is not possible to take the next step in imagining new ideas and concepts. Margaret Boden's discussion of Friedrich von Kekulé's discovery of the structure of benzene atoms provides an excellent illustration of this.[7] The story goes that Kekulé was dozing before the fire, imagining the molecules dancing before his eyes. As they moved, they formed strings which twined and twisted like snakes. As one snake seized hold of its own tail, Kekulé woke with a start, realising that the molecular structure of benzene must be a ring. At the time, chemical theory stated that all organic molecules must be made from strings of carbon atoms, no other structure was possible. In fact, this theory was Kekulé's own which should, perhaps, have ruled out the possibility that he would propose a different hypothesis. However, the building blocks of the long shape and sinuous, snake-like movement were present in Kekulé's cultural toolkit even if they were possibly not, in the case of the snakes, within his personal experience. All it took was his imagination to combine those pieces in a creative way to allow him to see the possibility of something entirely new. However, Kekulé needed to have access to those separate elements in order for his imagination to be able to combine them. Indeed, Ladina Bezzola Lambert has stated that 'in the visualizing of the unknown the imagination is rigidly confined to past perceptions. Even though the imagination may modify actual perceptions by separating and recombining them, it nevertheless cannot create anything fundamentally new, but only recycle old material'.[8]

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[6] Koestler, p. 108.
[7] Margaret A. Boden, *The Creative Mind: Myths and Mechanisms*, 2nd edn (London: Routledge, 2004), pp. 62-63.
[8] Ladina Bezzola Lambert, *Imagining the Unimaginable: The Poetics of Early Modern Astronomy* (Amsterdam: Rodopi, 2002), p. 9.

Biographical evidence

Another way in which it is possible to demonstrate cultural impact on the development of the telescope is to look at the influence it may have had on the people responsible for making those developments. To that end, I have selected a number of key British figures who were deeply involved in the development of the telescope, or closely related astronomical practices, during the seventeenth century: James Gregory, Edmond Halley, Robert Hooke, Christopher Wren, John Flamsteed, and Isaac Newton.[9] For each of these natural philosophers, I have looked for any evidence of their awareness of, and engagement with, the ideas and concepts contained within seventeenth-century representations of life on the moon. Due to the difficulties, outlined in Chapter 7, of tracing indirect influences in scientific writing and artefacts, I have chosen not to investigate their formal, published works as part of my search, but instead to seek out evidence that will potentially give a greater insight into their personal ideas and influences, into the 'human' element of their scientific endeavours. Whilst this means that there is a small chance of meaningful information being missed, there is a greater probability of finding significant details in less formatted, more 'unguarded' records than in papers prepared specifically for a wide and public audience. These less formal documents include letters, diaries and records of either their own libraries or other collections that they have been responsible for building. In many instances, much of this type of evidence is no longer extant, leaving a necessarily incomplete, though still informative, picture. Where such records do still exist, I have approached them with the specific objective of determining, firstly, whether they capture any evidence of either ownership or reading of contemporary representations of life on the moon; secondly, whether they provide any evidence of either ownership or reading of the older texts discussed in Part Two, specifically those early representations of the moon as a material place, such as Plutarch and Lucian's works; and, finally, whether these records present any evidence to suggest exploration or discussion of extraterrestrial life, or the closely connected debate surrounding the plurality of worlds.

[9] I use the term 'British' deliberately as one of the selected natural philosophers, James Gregory, was Scottish. Although falling geographically outside the focus on England in this chapter, Gregory is an important figure in the telescope's development as the first person to design a reflecting telescope. Despite being located in Scotland, he maintained professional contact with leading English natural philosophers of the day, visited London to try to get his telescope made, and was elected as a Fellow of the Royal Society in 1668. Therefore, I consider that his inclusion here is legitimate.

One assumption I have made in this investigation is that where ownership of a particular book can be established, the owner would have read that book and, therefore, would have had at least some familiarity with its contents. Moreover, the fact that the book was kept, rather than simply borrowed, sold on, or consulted within a different library or collection, can be considered to signify that a certain level of importance or worth has been attached to that item by its owner.[10] Additionally, I have focused on those texts published within the seventeenth century: although relevant texts published later than 1699 may be noted, they have been discounted from my analysis.

James Gregory (1638-1675)[11]

James Gregory was a mathematician who held professorships at St Andrews and Edinburgh Universities. However, his interests also lay in optics and the telescope. Gregory became the first person to design a telescope that used mirrors instead of lenses - the very first reflecting telescope - in 1661. This design was later published in his *Optica Promota* of 1663, although he was never able to build it himself.[12] While many of Gregory's letters and papers concentrate on his mathematical ideas, there is some evidence to suggest that he would not have been completely unaware of the idea of life on the moon. Antoni Malet's 1989 thesis states that Gregory was 'deeply acquainted with Kepler's *Ad Vitellionem paralipomena* (1604)'.[13] As mentioned in the case study in Chapter 2, this was the first of Kepler's works in which he speculated about life on the moon.[14] Despite this contemplation being only a tiny portion of the whole book, a 'deep acquaintance' with this text means that Gregory would undoubtedly have been aware of it.

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[10] As an example of access to other libraries, John Harrison has outlined the access that Isaac Newton is likely to have had to the Public Library of the University of Cambridge, the libraries of the various Cambridge colleges including his own, Trinity, and the private library of Isaac Barrow, one of Newton's tutors and the first person to hold the Lucasian Chair of Mathematics. John Harrison, *The Library of Isaac Newton* (Cambridge: Cambridge University Press, 1978), p. 6.

[11] James Gregory's surname is sometimes written using the Scottish spelling of 'Gregorie'. A general biography of James Gregory is available: Niccolò Guicciardini, 'Gregory, James (1638–1675)', *Oxford Dictionary of National Biography* (Oxford: Oxford University Press, 2004) <http://www.oxforddnb.com/view/article/11465> [accessed 7 April 2017].

[12] Jacobo Gregorio, *Optica Promota, Seu, Abdita Radiorum Reflexorum & Refractorum Mysteria, Geometrice Enucleata* (Londini: J. Hayes, pro S. Thomson, 1663).

[13] Antoni Malet, 'Studies on James Gregorie (1638-1675)' (unpublished doctoral dissertation, Princeton University, 1989) <http://www.academia.edu/3693787/Studies_on_James_Gregorie_1638_-_1675_> [accessed 7 April 2017].

[14] In Chapter 2 I refer to this text as *Astronomia Pars Optica*. This work is commonly known by either title.

While teaching at St Andrews, Gregory was responsible for plans to build a university observatory. He raised money towards the building work but it was not completed before he left for Edinburgh in 1674. However, Gregory had already begun collecting materials to support work in the observatory, including instruments and books. A catalogue of St Andrews University Library drawn up in 1687 contains a section listing books that were purchased by Gregory for the observatory.[15] This lists two books which are of particular interest. The first of these is *Micrographia* by Robert Hooke, listed in the catalogue as 'Hook's Micrographia'.[16] Originally published in 1665, although the edition held by the University is dated 1667, the content of this monograph concentrates mainly on observations of everyday items using a microscope.[17] The last three observations which are discussed, however, are telescopic rather than microscopic and the final one of the book is '*Of the Moon*'.[18] In this observational record, Hooke compares the moon to the Earth on a number of occasions. In particular, there is one passage in which he describes the appearance of a distinct lunar feature he has observed:

> The Vale it self [...], is much of the figure of a Pear, and from several appearances of it, seems to be some very fruitful place, that is, to have its surface all covered over with some kinds of vegetable substances; for in all positions of the light on it, it seems to give a much fainter reflection then the more barren tops of the incompassing Hills, and those a much fainter then divers other cragged, chalky, or rocky Mountains of the Moon. So that I am not unapt to think, that the Vale may have Vegetables *analogus* to our Grass, Shrubs, and Trees; and most of these incompassing Hills may be covered with so thin a vegetable Coat, as we may observe the Hills with us to be, such as the short Sheep pasture which covers the Hills of *Salisbury* Plains.[19]

This image of verdant fruitfulness on the moon is immediately reminiscent of Godwin and Cyrano de Bergerac's paradisal moon-worlds. Moreover, it is the very same type of

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[15] *An Edited Transcript of the '1687' Catalogue in St Andrews University Library Covering the Years 1687-1704*, ed. by R.V. Pringle, Sources for Library History, 3 (St Andrews: St Andrews University Library, 1975). The section titled 'A Catalogue of Books bought by Mr Gregorie for the Observatorie and other books not in any former catalogue' begins on p. 34.

[16] Ibid.

[17] Many thanks to Daryl Green, former Rare Books Librarian at St Andrews University Library, for the information about, and photographs of, the texts held in the University Library's Special Collections.

[18] Hooke, *Micrographia*, p. 242.

[19] Ibid., pp. 242-243.

comparison with the Earth that is so instantly familiar from the various representations of life on the moon at the heart of this research.

There is nothing in the edition held by St Andrews that could definitively prove that it is one of the volumes ordered by James Gregory for the observatory collection. However, the University does own several other books which are direct matches for titles on the 1687 catalogue but which do not have any physical provenance linking them directly to Gregory. This may be because they were purchased by the University, rather than individually by Gregory. Nevertheless, the fact that this edition was published in 1667 does make it possible that that it was acquired for the observatory at Gregory's behest.

The second book of interest listed in the 1687 catalogue is recorded as 'The world in the moon'.[20] The catalogue gives no other information and, from this, it is impossible to know what the book actually is: the title is similar to a number available during this period. Fortunately, the book itself still exists and remains in the special collections of St Andrews University Library. The spine lettering is still legible and reveals that it is a copy of John Wilkins's *The Discovery of the World in the Moon* (Figure 7).

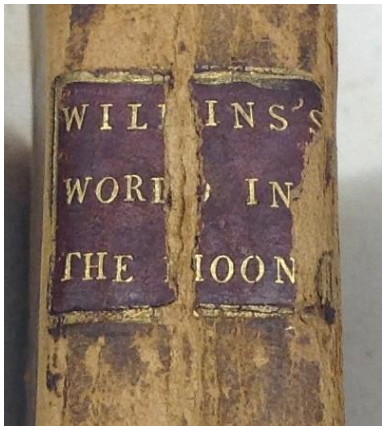
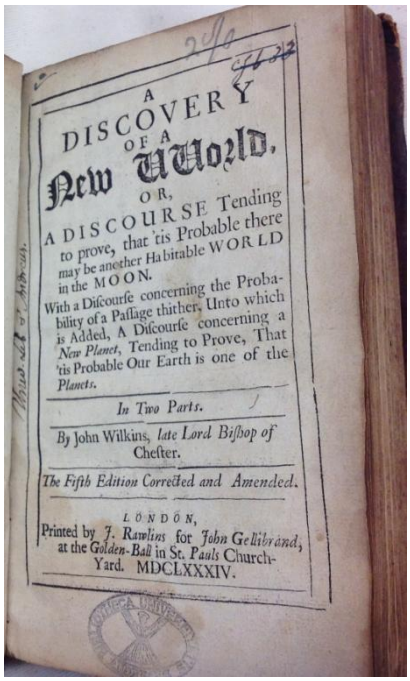


Figure 7: Photograph of book spine in St Andrews University Library Special Collections

Inspection of the volume's title page, however, reveals that this is a copy of the fifth edition, published in 1684 (Figure 8). As Gregory left St Andrews in 1674 and died the following year, it would have been impossible for him to have purchased this book for the observatory collection. The most likely explanation is that this book was purchased by

[20] Pringle, p. 35.

somebody else at St Andrews University after Gregory's departure and it was simply catalogued along with the other astronomy-related books in 1687.



A
DISCOVERY
OF A
New World,
OR,
A DISCOURSE Tending
to prove, that 'tis Probable there
may be another Habitable WORLD
in the MOON.
With a Discourse concerning the Proba-
bility of a Passage thither. Unto which
is Added, A Discourse concerning a
New Planet, Tending to Prove, That
'tis Probable Our Earth is one of the
Planets.

In Two Parts.

By John Wilkins, *late Lord Bishop of* Chester.

The Fifth Edition Corrected and Amended.

LONDON,
Printed by *J. Rawlins* for *John Gellibrand*, at the *Golden-Ball* in St. *Pauls* Church-Yard. MDCLXXXIV.

Figure 8: Photograph of book title page in St Andrews University Library Special Collections

While this does not shed any further light on Gregory's personal engagement with the ideas found in seventeenth-century representations of life on the moon, it does indicate that a member of university staff, between 1684 and 1687, felt that this was a book that students of astronomy and other users of the observatory should have reference to. This is a clear suggestion that there was value, for those engaging in astronomical practice, in a philosophical discussion of life on the moon. Moreover, this edition is one which includes the additional Proposition 14 which considers travelling to the moon and specifically refers to Godwin's work.

Edmond Halley (1656-1742)[21]

Edmond Halley had a lifelong passion for astronomy and is now most commonly remembered for the comet named after him. He left Oxford University without a degree in order to travel to St Helena and map the constellations of the southern sky that could

[21] A general biography of Edmond Halley is available: Alan Cook, 'Halley, Edmond (1656–1742)', *Oxford Dictionary of National Biography* (Oxford: Oxford University Press, 2004) <http://www.oxforddnb.com/view/article/12011> [accessed 7 April 2017].

not be seen from Europe. He also made 'a regular Course of Observations, of the Moon especially' in the latter part of the seventeenth century and became only the second man to hold the post of Astronomer Royal, following John Flamsteed's death in 1720.[22]

Halley's letters and papers show little evidence of engagement with the ideas found in representations of life on the moon. Rather, they demonstrate that, if he had any interest in an 'other world' it was one to be found underwater: Halley wrote a number of papers on walking and working under water in a 'Diving Bell'.[23] Similarly, the thorough summary of Halley's unpublished *Commonplace Book*, constructed by Edward Cohen and John Ross, indicates no significant levels of interest in the ideas in question.[24]

One source, however, which indicates a possible interest in the concepts of life on the moon, is the sale catalogue of Halley's library. Unfortunately, the sale of Halley's library was carried out alongside the sale of another personal library, which belonged to an unnamed Serjeant at Law, and their book lists were intermingled into a single sale catalogue. This means that there is no way to tell absolutely which books belonged to which man. However, as H.A. Feisenberger has suggested, 'it is surely legitimate to consider the scientific books as being Halley's property'.[25] Therefore, it must similarly be legitimate to consider the legal books as having belonged to the Serjeant at Law. Those books on other subjects, such as 'dancing, [...] architecture, horses, travel, America, etc' cannot have their ownership determined either way.[26]

Taking this element of uncertainty into account, there are several titles in the catalogue which are pertinent to this research. A number of these are editions published after the end of the seventeenth century, such as 'Huygens's Celestial Worlds discovered' published in 1722 and 'Fontenelle's Plurality of Worlds' published in 1728.[27] It is possible that earlier, seventeenth-century, editions of these texts may have been read by the

[22] *Correspondence and Papers of Edmond Halley*, ed. by Eugene Fairfield MacPike (Oxford: Clarendon Press, 1932), p. 6.
[23] Ibid., pp. 144, 150, 152, 154, for example.
[24] Edward H. Cohen and John S. Ross, 'The Commonplace Book of Edmond Halley', *Notes and Records of the Royal Society of London*, 40.1 (1985), 1–40.
[25] *Sale Catalogues of Libraries of Eminent Persons*, ed. by H. A. Feisenberger (London: Mansell, 1975), p. 10.
[26] Ibid.
[27] Ibid., p. 229 and p. 233.

owner before the purchase of these particular copies. However, any conclusions drawn on this basis would be purely speculative and so they must be discounted.

This leaves a small number of texts published within, or before, the seventeenth century, or which did not have their publication date recorded in the sale catalogue. Firstly, there is a small group of classical texts: two different editions of 'Luciani Opera', one from 1522 and the other from 1687, a five-volume set of 'Plutarch's Morals' from 1694 and thirteen volumes of the 1572 'Plutarchi Opera'.[28] The 1572 Plutarch, as far as it is possible to tell from the catalogue, appears to be a copy of the first complete edition of Plutarch's works produced by Henri Estienne.[29] This edition contained the *Moralia* in both Greek and Latin, so Plutarch's *Concerning the Face which Appears in the Orb of the Moon*, which is drawn from his *Moralia* (*Morals*), would have appeared in both the 1694 publication and the 1572 *Opera*.[30] Returning to the two Lucian texts, it is possible that *A True Story* was included in the 1522 *Opera*; however, it definitely was incorporated into the 1687 edition.[31] If any of these four works belonged to Halley, with the possible exception of the 1522 Lucian *Opera*, it would mean that he was familiar with those early texts that portrayed the moon as a material location. Nevertheless, both Plutarch and Lucian were classical authors whose works would not have appeared out of place in the library of any educated person during this period, so could equally well have belonged to the Serjeant at Law.

The remaining group of five texts are all contemporary seventeenth-century publications. Two of these are more strictly natural philosophy texts and, as such, I would propose that the likelihood is that they belonged to Halley. These are 'Kepleri Astronomia' (1604) and 'Hugenii Cosmotheros' (1698), the first of which mentions the possibility of life on the

[28] Ibid., pp. 170, 244 and 272.
[29] This text is listed in the catalogue as '*apud H. Steph.*'. Henri Estienne was also known by his Latin surname, Stephanus. See, for example: 'Estienne, Henri the Younger or (Latin) Henri Stephanus (1531-98)', ed. by Gordon Campbell, *The Oxford Dictionary of the Renaissance* (Oxford: Oxford University Press, 2003) <http://www.oxfordreference.com/view/10.1093/acref/9780198601753.001.0001/acref-9780198601753-e-1300> [accessed 14 April 2017].
[30] A copy of the complete set of Estienne's 1572 edition of Plutarch's *Opera* was sold by Christie's in 2015. The description in the sale catalogue includes confirmation that this edition contained Plutarch's *Moralia*, see: http://www.christies.com/lotfinder/Lot/plutarch-c46-c120-opera-in-greek-and-latin-5909357-details.aspx [accessed 14 April 2017].
[31] A copy of this edition is available online at: https://books.google.co.uk/books?id=gvy0AAAAMAAJ [accessed 12 February 2016]. *A True Story* begins on p. 639.

moon briefly, as I have discussed above;[32] the second of which dismisses the possibility of life on the moon, but details the likelihood of life elsewhere in the Universe.[33] The final three texts are all works discussed in Part Two: 'Bergerac's Worlds of the Sun and Moon' (1687), 'Ignatius's Conclave' (1635) and 'Entretiens sur la Pluralite des Mondes' by Fontenelle, which is undated but listed as being published in Amsterdam.[34] I have separated these from the first two texts in this group as they are not strictly 'scientific' texts and, as such, cannot unquestionably be attributed to Halley's library. Even Fontenelle's work, which is a direct discussion of natural philosophy, was aimed at a lay audience. Nevertheless, I believe it is *probable* that this group of five texts belonged to Halley. Even if my assumption is only correct for the Kepler and Huygens titles, it would still be possible to draw the conclusion that Halley was, at the very least, aware of the concepts of life on the moon and the plurality of worlds debate.

Robert Hooke (1635-1703)[35]

Robert Hooke was a man of many interests, from architecture and watch design to medicine and book collecting. He was appointed the first Curator of Experiments at the Royal Society in 1662 and played a major role in rebuilding London after the Great Fire of 1666. This included co-designing the London Monument with Christopher Wren to serve as a giant, fixed telescope, as well as a physical commemoration.[36] He was also the first person to build a working Gregorian telescope from James Gregory's original design, which he presented to the Royal Society in 1674.[37]

The publication for which Hooke is best remembered is *Micrographia* (1665). As discussed above, this includes a number of references comparing the moon to the Earth in the final observation of the book. The various moon-Earth analogies, particularly where Hooke writes about the 'cragged, chalky, or rocky Mountains of the Moon' and

[32] Feisenberger, p. 199. This is the same text as Kepler's *Ad Vitellionem paralipomena*, with which James Gregory was so familiar.
[33] Ibid., p. 198.
[34] Ibid., p. 220, p. 236 and p. 285. Despite the lack of date in the sale catalogue, French language editions of Fontenelle's text were published in Amsterdam as early as 1686 (see, for example, the copy held by Cambridge University), so it is not unlikely that this was also a seventeenth-century edition.
[35] A general biography of Robert Hooke is available: Patri J. Pugliese, 'Hooke, Robert (1635–1703)', *Oxford Dictionary of National Biography* (Oxford: Oxford University Press, 2004) <http://www.oxforddnb.com/view/article/13693> [accessed 14 April 2017].
[36] Dunn, p. 40.
[37] Guicciardini.

'several kinds of pits [...] that [...] seem to be a hollow *Hemisphere'* are similar to Galileo's moon 'full of hollows and protruberances [...] varied everywhere by lofty mountains and deep valleys'. [38] It is interesting to note that Hooke, in fact, owned a 1653 edition of *Sidereus Nuncius.*[39]

Additionally, within his vast personal library, Hooke owned numerous texts that contained representations of life on the moon: Cyrano de Bergerac's 'Comical History of the World in the Moon' (1659); 'Wilkins Disc. Of new World in the Moon' (1640) which was the first edition to contain his updated Proposition 14 referring to Godwin's work; 'Behn's Discovery of New Worlds' (1688), which was her translation of Fontenelle's *Entretiens sur la Pluralité des Mondes*; Godwin's 'The Man in the Moon, or a Voyage thither' (1657); and '*Christ. Huygens* Cœlestial World' (1698).[40] Moreover, the sale catalogue of his library indicates that, at the time of his death, Hooke owned copies of a number of other texts that discussed or mentioned these ideas and concepts: the collected works of Plutarch and Lucian, which are likely to have contained their works on this topic;[41] a 1677 edition of 'Satyre Menippée de la Vertue du Catholicon d'Espagne';[42] Kepler's 'ad Vitellionem Paralipomena' (1604), as well as another book by Kepler listed as 'De Astronomia Lunari' (1634), which can only have been a copy of his *Somnium*;[43] a 1668 edition of the Duchess of Newcastle's 'Observations upon Experimental Philosophy' which had her *Blazing World*, a story about the Empress of another, though not lunar, world, appended to it;[44] 'Burton's Anatomy of Melanchol'[sic] (1699),[45] in whose chamber Hooke studied while at Oxford;[46] 'James Howels Letters' (1647) which includes the letter in which Howell outlines some of the arguments around life on the moon and stars;[47] and, finally, two copies of Wilkins's 'Mathematical Magick' (1680 and 1648),[48] one of which

[38] Hooke, *Micrographia*, pp. 242-243; Galilei, p. 52.
[39] Feisenberger, p. 89.
[40] Feisenberger, p.108, and p. 111 – The titles quoted, and those following, are not italicised in the original.
[41] Ibid., p. 62 and 99.
[42] Ibid., p. 49
[43] Ibid., p. 79.
[44] Ibid., p. 99.
[45] Ibid., p. 100.
[46] Richard Nichols, *The Diaries of Robert Hooke, the Leonardo of London, 1635-1703* (Lewes: The Book Guild, 1994), p. 17.
[47] Feisenberger, p. 108.
[48] Ibid., pp. 13 and 111

John Wilkins is said to have given to Hooke himself.[49] This long list of texts, which obviously only includes those that were in Hooke's library at the time the sale catalogue was drawn up, leaves little room for doubt that Hooke was aware of the idea of life on the moon. Indeed, such an extensive list would lead to the conclusion that he was positively interested in the topic, covering, as it does, a large number of the major works on this topic published in the seventeenth century.

Robert Hooke's diary also suggests that he had an interest in the moon as a geographic location with potential for life. His entry for 1st January 1675/6 describes the first meeting of a 'New Philosophicall Clubb', made up of members of the Royal Society.[50] Hooke reported on the efficacy of his 'Selesnoscope' in providing a clear image of the moon and, despite Sir Christopher Wren's opposition: 'argued for water in the Moon and that the under parts of the sea were seen as well as the tops of hills'.[51]

Christopher Wren (1632-1723)[52]

Sir Christopher Wren is best remembered for his great achievements in architecture, having designed a number of iconic buildings, such as St. Paul's Cathedral in London and the Sheldonian Theatre in Oxford. However, before becoming such a renowned architect, Wren's career was focused around astronomy and he held astronomy professorships at both Gresham College and Oxford University.

A number of Wren's papers survive in various archives, but the vast majority of these are related to his work, particularly his architectural designs; very little records the more personal aspects of his life. One document which does provide a modicum of insight into his interests is the sale catalogue of his personal library.[53] As with the auction catalogue of Edmond Halley's library, Wren's was also amalgamated with another book collection.

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[49] Nichols, p. 19.
[50] *The Diary of Robert Hooke 1672-1680*, ed. by Henry W. Robinson and Walter Adams (London: Taylor & Francis, 1935), p. 205.
[51] Ibid., p. 206.
[52] A general biography of Christopher Wren is available: Kerry Downes, 'Wren, Sir Christopher (1632–1723)', *Oxford Dictionary of National Biography* (Oxford: Oxford University Press, 2004) <http://www.oxforddnb.com/view/article/30019> [accessed 15 April 2017].
[53] Cock and Langford, *A Catalogue of the Curious and Entire Libraries of That Ingenious Architect Sir Christopher Wren, Knt. and Christopher Wren, Esq; His Son, Late of Hampton Court, Both Deceas'd; [...] Which Will Be Sold by Auction, by Mess. Cock and Langford, on Monday the 24th of This Instant, October, 1748, [...] at Mr. Cock's in the Great Piazza, Covent Garden* (London: Cock, 1748).

However, the difference with Wren's library is that the owner of the other books is a known, named, individual: his own son, Christopher Wren (1675-1747). While this, again, poses the problem of being unable to identify the owner of any particular book with certainty, the fact that it is known when each of these men was born and died, and something of their background and interests, means that it is possible to make educated guesses about the original ownership of particular titles. In terms of publication, any books dated after the death of Christopher Wren senior in 1723 can confidently be attributed to his son's library. While this does not work in reverse – books published before the birth of Christopher Wren junior may still have been acquired by him directly at a later date – the earlier publications can be said to be more *likely* to have been collected by Sir Christopher Wren, particularly where the subject matter lies within his circle of interest. Both father and son were Fellows of the Royal Society and the Society's records provide a guideline to the research subjects with which each man was occupied.[54] Sir Christopher Wren's record indicates his interests in architecture, astronomy and mathematics, as well as a research field of anatomy. His son's interests are simply indicated by his research field of numismatics. This provides a starting point for identifying ownership, as volumes covering one of these particular areas is much more likely to have belonged originally to the man who worked or researched in that area.

Taking this information into account, there are seven items listed in the sale catalogue which are of potential interest. For the purpose of analysis, these can be divided into three groups. In the first group are three books which could have belonged to either Christopher Wren. Firstly, there are two copies of *Luciani Opera*: one was published in Amsterdam in 1687 and is apparently the same edition as appears in the sale catalogue of Edmond Halley and the anonymous Serjeant at Law, the other is undated. Secondly, there is a copy of Burton's *Anatomy of Melancholy*, which is also undated.[55] While *A True Story* was certainly included in the 1687 edition of Lucian, and the *Anatomy of Melancholy* included Burton's 'Digression of the Aire', both of which were explored in Part Two, neither of these would have been out of place in the library of any gentleman

[54] Records for each man available via the 'Find Past Fellows' search facility on the Royal Society website at https://royalsociety.org/fellows/ [accessed 15 April 2017].
[55] Cock and Langford. The copies of Lucian's *Opera* appear on p. 12 and p. 15 (listed as items 342 and 432), and the copy of Burton is listed on p. 14 as item 387.

of the period, regardless of his specific interests. Moreover, the two copies of Lucian could well have belonged to the same man; it is possible they contained a different selection of texts, or perhaps one copy may have been a gift as in the case of Robert Hooke's two copies of *Mathematical Magick*, discussed above. Circumstantial evidence on the whereabouts of the younger Christopher Wren states that 'In autumn 1705 he was in the Netherlands, where he bought a number of books', which makes it possible that the Amsterdam Lucian belonged to him.[56] However, this is by no means certain as the books he purchased are not detailed. Similarly, the last amended edition of Burton's *Anatomy of Melancholy* was published 24 years before the younger Christopher Wren was born, making it more *likely*, but certainly not definite, that this work belonged to his father. Taken together, this leaves the first group of books with little solid evidence to contribute.

The second group consists of two items which have a far greater probability of having belonged to Sir Christopher Wren. These are a 1665 edition of Hooke's *Micrographia* and a copy of Huygens's *Cosmotheoros*.[57] The *Cosmotheoros* is grouped with two other works of Huygens – *Opuscula* and *Systema Saturnium* – and all appear to be listed as being published in The Hague in 1659. Unfortunately, this is inaccurate as only *Systema Saturnium* was published in 1659, the other two works were not first published until much later. This means that it is impossible to tell from the catalogue whether this copy of *Cosmotheoros* is a 1698 first edition, or a later publication. However, Huygens was a familiar and respected name amongst Royal Society members and was himself elected to Fellowship in 1663. Therefore, I would suggest that it is highly probable that Sir Christopher Wren would have purchased a copy of his *Cosmotheoros* when it was first published. Even if this is a later edition, the subject matter makes it very likely that this volume was owned by Sir Christopher Wren rather than his son. Both texts contain ideas linked to the concept of a world in the moon. Hooke's use of Earth analogies in the last observation contained in *Micrographia* has been discussed above, but *Cosmotheoros* is entirely on this subject: Huygens's argument against life on the moon only leads on to his expectation of life elsewhere in the Universe. Moreover, coming as it did at the end of a

[56] Downes, section on 'Christopher Wren (1675–1747)'.
[57] Cock and Langford. *Micrographia* is listed on p. 6 as item 108; *Cosmotheoros* is listed on p. 9 as part of item 212.

century of speculation on this topic, the work provides a neat summary of, and close to, the previous years of conjecture. Nevertheless, the owner of these two books could not fail to be aware of the issues surrounding the concepts of life on the moon and the debate on the plurality of worlds.

The final group of items consists of twelve volumes of the Royal Society's *Philosophical Transactions*.[58] The aim of this publication was to keep its readers up-to-date with 'progress of the Studies, Labours, and attempts of the Curious and learned in things of this kind, as of their compleat Discoveries and performances' in the world of natural philosophy.[59] This meant that copies would be obtained as close to the date of publication as possible, so that the purchaser had access to the latest news. Whilst acknowledging the slower rate of news circulation in this period compared to today, it would still follow that the older a volume became, the less desirable it would have been to purchase. Therefore, it can be deduced that at least the earliest volumes of the journal would have belonged to Sir Christopher Wren rather than his son. The volumes included in this small collection are volumes 1-4, published between 1665 and 1669, and volumes 11-18, published between 1676 and 1694. I would suggest that the first four volumes can be attributed to the senior Christopher Wren's library with some certainty, as they were published before the birth of his son. A number of articles printed in these four volumes touched on topics that were indirectly related to the idea of extraterrestrial life: for example, 'heads' (or suggested topics of interest) for travellers looking to contribute to building natural histories of strange and wonderful places, as discussed in Chapter 3, or questions for specific destinations, such as Hungary and Transylvania, the Antilles and Japan.[60] Volume 3 also includes an extract which describes previously unknown creatures viewed in their new tiny world through a microscope.[61] However, the first volume, in particular, contains a number of more direct references. For example: 'Monsieur

[58] Ibid., p. 17. These volumes are all listed together under item 506.
[59] 'The Introduction', *Philosophical Transactions*, 1 (1665), 1–2 (p. 2).
[60] Boyle, 'General Heads', pp. 186-189; Thomas Henshaw and Abraham Hill, 'Inquiries for Hungary and Transylvania', *Philosophical Transactions*, 2 (1666), 467–72; 'Enquiries and Directions for the Ant-Iles, or Caribbe-Islands', *Philosophical Transactions*, 3 (1668), 634–39; M.I., 'Some Observations Concerning Japan, Made by an Ingenious Person That Hath Many Years Resided in That Country', *Philosophical Transactions*, 4 (1669), 983–86.
[61] 'Two Extracts out of the Italians Giornale de Letteri; ... the Other, Concerning a Microscope of a New Fashion, Discovering Animals Lesser than Any Seen Hitherto', *Philosophical Transactions*, 3 (1668), 840–42.

Auzout's Speculations of the Changes, Likely to be Discovered in the Earth and Moon, by their Respective Inhabitants', which considers seasonal changes and erupting volcanoes amongst other large-scale events, and at least two direct analogies between the Earth and other planets in terms of their turning about an axis.[62] Additionally, there is also an exchange between Adrien Auzout and Robert Hooke about an instrument for grinding telescope lenses. In this exchange, the Frenchman reportedly states 'that we are yet very far from seeing *Animals &c.* in the *Moon*, as Monsieur *Des Cartes* gave hope, and Mr *Hook* despairs not of'[63] to which Hooke later retorted:

> [...] for his good wishes, that those, who promise to make him see *Plants* or *Animals* in the *Moon* (of which I know not any, that has done so, though perhaps there may be some, notwithstanding his Objections, that do not yet think it impossible to be done) had considered; what a Man is able to see with his *bare* Eye at 60 Leagues distance: I cannot but return him my wishes, that he would consider the difference between seeing a thing through *Gross* and *Vaporous* Air neer the Earth, and through the Air over our heads [...][64]

Perhaps not the most genial of philosophical discussions, but the crucial point is that it is not the idea that plants or animals could be living on the moon that is controversial here. Indeed, this seems to be a natural reference to drop into a conversation as, in itself, it draws no remark at all. Not even from the editor of the *Philosophical Transactions*, who was responsible for selecting these items for publication. What is being disputed is the ability of current technology to *see* such organisms. This implies an unstated acceptance of the idea of life on the moon amongst the philosophical community at this time; not necessarily a *belief* in moon life, but certainly a recognition of it as a cultural norm and as an unexceptional topic to introduce into astronomical debate.

The discussion thus far has focused on the sale catalogue of Sir Christopher Wren's library. However, despite not being drawn from his own records, there is other evidence that exists which can be used to infer Wren's awareness of these concepts. In particular, Robert Hooke's diary indicates a close acquaintance between Hooke and Wren. There are

[62] Adrien Auzout, 'Monsieur Auzout's Speculations of the Changes, Likely to Be Discovered in the Earth and Moon, by Their Respective Inhabitants', *Philosophical Transactions*, 1 (1665), 120–23.
[63] Adrien Auzout, 'Considerations of Monsieur Auzout upon Mr. Hook's New Instrument for Grinding of Optick-Glasses', *Philosophical Transactions*, 1 (1665), 57–63 (p. 60).
[64] Robert Hooke, 'Mr. Hook's Answer to Monsieur Auzout's Considerations, in a Letter to the Publisher of These Transations', *Philosophical Transactions*, 1 (1665), 64–69 (p. 68).

a number of entries in which Hooke refers to being in Wren's company, whether out walking, or at a coffee shop meeting. For example: 'Told Sir Chr. Wren flying module [...]' on 31st May 1679, or 'At Bruin's coffee house with Sir Chr. Wren about planetary catena [...]' on 21st October the same year. [65] I have outlined, above, Hooke's apparently strong interest in the topic of life on the moon and it would be surprising to suppose that this subject never arose in conversation between them. Indeed, Hooke's diary entry for 1st January 1675/6, which I quoted above, establishes that Hooke and Wren debated the presence of water on the moon on at least one occasion.

John Flamsteed (1646 – 1719)[66]

John Flamsteed was the first person to be appointed to the post of Astronomical Observator, later known as Astronomer Royal, when it was created by Royal Warrant on 4th March 1675.[67] His work focused on taking astronomical observations and producing a new, far more accurate, star chart than had previously been available, as part of the search for a method of determining longitude at sea. However, Flamsteed's position also highlighted him as an authority on astronomical matters, and he spent time corresponding with other astronomers, and providing advice to those who asked for it: for example, in the summer of 1673, James Gregory requested and received advice from Flamsteed on the best instruments to obtain for the new observatory at St. Andrews.[68] Like Wren, he left very little in the way of personal insight behind him, despite the notebooks and large amount of correspondence that are still extant. The introduction to Volume 1 of his edited correspondence goes some way to explaining this apparent contradiction by underlining the fact that many of his letters:

> [...]cannot be regarded strictly as private documents. It was not only that a letter might be intended to be read at a Royal Society meeting, or might be addressed to one person but designed to be shown to another [...] ; at a more informal level, letters conveying astronomical information were commonly and routinely shared by the recipient with any interested friends. Many of the

[65] Robinson and Adams, pp. 414 and 428.
[66] A general biography of John Flamsteed is available: Frances Willmoth, 'Flamsteed, John (1646–1719)', *Oxford Dictionary of National Biography* (Oxford: Oxford University Press, 2004) <http://www.oxforddnb.com/view/article/9669> [accessed 15 April 2017].
[67] Ibid.
[68] *The Correspondence of John Flamsteed, First Astronomer Royal*, 1; 1666–1682; Gregory's letter dated 16 July 1673, pp. 225-227; Flamsteed's response dated 2 August 1673, pp. 233-238.

> ostensibly private letters reproduced here must thus be recognized as playing a part in Flamsteed's life as a public figure. [...] Information about more genuinely private matters can only be assembled from scattered scraps, which are often disappointingly slight.[69]

Thus, it is hardly surprising that more personal thoughts and opinions are somewhat harder to find. Aside from a single reference to the moon having an atmosphere in a letter to Richard Towneley, dated 16th March 1674/5, Flamsteed makes no mentions of any idea associated with the concept of life on the moon in his correspondence.[70] He does, however, make references to two publications which touch on some of those ideas. In a letter to Lord Brouncker, dated 24 November 1669, Flamsteed praises Hooke's *Micrographia* and, in two later letters to Isaac Newton, he mentions Kepler's *Ad Vitellionem Paralipomena*. The relevant details regarding both of these have been discussed above.[71]

Additionally, Flamsteed compiled lists of the books he owned prior to 1685, which can be found in his notebooks amongst various lunar observations and calculations.[72] These show that he owned copies of both the titles he referred to in his letters. Moreover, he owned a copy of the 1674 edition of Peter Heylyn's *Cosmography,* the fourth book of which ends with a discussion of fantastic lands, including the 'New World in the Moon'.[73] This particular passage is reasonably brief, but includes reference to Lucian's *A True Story*, as well as to the contemporary discussions of the moon as another Earth with inhabitants 'of divers Languages, Customs, Polities and Religions'.[74] Despite the fact that Heylyn is obviously not entirely convinced of a moon-world's existence, believing that 'there are stronger hopes of finding a New World in this *Terra Australis* then in the body of that

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[69] Ibid., p. 7.
[70] Ibid., p. 330.
[71] Ibid., pp. 16-17, and *The Correspondence of John Flamsteed, First Astronomer Royal*, 2; 1682–1703. Letters referred to are dated 6 December 1694 (p. 537) and 10 December 1694 (p. 540).
[72] 'Papers of John Flamsteed: A Book of Lunar Calculations, Also Used for Copies of Scientific Correspondence', 1674, The National Archives, Kew, RGO 1/42, pp. 186^{v}-191^{r}, and 'Papers of John Flamsteed: A Letter-Book Containing Copies of Letters', 1676, The National Archives, Kew, RGO 1/43, pp. 24^{v}-28^{v}.
[73] Eric G. Forbes, 'The Library of the Rev. John Flamsteed, F.R.S., First Astronomer Royal', *Notes and Records of the Royal Society of London*, 28.1 (1973), 119–43 (p. 129). The edition owned by Flamsteed was the fourth edition; the first edition was published in 1652. Peter Heylyn, *Cosmography in Four Books Containing the Chorography and History of the Whole World, and All the Principal Kingdoms, Provinces, Seas, and Isles Thereof* (London: Printed for Philip Chetwind, and Anne Seile, 1674), p. 473.
[74] Heylyn, p. 473.

Planet', he appears willing to keep an open mind on the matter.[75] Flamsteed's acquaintance with these books does not demonstrate belief on his part, either, but it can be inferred that the concept would have been a familiar one to him.

Isaac Newton (1642-1727)[76]

Of the natural philosophers I have chosen to examine, Isaac Newton is perhaps the most instantly recognisable name to modern readers. An eminent mathematician with strong interests in optics and astronomy, Newton held the Lucasian Chair of Mathematics at Cambridge University from 1669 until 1701, became a fellow of the Royal Society in 1672 and, later, its president from 1703.[77] He was the first person to make a working reflecting telescope, one of which is still held in the Royal Society's collections.[78] In 1687 he published his *Philosophiæ Naturalis Principia Mathematica*, which explained a large number of previously mysterious physical phenomena such as tides, the orbits of comets, and motions of the moon.

Whilst large numbers of Newton's papers are still extant it is, once again, information about his own library and small details contained in his letters that provide the most insight into his potential engagement with the concept of life on the moon. John Harrison, in his 1978 book *The Library of Isaac Newton*, stressed that Newton's library was a working one: the books he owned were for reading and using in his work, and not simply there as part of a collection or for decorative purposes. Indeed, Newton marked passages that he felt were particularly noteworthy using a system of dog-earing and he also made notes on some works in his wastebooks.[79] One of those works was Hooke's *Micrographia*. Although Harrison's volume does not show that Newton owned a copy of this publication, there is evidence in his papers and his correspondence to indicate that

[75] Ibid.
[76] A general biography of Isaac Newton is available: Richard S. Westfall, 'Newton, Sir Isaac (1642–1727)', *Oxford Dictionary of National Biography* (Oxford: Oxford University Press, 2004) <http://www.oxforddnb.com/view/article/20059> [accessed 17 April 2017].
[77] Ibid.
[78] Newton's reflecting telescope, which he presented in 1671, is held as part of the Royal Society's scientific instruments and objects collection, reference MO/1.
[79] John Harrison, 'Newton's Library: Identifying the Books', *Harvard Library Bulletin*, XXIV.4 (1976), 395–406 (pp. 400 and 404).

he was familiar with it.[80] In one of his notebooks, Newton has copied extracts from *Micrographia*, but also added his own thoughts (for example: 'Though Descartes may bee mistaken so is Mr Hook') demonstrating not only familiarity, but active engagement with the text.[81] Additionally, Newton refers to this work a number of times in letters written to Henry Oldenburg, then Secretary to the Royal Society.[82]

Nevertheless, there are a number of books listed in Newton's library that are of interest to this research. A copy of *Sidereus Nuncius*, included within a 1682 third edition of Pierre Gassendi's *Institutio Astronimica*, and a first edition of Huygens's *Cosmotheoros* have the strongest significance, but a 1692 edition of John Ray's *The Wisdom of God Manifested in the Works of the Creation* is also listed.[83] This text mentions the possibility of life on the moon quite briefly, but the author is of the opinion that it is very likely to exist, and refers the reader to Wilkins's *The Discovery of a World in the Moon* and Fontenelle's *Entretiens sur la Pluralité des Mondes* for further information:

> Secondly, The *Moon*, a Body in all probability somewhat like the Earth we live upon [...] Did this *Luminary* serve to no other ends and uses, as I am perswaded it doth many, especially to maintain the Creatures which in all likelihood breed and inhabit there, for which I refer you to the ingenious Treatises written by *Bishop Wilkins* and *Monsieur Fontenelle* on that subject, yet these were enough to evince it to be the Effect and Product of Divine Wisdom and Power.[84]

Newton would have been familiar with the names of Wilkins and Fontenelle as, respectively, a founding Fellow of the Royal Society and a Fellow of the Académie des Sciences, the Royal Society's French equivalent. Additionally, a third edition of Jean de la Bruyère's *Caractères* is identified as belonging to Newton's library.[85] As discussed in Part

[80] Newton's books were sold after his death and changed hands a number of times, leading to their dispersal. It is also feared that many of them were destroyed without record, so it is unlikely that a definitive catalogue of his library can ever be created. See: R. de Villamil, 'The Tragedy of Sir Isaac Newton's Library', *The Bookman*, March 1927, 303–4.
[81] Isaac Newton, 'Newton Papers: Early Papers', 1665, Cambridge University Library, MS Add.3958, fols. 1^{r}-4^{r}. The direct quote given can be found on fol. 1^{v}.
[82] *Correspondence of Isaac Newton*, ed. by H. W. Turnbull, 7 vols. (Cambridge: Cambridge University Press, 1959), 1: 1661–1675. Specific examples can be found in letters dated 6th February 1671/2, 21 May 1672, 11 June 1672 and 21 December 1675.
[83] Harrison, *The Library of Isaac Newton*, p. 147, p. 165 and p. 224.
[84] John Ray, *The Wisdom of God Manifested in the Works of the Creation* (London: Printed for Samuel Smith, 1692), pp. 56-57.
[85] Harrison, *The Library of Isaac Newton*, p. 173.

Two, this volume contains a brief reference to life on the moon in its Chapter 16 on 'Des Esprits Forts'. However, this edition is dated 1702 which falls just outside the scope of this research and, therefore, must be discounted.

As well as contemporary works discussing life on the moon and the plurality of worlds, Newton's library contained two different copies of the works of Lucian, dated 1615 and 1687, the latter of which is likely to be the same edition as those listed in the sale catalogues of Edmond Halley and Christopher Wren.[86] This later edition of Lucian contained both books of *A True Story*, as discussed previously, and it is probable that the earlier edition would have done so, as it described itself as 'Opera omnia quæ extant' (all works which exist).[87] Newton's library also contained a multi-volume copy of the works of Plutarch which, I would suggest, appears to be the same 1572 Henri Estienne edition as the one found in the sale catalogue of Halley's library.[88] The Plutarch is described in a similar way ('Quæ extant opera') and it is known that this edition contained the *Moralia* in both Greek and Latin. Therefore, it can be concluded that it contained *Concerning the Face which Appears in the Orb of the Moon*. Indeed, whether Newton read Plutarch's tract in his own book, or elsewhere, he was certainly familiar with it. H.W. Turnbull, the editor of most volumes of Newton's published correspondence, highlights the fact that he quoted a number of passages from *Concerning the Face which Appears in the Orb of the Moon* 'in composing his unpublished Scholia to Propositions 4-9 of the third book of the *Principia*'.[89]

Newton's extant correspondence provides two small indications of his thoughts regarding the possibility of life on the moon or elsewhere. The first, contained in a letter to Thomas Burnet written in January 1680/1, demonstrates that extraterrestrial life was not something that he considered impossible. As part of a discussion on the literalness of Moses's description of creation, Newton writes:

> So when he tells us of two great lights & the stars made ye 4th day, I do not think their creation from beginning to end was done ye fourth day nor in any

[86] Ibid., p. 183.
[87] Ibid., p. 183. The translation is mine.
[88] Ibid., p. 219.
[89] *Correspondence of Isaac Newton*, ed. by H. W. Turnbull, 7 vols. (Cambridge: Cambridge University Press, 1961), 3: 1688–1694, p. 198, n. 3.

> one day of ye creation nor that Moses mentions their creation as they were physical bodies in themselves some of them greater then this earth & perhaps habitable worlds, but only as they were lights to this earth [...][90]

The second of these indications appears in a letter regarding the atmosphere of comets, written to James Crompton the following month, and intended to be brought to John Flamsteed's attention: 'But our earth is half covered over wth water & so is ye Moon in a manner'.[91]

Despite the difficulties of seeking evidence in the incomplete personal papers and records of these six natural philosophers, I would suggest that it is significant that each one of them has been demonstrated to have, at the very least, an awareness of the concept of life on the moon. Every man was familiar with either Hooke's *Micrographia* or Kepler's *Ad Vitellionem*, or both works. Moreover, half of them owned copies of Huygens's *Cosmotheoros*, which dealt with the topic in much greater depth. What can be inferred here, while remembering that this is a reasonably small sample to draw from, is that it was common for natural philosophers of the period, who were involved in astronomy, to own, or at least read, texts which cover the topic of life on the moon or the plurality of worlds debate. Additionally, in some cases, such as Robert Hooke's extensive collection of texts treating this topic, there is evidence to suggest a much more active interest. The influence of the texts on these natural philosophers cannot be pointed at directly; in their extant records, none of them has made an overt link connecting their work on the telescope to a desire to seek out inhabitants beyond Earth. However, what has been seen is that the idea was certainly embedded within the consciousness of these natural philosophers. There are both direct and indirect references within letters and *Philsophical Transactions* articles which would have been read widely by Royal Society Fellows. Conversations regarding water and an atmosphere on the moon, and a description of vegetable matter on its surface are unlikely *not* to have been connected by natural philosophers to the next logical step: that those ingredients would provide the right environment for some type of life beyond Earth. Indeed, these elements are discussed in exactly this way by Christiaan Huygens in his *Cosmotheoros*, for example:

[90] *Correspondence of Isaac Newton*, ed. by H. W. Turnbull, 7 vols. (Cambridge: Cambridge University Press, 1960), 2: 1676–1687, p. 331.
[91] Ibid., p.345.

> Here then we have found in these new Worlds Fields warm'd by the kindly Heat of the Sun, and water'd with fruitful Dews and Showers [...] And what Nourishment, what manner of Growth shall we allow them? Why, I think there can be no better, nay no other, than what we here experience; by having their Roots fastned into the Earth, and imbibing its nourishing Juices by their tender Fibres [...] 'Tis much the same in Animals as 'tis in Plants, as to their manner of Nourishment [...] all feed on Herbs, or Fruits, or the Flesh of other Animals that fed on them [...][92]

Moreover, I would suggest that the influence of the ideas articulated by these texts can be assessed, to some extent, by whether they are also evident in works *produced* by natural philosophers. From the natural philosophers I have investigated, above, the example of Robert Hooke is prominent as the author of *Micrographia*. However, a consideration of the texts at the centre of this research demonstrates that this is not at all uncommon. Even leaving aside Kepler's striking picture of life on the moon in *Somnium*, which may have been partially created before Galileo's work, there are three texts at the core of this research whose authors were themselves natural philosophers and Fellows of the Royal Society: *The Discovery of a World in the Moone* (Wilkins), *Entretiens sur la Pluralité des Mondes* (Fontenelle), and *Cosmotheoros* (Huygens).[93]

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[92] Huygens, pp. 28-30.

[93] Fontenelle was not elected to the Royal Society until 1733. He was, however, already a member of the French Académie des Sciences by the time of his election.

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PART FIVE

Conclusion

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Conclusion

In 1666, Isaac Newton began to experiment with light and discovered that sunlight would split into a rainbow of colours when passed through a glass prism.[1] This was the revelation of optical refraction. Bending white light in this way transforms it and, at the same time, directs it along new pathways. I have proposed in this thesis that Galileo's publication of *Sidereus Nuncius* in 1610 was the central prism in a cultural refraction of both the telescope, and of the concept of life on the moon as depicted in literature, drama and philosophy in the seventeenth century.

My examination of representations of life on the moon written before and after 1610 led to the identification of four specific differences between the two periods, as discussed in Part Two. Firstly, in comparison to earlier texts, those written after 1610 demonstrate an increasingly material approach in their representations. The moon has become an exclusively geographical place, a location rather than a character, and its inhabitants are no longer spiritual or mythical, but social, physical beings. Secondly, those beings have lost the 'otherness' common to earlier representations and, in many cases, have taken on a human, or at least recognisably human-like, persona. Thirdly, a difference in authorial approach was identifiable between the two periods. Authors writing after 1610 display a much less Earth-bound attitude than those writing before: there is a common theme of exploring beyond Earth, both physically and virtually, as well as exploring the implications of the new possibilities. Whether expressing or refuting them, religious anxieties were a key subject of exploration for authors during this period. Finally, an increasing realism is recognisable after 1610, both in terms of fictional authenticity and in the way proof is presented, or demanded, by a range of texts. This culminates, at the end of the century, with Christiaan Huygens's attempt to isolate the emerging scientific discourse from other cultural discourses, such as literature. By this time, lunar inhabitants had begun to fade into a mere framework, or plot device, rather than being a core subject for literary

[1] Isaac Newton, 'A Letter of Mr Isaac Newton, Professor of the Mathematicks in the University of Cambridge; Containing His New Theory about Light and Colours: Sent by the Author to the Publisher from Cambridge, Febr. 6. 1671/72; In Order to Be Communicated to the Royal Society', *Philosophical Transactions*, 6 (19th February 1671/72), 3075–87.

discourse, as can be seen in the works of Butler, Behn and Settle. However, Huygens was to sound their death knell. On reviewing the evidence in his *Cosmotheoros*, Huygens is unable to persuade himself that the moon has either water or an atmosphere and concludes, somewhat sadly, 'I cannot imagine how any Plants or Animals [...] can thrive in a dry, waterless, parch'd Soil'.[2] Despite his obvious discomfort at the thought of the moon having no purpose, he is at a loss at how to proceed except by 'mere guesses'.[3] The best Huygens is able to do is to create conceptual inhabitants on the moon to use as a tool in providing demonstrations, as if from the moon's perspective. These inhabitants serve as a viewpoint and nothing more. To all intents and purposes, the lunar population has truly disappeared. The inhabitants of the moon are no longer just being ignored in lieu of better evidence by La Bruyère, or used as a convenient plot device by Settle and Behn. Instead, Huygens has deliberately and carefully reasoned them out of existence.

There is a danger here of imposing a false narrative on my analysis of these texts: a neat story that tells of the rise and fall of moon literature, coming to a satisfying conclusion at the end of the seventeenth century. The pattern that I have identified is certainly traceable within the specific texts selected for this research, but it is important to acknowledge that this cannot be viewed as a general theory of all seventeenth-century moon literature. It is possible that further investigation, using different texts to test my hypothesis, may demonstrate an alternative shape to moon literature in this period. For example, some of the texts which were not selected for full analysis in this thesis, such as More's *Democritus Platonissans*, or Bentley's *The Folly and Unreasonableness of Atheism*, or, indeed, treatment of non-English works in their original language, may prove fruitful for further research. Moreover, I believe that a study of the British Library manuscript, *Selenographia: the Lunarian, or Newes from the World in the Moon to the Lunaticks of this World*, which was excluded from this research for reasons of non-publication and lack of provenance, would also provide a welcome addition to knowledge in this subject area. It is a manuscript that is mentioned periodically in scholarly writing – despite being dismissed by Nicolson as 'not worth publishing', 'tedious in the extreme' and 'rightly

[2] Huygens, p. 131-132.
[3] Ibid, p.133.

neglected' - but which, to my knowledge, has never been investigated in any depth.[4] Approaching *Selenographia* with a different critical viewpoint from Nicolson's would allow this manuscript to be viewed as a product of its culture, with the potential to provide insight into the cultural imagination that generated it. Nevertheless, I would suggest that an amendment to the criteria for text selection in future research would undoubtedly lead to an expression of the complexity and chaotic nature of the development of cultural ideas. This would reveal in a more detailed manner the varying rates at which new concepts were rejected or celebrated by different people, as the century progressed.

My case study of Kepler's work, which investigated the differences between his pieces composed before and after 1610, gestured towards this greater cultural complexity through his writing's deviation from the pattern identified in the other examined texts. There are a number of reasons why this could be the case. Kepler is unusual in the fact that he was already thinking about the moon as a physical place, part of the Copernican universe, from at least as early as 1593 when he wrote his university dissertation. He had already made his own observations of the moon, as recorded in his *Astronomia Pars Optica* in 1604, and had considered using lunar inhabitants as a 'view point' from which to provide proof of astronomical theories. This was a technique, as we have seen, that Huygens did not employ until almost the end of the century. In other words, the ideas were already familiar to Kepler and, in that sense, he was ahead of other writers in considering them. However, the study concluded that changes did occur around 1610 which made a difference to the way in which he wrote about life on the moon after this date.

A wide range of factors contributed to the specific way in which depictions of life on the moon emerged in the seventeenth century, as discussed in Part Three. A unique set of circumstances appears to have converged to produce a literary product that was to last less than one hundred years. Travel and the travel writing genre provided an especially strong model for moon literature, but also for its accelerated reduction in popularity after

[4] Nicolson, *Voyages*, pp. 154-156. Apart from Nicolson, mentions of this manuscript can be found in, for example, Roberts, p. 47, *The Routledge Companion to Science Fiction*, ed. by Mark Bould and others (London: Routledge, 2009), p. 8, and Joseph Arrowsmith, *The Reformation*, ed. by Juan A. Prieto-Pablos and others (Barcelona: Edicions de la Universitat de Barcelona, 2003), footnote on p. 113.

the Restoration. Joan-Pau Rubiés's description of travel literature as a 'genre of genres' would also be a perfectly good summation of these moon texts: they subsume and connect to such a large part of the cultural picture that it is difficult in many ways to break those influences down into separate components.[5] Additionally, the large number of English social changes that took place during the seventeenth century had a significant impact. The disillusionment and scepticism prevalent at this time, in response to the instability and uncertainty in society, can be seen reflected in the exploration of social issues in the worlds and cultures depicted on the moon: a searching for solutions, or simply a venting of frustrations. The changing attitude to natural philosophy and its practitioners also had an impact. Astronomical ideas were popular in the seventeenth century: as a percentage of the total number of published books, more books on astronomy-related topics were published in the seventeenth, than in either the sixteenth or eighteenth centuries. This period seems to have encapsulated a sudden peak in popular interest, with representations and discussions of life on the moon at the centre. As more books were published exploring or explaining the new cosmological theories and the implications of intelligent life elsewhere in the universe, they fertilised the imagination of other writers, until the very popularity of the concept led to its ultimate downfall.

The doubts that surrounded vision and visual experience at the start of the seventeenth century were problematic for natural philosophy. It was necessary to find an acceptable means to use visual encounters in an evidential way and this resulted in the development of a 'good enough' approach to vision, within carefully laid out conditions. The telescope, as a new visual instrument, was, unsurprisingly, caught up in this wider debate. However, Galileo's work on improving the original Dutch telescope came at a time when it was not only just possible to make such improvements, but also at a time when the prevailing attitude was beginning to turn towards developing a level of trust in visual perception once more. As observed in Chapter 8, this was a crucial piece of serendipity.

However, it is interesting to note that, just as natural philosophy began to find ways to deal with the fear of imagination and hallucination interfering with visual evidence, the

[5] Rubiés, 'Travel Writing as a Genre', p. 6.

telescope introduced a new kind of astronomy: one removed from measurement and calculation, which had to rely on the imagination in order to share observational results. To share the private experience of his telescopic observations, and promote their significance, Galileo had to attempt to engage his readers' imagination in a way that allowed them to recreate the results of his observations for themselves. The enthralling text, his use of striking and memorable images, and the carefully designed diagrams and drawings, all worked together in *Sidereus Nuncius* to achieve this – perhaps even more effectively than Galileo had planned. Not only did he win the patronage that he had hoped for, and become known throughout the world of natural philosophy, but Galileo's work was followed by the creation of a number of literary and philosophical representations of life on the moon which took inspiration from the revelations of *Sidereus Nuncius*.

Despite the appearance of various common factors in the moon literature of the period, the impact of the telescope and its introduction to the wider public via *Sidereus Nuncius* was absolutely central to the conception of these texts. Moreover, Chapter 6 demonstrated that four of the five texts written prior to the Civil War – those by Donne, Jonson, Godwin and Wilkins – could not have been created without this impetus, and that the portions of the fifth text, Burton's *Anatomy of Melancholy*, which focus on the concept of extraterrestrial life are absolutely dependent on Galileo's work. Therefore, I would argue that the telescope played an extremely significant role in the shaping of these English representations of life on the moon. The three English texts written after the Civil War, however, show a different level of connection. While none of them can be directly linked to Galileo's work, as the earlier publications can, both Behn and Butler's works demonstrate a strong involvement with the telescope as it was perceived at the time, making full use of its cultural symbolism and inherent flaws. Only Settle's play has no demonstrable correlation with *Sidereus Nuncius* or the telescope. Nonetheless, *The World in the Moon*'s title, as well as the featured entertainment, suggests an engagement with the popularity of the contemporary moon-world trope that was so prevalent in the cultural imagination of the seventeenth century.

Cultural imagination, including the moon literature at the heart of this thesis, was an influential factor in the development of the telescope, as discussed in Part Four.

Depictions of life on the moon, and the ideas they encompass, pervaded cultural thinking and imagination during this period: these texts not only borrowed ideas from other cultural discourses, but fed new material back in. This becomes particularly significant when their impact on the development of the telescope is considered. The cultural environment shaped both when and how the telescope was able to develop, showing that the birth of the telescope was certainly linked to the prevailing culture of the time. However, examining the level of awareness of these ideas in key individuals responsible for the development of the telescope, and related astronomical practices, reveals not simply a passing familiarity but a particular knowledge of these theories within the realm of natural philosophy. From the books they owned, to the professional journal articles they read, and the natural references made to the concepts in letters and conversations, it can be confidently supposed that these ideas were embedded in the consciousness of those individuals. Additionally, it is noteworthy that a number of the texts discussing life on the moon and associated ideas were themselves written by members of the natural philosophy community. Moreover, three of these writers are strongly associated with the development of the telescope: Kepler, Hooke and Huygens.

Although a direct, unarguable, connection cannot be exposed, this evidence would suggest that culture and the cultural imagination did indeed have an impact on the development of the telescope. At the beginning of Chapter 8, I suggested that moon literature had a pervasive, though subtle, impact on the telescope's development. Here, I would like to add to this by proposing that culture, and the cultural imagination, was the most influential of the various factors that shaped the telescope. There are a number of reasons for this. Firstly, while the other factors considered in Chapter 7 helped the telescope to form in specific ways, the instrument was shaped by culture in a far more generic, and wide-ranging, way. For example, although the conflict between the Dutch and the Spanish in the early 1600s provided an opportunity for Lipperhey's discovery to be unveiled in the powerful atmosphere of the States-General, it was the crucial serendipity of the cultural environment, and the cultural provision of the requisite imaginative building blocks, that enabled such an innovation to happen in the first place. Secondly, the extreme subtlety and pervasiveness of cultural influences should not be underestimated. It is difficult, perhaps impossible, to reject culturally embedded

assumptions and perceptions without first being conscious of them. Indeed, although I have endeavoured throughout this research to let the texts and other evidence speak for themselves, it has, nevertheless, been important to recognise my own bias as a researcher towards, for example, the concept of cultural interconnectivity. This has been necessary as a way of disciplining myself against the temptation to construct interpretations that are supported only by my own assumptions, rather than by the evidence I have gathered. I have discussed the fact that the scientists of the day were as subject to cultural influences as anyone else during the period. But, I would also suggest that astronomers were even more influenced by the concept of life on the moon than anyone else: they spent their nights gazing at the universe, and their days thinking and writing about it. It would be surprising to think that when the concept came up in books, or plays, or a letter from a colleague, that they would not be inclined to think more deeply on the matter than someone for whom it was merely an interesting diversion. Thirdly, as Aït-Touati has stated in specific reference to literary representations of life on the moon, 'the most powerful texts for establishing the truth of the new astronomy are fictions'.[6] Without these texts facilitating the establishment of belief in the new visual astronomical practices, practices which could not be corroborated in any other way, the telescope may have remained an amusing toy rather than becoming a trusted scientific instrument.

Furthermore, as well as their persuasive element, another key ingredient that these texts brought to seventeenth-century culture was the expression and continual regeneration of the wonder and curiosity initially sparked by *Sidereus Nuncius*, a spark that inspired the passion of early modern astronomers to keep looking further into God's celestial works. In a way, the representations of life on the moon provided the impetus required for the telescope to keep developing. Without such impetus, it is possible that efforts may have foundered in the face of both difficult challenges, such as the seemingly insoluble problems of chromatic and spherical aberration, and the growth of popular scorn, as demonstrated by various representations of virtuosi towards the later part of the

[6] Aït-Touati, p. 17.

century.[7] Moreover, I would suggest that the tantalising element of possibility found in moon literature encouraged those continual efforts to make improvements and achieve better results - simply, to find out *more.* And the more astronomers found out, the more possible those representations of life on the moon must have seemed, as if the beings they depicted were, perhaps, only just out of sight.

An examination, both of the ways in which moon literature and the telescope developed during the seventeenth century, and of the factors which influenced their respective developments, serves to underline the connections between them. For example, the depictions of life on the moon demonstrate a growing element of exploration after 1610. As discussed in Chapter 3, this was heavily influenced by the increase in travel, and travel literature, leading up to this period. And yet, exploration and travel were also key influences in the development of the telescope. Likewise, the growth of experimentalism had an undoubted effect on the way in which the telescope changed, but one of the distinguishing features of post-1610 representations of life on the moon is the shift towards an empiric realism in their presentation. Perhaps this is not so surprising, considering they are both aspects of the same culture. However, the resonance between them is unmistakeable. I would suggest that the linchpin in the persistence of this, throughout the century, were those natural philosophers who were most involved in astronomical matters. Not only were they producers and consumers of the telescope, but also producers and consumers of the various forms of moon literature. For a brief period, the cycle of consumption and production became self-perpetuating, only ceasing when the cultural environment itself changed. Huygens provides the first clue to the extent of that environmental change in his attempt to differentiate between his own work and the 'pretty Fairy Stories' of life on the moon.[8] This splitting of disciplines signals a new chapter in the continuous evolution of the cultural environment and may even indicate a new point of cultural refraction at which the telescope and moon literature once more begin to diverge.

[7] For example, Doctor Baliardo in Behn's *Emperor of the Moon*, and Sir Nicholas Gimcrack in Shadwell's *The Virtuoso*.
[8] Huygens, p. 3.

I have touched on some areas for future research already, which look mainly at expanding the scope of the material against which to test my hypothesis. I would argue that an examination of my research questions against an expanded European backdrop – not only in terms of text selection, but also in examining the wider cultural context of seventeenth-century moon literature and the early telescope – would provide a broader picture of both of these pan-European phenomena. Indeed, looking at the potential cultural influences on contemporary European natural philosophers, rather than just the British individuals considered here, would potentially provide insight into the relative weight carried by English moon literature and telescopic innovation throughout Europe during this period.

There are also some topics which have arisen in the course of this research which I have only been able to consider fleetingly, solely at the point they have overlapped directly with the subject of this thesis. For example, Chapter 4 looked at religion as one example of the social changes taking place in England during this period and very briefly explored the connection outlined by Hill and Roberts between Protestantism and seventeenth-century science and astronomy. In the small sample of authors I used this was apparently borne out, but the statistical insignificance of such a sample, together with the huge variability of individual human experience, tends to prompt more questions than such a brief consideration could answer. In this case, further detailed research would be needed to assess whether there is any firm ground on which to make such claims in terms of seventeenth-century moon literature. The connection between representations of life on the moon during this period and the story of the green children of Woolpit would also bear further investigation. Although this has not been touched upon directly in the course of this thesis, it has arisen on a number of occasions during my research for this project. Both Burton and Godwin refer directly to this story in their texts which have been analysed for this thesis. These two references have been incorporated by John Clark into his 2006 article on the history and transmission of the story.[9] Yet, other potential references are not included: for example, the stage direction at the end of Act I in Settle's *The World in the Moon* which refers to dancing swans and green men. This is ostensibly a

[9] John Clark, '"Small, Vulnerable ETs": The Green Children of Woolpit', *Science Fiction Studies*, 33.2 (2006), 209–229.

reference to the gansas and indescribably coloured Lunars in Godwin's work, but Godwin never refers either to the Lunars as being green, or even to the green children of Woolpit by name, in his text, so Settle has acquired the green element from elsewhere. It is interesting to note that the two different versions of this story, which originated in the twelfth and thirteenth centuries, were first published together in 1610. I would speculate that further research may uncover additional texts from this period making use of the story in the context of moon literature.[10]

Here, I would like to return to Marchitello's statement that 'the literary, for its part, can be said *to produce* the science'.[11] His full assertion is one of reciprocity, specifying that literature and science are discourses of equal cultural standing and each is, therefore, equally likely to impact the other. This thesis has demonstrated, in the specific case of the telescope and literary and philosophical representations of life on the moon, that this is indeed the case. Moreover, in the instance of some natural philosophers, who represent the point at which these two elements intersected most closely, the evidence appears to show a truly mutual development: not only did the moon literature culturally underpin their work but, in turn, they were inspired to produce moon-worlds of their own.

However, if the natural philosophers who came after him represented the closest point of intersection, then Galileo's *Sidereus Nuncius* must be regarded as the prism which set Renaissance moon literature, and the original perspective glass, onto their convergent pathways. Despite the impact of the various cultural elements discussed throughout this thesis, it is the refractive effect of Galileo's work which altered the direction in which each of these was to travel in the seventeenth century. The relationship between the telescope and representations of life on the moon is a complexly interconnected one, much like the wider cultural environment in which they were both to take shape. At first glance, there seems to be an obvious influence leading directly from the telescope to the moon texts of the period, but this is to look at both elements in a simplistic and superficial way. A deeper examination has revealed not only greater and, perhaps, rather unexpected detail in the influence the telescope lent to moon literature, but also the

[10] Ibid., p. 211.
[11] Marchitello, p. 352.

fundamental debt that the seventeenth-century telescope owed to the concept of life on the moon as it became suffused into the cultural imagination of the period. In this way, the publication of *Sidereus Nuncius* in 1610 can truly be considered a point of refraction.

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