

Journeys to the moon:

A study on cosmic travel stories in the early modern Renaissance period.

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Introduction

As long as mankind has existed, it has looked up to the night skies and wondered about the shining lights up there, the stars, the planets and the moon. The moon has fascinated mankind throughout our entire history. Humans have often speculated on the physical structure of the moon, its place in the universe and its influence on life on earth. The light of the moon has guided many a man on a dark night and it is no wonder that in some civilisations the moon was considered a goddess. Throughout history the moon has had several different names. The ancient Greeks¹ called her *Selene*, the daughter of *Hyperion* and *Theia*. Like her brother Selene drove a chariot through the sky, usually drawn by two horses. The goddess *Artemis* became associated with Selene, like her brother *Apollo* became associated with *Helios*. The Inuit-myths² say that the moon is a he and that it was possible to travel to the moon. They considered the moon to be both a celestial body and a mythical godlike figure that can travel. Whenever the moon visited the earth he could choose to bring a man or woman back with him on his dogsled. Some Inuit groups believed that the moon had influence on the migration of animals and the fertility. Whenever a taboo was broken the moon could grow angry and punish the Inuit by sending the animals away or making the women barren. Ancient Chinese mythology has two stories about the origin of the moon. The oldest story tells us how *Chang Xi* gave life to the twelfth moons in the West, which was considered to be wild, near the mountain Sunmoon. She bathed her children after their nightly journey through the sky. The second story tells us how *Chang E* was the spouse of the god *Yi*. She stole his elixir of eternal life, drank some of it and was carried off to the moon as a goddess.

Not only myths are involved when we are talking about the study of the moon. Astronomy is one of the oldest branches of scientific research. In early scientific notions the moon often posed a problem. Its waning and waxing confused the scientists who were sure the earth was the centre of the universe. In the 17th century the first known working telescopes were invented which allowed scientists to study the planets and the universe more precisely. This helped man to understand the universe and its complex scientific nature better. Science and especially the field of astronomy boomed in the 17th century. It is not surprising that some of the earliest and more famous literary works about travelling to the moon originate from that

¹ Mark P.O. Morford & Robert J. Lenardon. (2007) *Classical Mythology*. Eighth edition. New York , Oxford. Oxford University press.

² Editor in chief: Authur Cotterell. (2004) *Encyclopedie van de wereld mythologie*. 1999. United Kingdom, Bath. Parragon Books Ltd.

period of time where many astrological mysteries were solved, but many more remained. It is not surprising these stories originated in this period of time, but one can wonder as to what the function of these stories in this period of time was.

What is the function of cosmic travel stories in the early modern Renaissance period?

To discover the answer to this question several other questions have to be answered first. It is necessary, for example, to first define the difference between travel stories and imaginary travel stories. The cosmic travel story is part of the genre of imaginary travel stories and therefore they are closely related. To define the boundaries of the subgenre it is essential to have a certain amount of historical background information on the origin of travel stories and the way they differ from imaginary travel stories. With help of several studies upon narratives about journeys to the moon I hope to be able to define the cosmic travel story as a separate genre within the category of imaginary travel stories. Next I would like to give an historical background concerning the scientific worldview in the Renaissance period. This historical background is essential to understand the reasons and believes of the author of the narrative. These reasons and believes are influenced by scientific worldviews, religion and ideas about magic, like our scientific worldviews influence our thoughts and believes. Someone who would watch the sun rise and set without any knowledge of our solar system would think that the sun travels around the earth, rather than the other way around, but with our current ability to explore space, we now know that the earth in fact revolves around the sun and the difference between day and night is caused by the earth rotating on its own axis. To give an extensive background one must include the scientific view of the Middle Ages and the way it has changed over time, since the ideas of the Middle Ages have influenced the ideas of the Renaissance for a long period of time. The Renaissance brought new ideas with it and these ideas clashed with some ideas of the Middle Ages. To understand the impact of these new ideas and revelations one must know about the Middle Ages. In the 15th, 16th and 17th century it was not possible to separate religion from science the way we do now. Nor was it always possible to make a clear distinction between magic and science. These three things were inherently linked with each other. To understand how deep this connection ran, it is important to explain the idea of the Great Chain of Being in this thesis.

Once I have established a background, I would like to study the subject by means of four primary literary texts. All four of these texts will be cosmic travel stories. Three of these literary texts originate from the Renaissance. These texts shall be the following 17th century texts: *Somnium* by Johannes Kepler, *The Man in the Moon* written by Francis Godwin and *The other world* by Cyrano de Bergerac. The last text I will investigate is a text from the 19th

century, *From Earth to the Moon* written by the famous Jules Verne. Jules Verne has often been defined as the first science fiction author. I will use this work as a control text, which will hopefully help me capture the functions of these cosmic travel stories which are bound by their period of time. Hopefully it will also help me identify possible functions of cosmic travel stories that break free of the shackles of time and are universally applicable.

Finally I want to identify the functions the individual cosmic travel stories had in their periods of time. I want to compare these functions with each other to see if I can identify one dominant function for these stories in the Renaissance period. Finally I want to compare the functions of the Renaissance stories to the function of the cosmic travel story of the 19th century. Hopefully I can identify a function in these stories that transcends time and place. While comparing these functions however I will always bear in mind how deeply these stories are imbedded in their periods of time. One cannot simply transport the functions in one society to another period. Yet, the possibility of an inherent function of the cosmic travel story that transcends time and place presents a complex paradox, which could provide interesting study material.

Chapter 1: Travel stories and fantastic travel stories.

The 16th and 17th centuries were centuries that experienced many changes. They were era's of exploration, discoveries and new inventions. The new world was discovered in 1492, but the continent that *Columbus* discovered on his third journey (to Middle-America) was only called America in 1507 by a German cartographer. America was still being explored in the seventeenth century. The continent of Africa was being colonized. In 1415³ the Portuguese storm the Moor citadel Ceuta and start on their road to conquering much of North Africa. In 1494 the treaty of Tordesillas is signed. This document declares that the Spanish and Portuguese have the right to claim ownership on the lands they have discovered and shall discover in the future. This treaty was made possible with the cooperation of pope *Alexander the VI*. Trade-expeditions and journeys of discovery to the east, for example to India and China, were not uncommon. The Dutch East Indian Trading company was founded in 1602 and brought wealth to the small country of the Netherlands, which experienced its Golden Age in the seventeenth century. The travellers who went to these overseas countries often returned to tell stories of strange and wondrous creatures and people. The unknown sparked the public's fantasy and it was not long before travel stories became their very own fictional genre, where authors no longer travelled themselves, but wrote down stories they had heard or perhaps made up. Some of these stories were designed to keep ancient myths about the unknown going and were not at all concerned with the accurate description of the new discovered lands. However, it is not correct to say that the genre of travel stories is limited to the Renaissance period. Long before the New World was discovered there were stories about hero's travelling the earth, boldly going where no man had ever gone before.

One of the oldest and perhaps most famous travel story of all times is the story of *Odysseus*, written down by the famous Greek writer *Homer*. The *Odyssee* tells the story of the Greek hero Odysseus who tries to go home after the victory of the Greeks in the Trojan war, where he played a key role. However Odysseus has done something to displease *Poseidon* and the god does everything in his capability to keep Odysseus from returning home. Odysseus and his men suffer severely from shipwrecks and other disasters. During their journey homeward they meet many strange and fantastic creatures, like the beautiful tempting *Sirens*. Eventually Odysseus manages to defeat the odds, with some help of the Gods and returns home safely to his wife. Though the story clearly describes a journey, it is generally not

³ Fernand Salentiny. Translator: Paul van Vliet. (2005) "*Zeevaarders en ontdekkingsreizigers*. Van Admunten tot Zeppelin". The Netherlands. Lisse. Zuid Boekproducties b.v.

classified as an travel story, but rather as an epic. According to Kiene Brillenburg Wurth and Ann Rigney an epic is defined as a “*long narrative poem often with significant and historical subjects and heroic characters.*”⁴ This does not mean that an epic excludes elements that are also common in travel stories.

The earliest Christian travel stories were most likely the immrama, Celtic travel stories which also contain wondrous elements like the visiting of another world, encounters with monsters, or even things as strange as islands made of cheese. They were written down by the first Christian priests in the seventh century and have their bases in Celtic folklore. The genre is often confused with the echtraí, adventure tales about the Other World, but they differ in several aspects. The immrama seem to have had a more clear Christian connotation. The stories consist of a person wanting or needing to go on a journey, he enters a boat (often made of hides) and rows himself on to the ocean where he lets himself be guided by the waves and God. He often brings up to three people extra with him who die during the story or get left behind. The journey leads to several different islands which can be good, beautiful and full of food and women, but can also be evil, with monsters and trials. After several of these islands the hero reaches whatever he was looking for and then returns home with a token. On the way home he may encounter several other islands as well. The theme of a person setting a drift, which is called mac scríne was a punishment for fingal, in the old Irish society, or something one choose to do himself. For example in the “*Vita of St. Patrick*” *Maccuill* wants to kill *St. Patrick* but feels remorse and asks for his forgiveness. *St. Patrick* tells him that he cannot grant him forgiveness, because he is not the one who is to judge him. *Maccuill* goes out to sea without food or drink as a punishment to see what God decides to do with him. These stories are part of the base of the medieval travel stories, whose form and function had influences on the travel stories in the Renaissance, but distinctly differ from them as well.

There are many travel stories written in the late Middle Age. In these stories the journey was often a means towards a goal. In some of these stories the journey is not even a physical event, but rather a mental experience. A journey in this kind of story was a way to reach spiritual enlightenment. In many medieval travel stories the message of the story is far more important than the actual truth that is being described. The journey was a symbol for the development of the character, not entirely unlike in the immrama. The *Navigatio sancti brendaní abbatis*, or story of *Brandaan*, is a story based on immrama and has grown very

⁴ Kiene Brillenburg Wurth & Ann Rigney. (2006) “*Het leven van teksten. Een inleiding tot de literatuurwetenschap.*” The Netherlands. Amsterdam. Amsterdam University Press. Pg. 402

famous all over Europe. During the course of history it has been edited and rewritten several times.

Like in the earlier travel stories from the Ancient Greek period and the Middle ages some of the travel stories of the 16th and 17th century had fantastical fictional elements in them. For example, in his report on the country of Guanyana *Sir Walter Raleigh* described a fictional race of humans who had no neck or head but whose facial features were embedded in the chest, see Image 1⁵. The same kind of headless people are described in the stories of *Sir John Mandeville*⁶ when he describes the races of people who live on the Andaman Islands.



Image 1. The races of people described by Mandeville

Some 16th and 17th century travel stories however were absolutely accurate descriptions of the journeys and the encounters the explorers had had, the published ship journals of the East Indian Trading company are an example of these stories. A third kind of stories that were published in the genre or travel stories were the travel stories that were completely fictional, the author never even having set foot on a ship in his entire life. One can say that in travel stories there is a certain gradation that can be applied when it comes to fantastic fictional elements. Some stories have far more fantastic elements than other travel stories. I would like to focus on these travel stories with a high amount of fantastic elements, these stories I would like to give them the subgenre category, imaginary travel stories.

One could argue that any travel stories that possesses fantastical elements should qualify as an imaginary travel story, since it has fantastical elements and it is a travel story,

⁵ Image 1. St- Andrews. Mandeville's races of people. <<http://www-ah.st-andrews.ac.uk/mgstud/africa/jpgs/item2B.jpg>> last checked on 15-06-2011

⁶ Sir John Mandeville. Translator: C. W. R. D. Moseley. (?) *The travels of Sir John Mandeville*. Penguin Books.

but I would like to make the subgenre a little bit more exclusive. The genre of imaginary travel stories is not a genre merely defined by travel stories with fantastical elements. If this were so, then we ought to consider the earliest accounts of journeys to Africa as imaginary travel stories, where the idea of the unicorn most likely originated. Unicorns are fabled strange creatures with the body of a horse, the tail of a lion and with a horn erupting from its forehead. Though the stories on these fantastical creatures began with journal reports from explorers and therefore can be classified as travel stories they cannot be classified as imaginary travel stories. A unicorn may seem like a mythical nonexistent creature and of course, it doesn't exist, at least, not in the form of a beautiful white horse with a spiralled horn. However one of the earliest descriptions of an unicorn, written by *Marco Polo* describes the unicorn as followed: "*scarcely smaller than elephants. They have the hair of a buffalo and feet like an elephant's. They have a single large black horn in the middle of the forehead... They have a head like a wild boars...They spend their time by preference wallowing in mud and slime. They are very ugly brutes to look at. They are not at all such as we describe them when we relate that they let themselves be captured by virgins, but clean contrary to our notions.*"⁷ If one were to take a creature slightly smaller than an elephant, with similar legs, the head of a boar and a black horn in the middle of that head, what creature do you get? A creature that very much looks like the rhinoceros. Over time the legends like this can grow and warp. It is likely that that is how the unicorn came to have the image it has today. But if we assume that the myth of the unicorn has its base in the existence of the rhino then we cannot really qualify the occurrence of an unicorn in a travel story as a fantastical element, because it was never meant to be a fantastical element, it was not fictional. Rather, it was meant to be a description of one of the real animals Marco Polo had encountered during his journeys. The same thing can be said for a couple of other stories with fantastical creatures or elements in them. Essential to the genre of the imaginary travel story is that the occurring fantastical elements are meant to be fictional. They were never meant to represent the truth, but rather they were meant to appeal to the public's imagination. This is certainly the case when we focus on an special subgenre of the imaginary travel story. The stories of travelling to the moon.

Nowadays travelling to the moon is no longer a fantasy. On June the 21st (GMT) in 1969, *Neil Alden Armstrong* was the first man to actually place his foot on the moon. Since 1969 several men have followed him and it is not too strange to think that in the near future

⁷ Marco Polo. Transl. Ronald Latham.(1965) *The travels of Marco Polo*. Harmondsworth. Middlesex. Penguin Books. Pg. 225

the moon is within grasp for anyone who has enough money. Some scientists even predict that as early as the year 2020 space tourism will be common and regular people like you and me can spend the night in Earth- orbiting hotels.⁸ What will come true of these predictions, only time can tell, but the point is, that in the current scientific climate there is very little doubt that mankind can reach the moon and has in fact already done so several times. In the year 1500, or even in the year 1800, this was still a completely unrealistic idea. Anyone writing about travelling to the moon was writing fiction, a strange fantasy that would never come true. Though it is fiction and was considered to be a complete and impossible fantasy this has not stopped authors from writing about the possibilities of travelling to the moon.

The genre of voyages to the moon is incredibly old and can be dated back as far as the Romans, maybe even further. One of the early Roman authors concerning stories about travelling to the moon, or cosmic voyages, as Marjorie Nicolson⁹ proposes to call them, is *Lucian of Samosata*. This Lucian wrote a work called *True History*, which he admits to be not true at all, in the introduction. In this work, Lucian claims to have reached the moon and makes observations on the “planet” Moon. Another very famous work in which the author undertakes a cosmic journey, though dated quite some time after Lucian’s *True History* is the work written by *Dante Alighieri*, the *Divine Comedy*. With the help of his divine love *Beatrice* Dante ascends to the skies and reaches heaven. The genre of cosmic voyages really skyrockets in the period of the 16th century to the 18th century. In 1609 *Galileo* uses his improved telescope to observe the heavens. His observations were remarkable and with the shifting scientific climate, which I will discuss more broadly in the next chapter, it was no surprise that the heavens once again managed to captivate authors and readers alike. These inventions and changing worldviews along with the English translation of Lucian’s work in 1634 may have raised the interest in the theme of cosmic voyages in Western Europe. Whatever may be the cause of the sudden interest, there were suddenly a great amount of authors who desired to write about journeying to the moon or even beyond.

What is typical in this trend of cosmic travel stories, according to Nicolson, is that the Renaissance stories distinguish themselves from the earlier works in one specific element. In *True History* by Lucian, the narrator ends up on the moon, not by deliberate choice, but rather by coincidence. He is captured by a whirlwind and lifted up 3000 furlongs into the air and placed on the moon. 3000 furlongs is the equivalent of 603,505 kilometres. The real distance

⁸ Bill Widder. (2008) The CBS interactive business network.

<http://findarticles.com/p/articles/mi_m0EIN/is_1995_June_16/ai_17071324/> last checked on 13-06-2011

⁹ Marjorie Nicolson. (1948) *Voyages to the moon*. 1960. New York. The Macmillan company.

to the moon is in fact 378 000 kilometres¹⁰, so he would not have been anywhere near the moon, but, had the International Space Station¹¹ been there at the time, he would have happily soared past that on his way up. Dante in his *Divine Comedy* ascends to the sky with the help of Beatrice and by shedding the weight of his sins on his way up purgatory. In both these stories the protagonist does not seem to use any device to deliberately leave the earth and go into the cosmos and towards the moon. Nicolson notes that in the Renaissance period, when the cosmic journey grows to become a popular theme, this changes. These stories start to portray deliberate attempts of people travelling to the moon using specific flying devices, with certain amount of scientific or at least pseudo-scientific research. Of course there are exceptions to this rule, as we shall see in chapter three with Godwin's *The man in the Moon*. The dream of travelling to the moon starts with the dream of being able to fly. Throughout history men has invented many machines with which they hoped to one day be able to fly. In real life most of these machines failed, but in narrative fiction these machines succeeded and were able to fly protagonists all the way up to the moon, or in some cases even to the sun. The devices that were used for these cosmic journeys can tell a person a lot about the scientific worldviews at the time.

Another essential element to look at while studying these myths is the geographical nature of the moon. Some stories elaborately discuss the flora and fauna that is presumed to be present on the surface of the moon, or perhaps even underneath the surface of the moon. Other stories merely focus on the journey towards the moon, on what they encounter on their way to the moon and on how the universe would look like from a lunar perspective. Some stories mention intelligent life on the moon and describe their, often, ideal society. The way in which this bio-diversity, these societies and the universe are described can also tell us a lot about the ideals and ideas of the author. They can tell us why these stories were written and placed against a historical background, they can perhaps tell us how they were received by the public. In the end they may give us a clue as to what the function of these stories were in their period of time.

¹⁰ See appendix 1

¹¹ National Aeronautics and Space Administration.

<<http://www.nasa.gov/audience/forstudents/postsecondary/index.html>> last checked on 19-06-2011

Chapter 2: The scientific and religious worldview of the Middle ages and the Renaissance.

One cannot fully understand the function of a narrative in a society without understanding the foundations of this society. One must know the scientific worldview, the way religion functions in this society and the foundations of these beliefs. The Renaissance period was a period of radical change and scientific ingenuity, yet at the same time, the greater part of the masses held on to traditional values and beliefs. Therefore, to understand the function of a narrative in the Renaissance period it is also important to understand the Medieval scientific worldview and its religious beliefs.

Science and Magic:

To the 21st century reader it may sound strange to have the words magic and science in one sentence, but in the Middle Ages and in the early Renaissance period, the two terms were not as easily separated as they are now. Of course, back in the Middle Ages and the early Renaissance period they did not classify magic the same way we do now. Magic, as defined by the Oxford online English dictionary, is the power of apparently influencing events by using mysterious or supernatural forces. This definition of magic is a very broad one that leaves room for interpretation. Predicting the future by interpreting celestial signs is a way of influencing events, thus enacting magic. But if one uses hot air to make an object float, without understanding the powers that are at work there one can also say that one is influencing events by using mysterious forces.

One of the most common and more popular forms of magic in the Middle Ages was the tradition of magical healing. This type of folk medicine was a mixture of herbal lore, the accumulated experience of midwives and common sense. Another important part of this healing was the tradition of chanting spells or charms as part of the treatment, or as the sole form of treatment. This type of magic worked, in a way that placebo's can work as well. If the recipient placed enough faith in these spells, then this faith could go a long way in facilitating his recovery. Among popular magic one can also count the tradition of cunning men and wise women using their divination skills to retrieve stolen items and lost property. These forms of magic were common and popular, but were not considered scientific.

One of the areas where science and magic truly mix is on the field of astrology. In the Middle Ages and in the beginning of the Renaissance period, the practises of astrology and astronomy were practically the same thing. There was no such thing as a separate science for studying the movement of heavenly bodies. If one studied celestial movement, it was very likely that one also interpreted the signs. It was not uncommon that upon the birth of a child, an astronomer/ astrologer, was asked to study the sky and predict the future of the child by means of the position of stars. According to medieval believes, the stars could predict almost anything, from the birth of a king or the coming of a bad harvest. These predictions were immensely popular and were believed to be absolutely true. An astrologer was a learned man, a scientist, who was often highly respected. Kings relied of astrologers to predict wars and other events. Predictions for entire years and regions were done in the form of almanacs, year calendars which gave information on the position of the stars, the times of the sunset and sunrise, predictions of the weather, predictions of the economical prospects and more.

There is another branch of very popular science, with is now considered to have more to do with magic, alchemy. Most of us have heard of the philosophers stone, a fabled stone instrument with which one could turn lead into gold and create the elixir of life. Real medieval alchemy perhaps did not go quite as far, but it certainly was a science devoted to changing the inherit properties of objects or metal, to something else. Most of the time the alchemist would indeed try to elevate metals to gold. Though this was of course impossible, we can attribute many scientific discoveries on the field of chemistry to alchemy, like the discovery of phosphor, for example. The practise of alchemy was popular well into the Renaissance period. In the 17th century it began its recline and became to be replaced by modern chemistry and pharmacy. This decline can partially be explained by the decline of faith in the Great Chain of Being in the 17th century.

Science and Religion:

In a way, religion has its own type of magic as well. According to Keith Thomas¹² almost every primitive religion can be considered, in its foundations, as a means to obtain supernatural power. The medieval church found itself based in a society that had the tradition that the working of miracles was the way of demonstrating the religions monopoly on the truth. It adapted itself, performing its own kind of magic. Saints attained sainthood by performing miracles, thus a very important part of the Roman Catholic Church was founded

¹² Keith Thomas. (1971) *Religion and the Decline of Magic*. 1991. London, Penguin.

on the performing of magic. In the Middle Ages, as well as in the early Renaissance, the church was the institute that one turned to for the ultimate truth. If the church approved of your theory, it became part of the religious repertoire. On the other hand, if the church disapproved of your claims then you were sure your claim was not going to find a lot of support in the scientific circles.

This monopoly of the truth meant that religion and science were very closely intertwined during the Middle Ages and the early Renaissance period. An important factor in this merge of science and religion was the idea of the Great Chain of being, which I shall explain later on in this chapter. The very first cracks in the coexistence between religion and science began to show during the Reformation in the 16th century. Suddenly there was a group of people claiming that the fate of a person was already determined at birth, that there was no way to change this. The patron saints were no longer considered as important and holy as they used to be. But most importantly, concerning the bonds between religion and science, the Protestants believed that the pope and his priests did not always speak the absolute truth, but that one could only trust the holy scripture to always speak the truth. After centuries of having a monopoly on the truth, the Roman Catholic Church was shaking on its foundations, it lost its monopoly on the truth and therefore it also lost a certain amount of its connection to science.

One of the most important factors that helped in separating religion and science was the shift from the geocentric worldview to the heliocentric worldview. Right before he died in 1543 Copernicus published his now famous “*Revolutionibus orbium coelestium*” in which he claimed that the sun did not rotate around the earth as they believed at the time, but rather the earth rotated around the sun. Copernicus his work was mostly ignored at the time of its publishing, even radical thinkers like Martin Luther and Francis Bacon considered it too speculative and contradictory to all common sense. Surprisingly enough, the meagre resistance the ideas met mostly came from Protestant thinkers who thought it to be in direct contradiction with the Bible. The real discussion started to boom with Galileo Galilei. He was a supporter of Copernicus his believes and started to spread and support them with scientific evidence. Even the Catholic church now thought that these ideas were dangerous and started to object against them. Galileo and Copernicus were supported by Johannes Kepler, whose his cosmic travel story *Somnium* I shall discuss in chapter three. Kepler improved the Copernican worldview by explaining that the earth and planets do not orbit in perfect circles, but rather they orbit in ellipses. In the late 17th century Isaac Newton’s theory of gravity provided even

more proof for a heliocentric universe and slowly the scales began to tip towards a heliocentric worldview.

The Great Chain of Being:

The Great Chain of Being is a concept of world order that was developed by Aristotle. The idea is that everything, every single organism has its rightful place in the universe. The chain was all-inclusive, not only organisms, but also the smallest particle of inanimate matter was part of it. According to the Catholic church this place was designated to these organisms by God. In the Middle Ages God was at the top of this chain and none could aspire to ever rise to that level. The chain could be broken down into classes. There is a very clear kind of hierarchy in the Great Chain of Being, some classes being less than others. The class of man for example, is placed above the beasts, but it is placed beneath the class of angels and other supernatural phenomena. There were five main classes.

1. The holy and supernatural phenomena
2. The humans
3. Beasts
4. Plants
5. Lifeless objects, like metals and sand

These main classes can be broken down even further, the class of plants for example has the subclasses flowers and trees, as well as more subclasses. Within each of these classes there was one kind that was the most important, the primate. In the class of humans, the king or sovereign must be considered the primate. In the class of metals, gold is the primate. It was not possible to rise above your given place in the chain. Certainly not without help from outside. Yet this is what alchemist aspired to do, they wanted lower metals such as lead to rise to the class of the primate metal, gold. By some people, alchemy was therefore considered unnatural. Humans could only aspire to become a saint with the help of god, thus rising in class. Mostly though the idea of rising in class was disapproved. This is not that strange of course, because kings and sovereigns would not enjoy any old farmer all of the sudden rising to their subclass.

All the classes were connected to each other in a very specific way. The planets were connected to the elements and to metals. Humans were considered to have four humors, humores, namely: yellow bile, blood, black bile and phlegm. These four humors were

connected to the elements, yellow bile was connected to fire, black bile to earth, blood to air, and phlegm to water. It was believed that if someone was ill, the balance between the humors was disturbed. You had too much of one humor or too little of another humor. Because of the Great Chain of Being the humors were connected to certain plants or certain metals, these plants and metals could help in the treatment of diseases. These treatments would be even more effective if performed under the influence of a certain kind of planet or celestial sign.

The Great Chain of Being was supported by a geocentric worldview. With the waning of this worldview the support for the Great Chain of Being began to fade as well.

All of the Renaissance cosmic travel stories that we shall study in chapter three originate from the 17th century, in this strange chaotic period of time where the scientific worldview was radically changing. However, they were also written before one of the most important discoveries in the 17th century, one that is still extremely important in the scientific world of physics. The discovery of gravity. Certainly the laws of gravity are very important when it comes to cosmic explorations, but because this discovery was not yet made at the times that our 17th century books were written, they do not treat the subject of the pull of the earth in great detail.

Scientific changes were not the only changes that mark the developments in 17th century Europe. For the Netherlands and England it was the time for explorations and colonisation. It was the period of the Reformation and the Contra-Reformation, but also the period of the inquisition and witch trials. The territorial conflicts between Spain and England were fading a bit, due to the fact that Spain's position as a world power was fading. The Baroque movement was moving towards the west from Italy. During the second half of the century France was ruled by king Louis XIV, the Sun King. France had just ended the war with what is now Germany and its war with Spain. There was a short period of displeasure amongst the French citizens but this resistance against the king ended in 1653 and Louis XIV returned to power triumphantly.

The 19th century story, our control text has a completely different background. Science and magic were separated in a way that we now separate them. The laws of gravity were understood and widely accepted by now. *Darwin* had published his work "*On the Origin of Species*" in 1859, describing his theory of natural selection and evolution. This work with its radical new ideas opened many discussions and still does today. When Jules Verne wrote his "*From Earth to the Moon*" in 1865 he surely would have heard something about this

discussion, but it seems like he chose not to discuss the subject in his work “*From Earth to the Moon*”. In the second half of the 19th century the American civil war ended with a victory of the Northern states and the abolishment of slavery in the United States. As we shall see in chapter three, this historical event certainly influenced Jules Verne in his writing. It was a period of industrial revolutions with the invention of steam engines and trains, factories and the discovery of new types of metal like aluminium. There were different responses to the new industrial world. Some people considered it period of great development which could only mean better times for all humans, and new possibilities that were not yet considered. Others were frightened to see humans being replaced by machines like *the Spinning Jenny*, and grew gloomy over the prospects of the future filled with the loud banging of machines and the steam of engines fogging up the cities, wrapping them in a veil of mist.

Chapter 3: The function of cosmic travel stories in the Renaissance period and beyond.

Johannes Kepler's *Somnium*¹³.

In his fictional work *Somnium*, Johannes Kepler¹⁴ situates his cosmic travel story within the framework of a dream. The narrator, who is Johannes Kepler himself, explains that in 1608 he was reading about Bohemia and at some point after watching the stars and the moon, he fell asleep and dreamed a wondrous dream. In his dream he dreamt that he was reading a book, written by an Icelandic man named Duracotus, this book itself is written in the first person perspective, Duracotus being the narrator here, and cited in Kepler's work. The type of narrating used here is a *frame story*. The narrator is a heterodiegetic first person narrator. The frame story creates a distance between the author and the narration. By claiming that this work is a recollection of a book read in a dream, the author protects himself from whatever is claimed in the story. This was necessary in the case of Kepler because *Somnium* promoted the idea of a moving earth, which was disputed by the church.

At first glance Keplers protagonist seems to be the son of a witch, which is surprising in 1621¹⁵, the period of the Protestant Reformation and the Counter-Reformation. There was a very strong tendency against witchcraft in this period and witch trials were being conducted. Kepler explains in his notes on *Somnium* or *the Dream* that he explicitly lets the protagonist mention that his mother is now dead, because Kepler believed that one would not write such an incriminating thing on his mother while she was still alive. He continues to explain that this is not because the woman actually is a witch or the son means to insult her. Rather it is an expression of his love that he waited until she died before writing down this story because he did not want ignorant people to hurt her. Keplers own mother was accused of being a witch in 1615 and by pulling some strings as the *Imperial Mathematician*, Kepler managed to keep her from persecution in 1621. This parallel was deliberately placed by Kepler as a way to punish his adversaries after his own mother's death in 1622. He explains in Note 4 that his reason for writing the dream is to support the argument for earth's motion as suggested by Copernicus.

¹³ Johannes Kepler. *Somnium: the dream, or posthumous work on lunar astronomy*: transl. [from the Latin] (1620 +/-) with commentary by Edward Rosen. Madison, Milwaukee: The University of Wisconsin Press 1967

¹⁴ His name is actually Johannes Keppler, but it is often written as Kepler. My version of *Somnium* uses Kepler and therefore so shall I.

¹⁵ The year Kepler started writing on his notes

The mother figure is a protest against ignorance as is demonstrated by the following quote:

“[...] *untutored experience or, to use medical terminology empirical practice is the mother who gives birth to Science as her offspring. For him it is not safe, so long as his mother, Ignorance, survives among men, [...]*”¹⁶ Further on, he explains that he was motivated by his encounter with an angry Lutheran anti-Copernicus who was threatening him at the time.

The motivation of the protagonist to visit the moon or at least learn from the people of the moon is that his dying mother wishes to convey her knowledge. The only way to do this is by calling forth the Deamon from Levania.

In *Somnium* the mode of transport is not a machine. In fact, there is no actual voyage, but if there were, the mode of transport is described to be as followed. The Levanians¹⁷ as a group push from underneath and lift the person into the air. They can only bring someone to Levania, the moon, when the moon begins to be eclipsed on its eastern side. The human should be thin and agile, because they cannot lift an obese person. The human must be lulled to sleep with narcotics and then his body must be arranged in a specific matter so the limbs will not be torn off during the flight. In the last stage of the journey the Levanians move the human with their minds and that is also how they ensure a safe landing for him or her.

Kepler hardly lingers on describing the lunar flora and fauna, but he does mention that in the Privolvan¹⁸ region anything on land grows very large, and that these creatures have a very short lifespan due to these monstrous bodies. Some creatures have legs, some have wings, some have boats. By day they reside in deep caves or at the bottom of the ocean to survive the heat. The Subvolvan hemisphere, Kepler says: “[...] *is comparable to our cantons, towns and gardens; the Privolvan, to our open country, forests and deserts.*”¹⁹ Life on the Privolvan hemisphere is hard, life on the Subvolvan side is not completely unlike ours.

Overall, the Lavanians seem intelligent, but there is nothing concrete to be said about their bodies. They do not mind teaching a select amount of earthlings what they know. They are always busy when they meet us for they have limited time in which to educate us. Kepler does not seem to judge these creatures. They are not good or evil. Rather the author passes judgement on those who cling to superstition and do not want to listen to science.

¹⁶ Johannes Kepler. *Somnium: the dream, or posthumous work on lunar astronomy*: transl. [from the Latin] (1620 +/-) with commentary by Edward Rosen. Madison, Milwaukee: The University of Wisconsin Press 1967 Note 4. pag. 36.

¹⁷ The people on the moon call the moon Levania, they themselves therefore are Levanians

¹⁸ Kepler explains there are two halves of the moon. The Privolvan side is the side that never sees the earth, the Subvolvan side is the side that does see the earth.

¹⁹ Johannes Kepler. *Somnium: the dream, or posthumous work on lunar astronomy*: transl. [from the Latin] (1620 +/-) with commentary by Edward Rosen. Madison, Milwaukee: The University of Wisconsin Press 1967 Note 4. pag. 28.

Kepler himself was a learned man, he was appointed Imperial Mathematician in 1609. In 1593 at Tübingen University he wrote a dissertation on “*How would the phenomena occurring in the heavens appear to an observer stationed on the moon?*”. This dissertation was rejected by Veit Müller, the professor in charge of the academic exercises. However, it formed the base for Kepler’s *Somnium*. Once Kepler decided to publish *The Dream* as he called it, he spend many years on his Notes. He died before the book was completely finished. His stepson took over the task of publishing it, but he also died before he could complete it. Finally, in need of money, his son Ludwig Kepler, took upon him the responsibility of publishing the work in its final form in 1634. It was dedicated to Philip III, Landgrave of Hesse, who had been Kepler’s benefactor before.

The function of *Somnium* in the Renaissance society

So what do these elements from the text and story tell us about the function of Kepler's work in the Renaissance society? From these elements it is possible to derive a couple of functions for the text. It is likely that Kepler wrote *Somnium* to support his own ideas as well as those of Galileo and Copernicus. The story clearly supports the idea of a heliocentric worldview. That this was one of the main functions of the text can be derived from the fact that most of the story is dedicated to the explanation of celestial movement and lunar geography. Despite the encounter with an extraterrestrial, there are no thoughts shared on the complexity their society or even on their appearance. Lunar flora and fauna is very briefly discussed, just as the mode of transport is discussed very briefly. Most of the text is taken up by a description of the lunar seasons and days. There is also a discussion as to how the Levanians see the movement of heavenly bodies in comparison to the earth. Apart from this, Kepler also explicitly mentions in his notes that one of the reasons to write this story was to support the idea that the earth moves around the sun. By distancing himself from the story, by means of a frame story, it is suggested that the story expresses some kind of radical view from which it is prudent to distance oneself. Kepler lived in the period of the Roman inquisition. No matter how strongly he believed his own theories, it is not strange for him to want to distance himself from them if it meant that this would save his life. Despite Kepler living in a pro Reformist country this did not mean that he did not have to fear the Inquisition. In fact, the first resistance his work encounters comes from Lutherans, who hold true to the world of the bible.

Another function that one can imagine this text to have, is the function of explanation by means of a fictional example. Kepler was already a rather famous astronomer and mathematician before he wrote *Somnium*. The fictional work *Somnium* was not the first work in which Kepler expressed his opinions on the matter of the centre of the universe. Kepler was the one who realized that rather than the epicycles that Copernicus had suggested, (in order to make up for some small deviations in the orbit of celestial bodies) the planets moved around the sun in ellipses. Kepler has explained his theories other highly scientific works, like *Astronomia nova*. These works were probably very hard to understand for the average person. However, *Somnium* is not that hard to understand, because it is written from a very clear perspective. It is not unlikely that this work was written by Kepler with the idea, that less educated people might be able to understand his work and theories better through a work of fiction.

Life on the moon in *Somnium* is described and yet not described. It is said to exist and it is said that it is extremely large, but no real description is provided. Some have wings, some have long legs, others have boats. Even the Levanian that explains the state of the moon to the protagonist is not described, because the protagonist and his mother cannot see him. The matter of life on the moon is not really defended, nor is it denied. It doesn't seem like the story functioned to convince people of the possibility of intelligent life on the moon.

A last function of the text is to be a charge against ignorant superstitious people. By mentioning this quite literally in his notes and by mentioning these ignorant people in the early part of the story Kepler asks the readers to think for themselves. He publicly declares anyone who thinks a herbalist is a witch ignorant. In this way the text functions as declaration against superstition.

The text was received rather badly. A correspondent of Galileo, Giovanni Pieroni described the work as "Strange and bizarre", not the best critique one can receive. It was only reprinted once in Latin and it took a very long period of time before translations, or even partial translations were made. It was not immediately popular or very well known, yet it had a great influence on great minds later. Kepler's ideas and therefore his work *Somnium* as well, became part of the curriculum that was referred to when defending the idea of a heliocentric universe.

Francis Godwin's *The man in the Moon*²⁰.

The man in the Moon by Francis Godwin is written in the first person perspective. Unlike Bergerac and Kepler, the narrator in this case is not Godwin himself. The protagonist and narrator introduces himself as Domingo Gonzalez, a Spanish man born of noble parentage. This is surprising, because Godwin himself is an Englishman. The story is supposed to take place from 1568 onwards to 1601. During this time England was a relatively Protestant country, excommunicated by *Pope Pius V*²¹. In 1588 the Spanish Armada took to the seas to invade England. This invasion was thwarted, with help of the Dutch who fought for independence from Spanish rule, by England. So at the time the story was meant to take place there was not a good relationship between Spain and England. In 1638 when the book was published this conflict was already resolved. Spain had started to lose most of its power and therefore was no longer a real threat for England, which most likely soothed the relationship.

In *The man in the Moon* it is not at all the protagonists intention to travel to the moon. Rather the machine that he build was meant to use to fly. Despite the fact that it was not his intention, the protagonist does not mind visiting the moon. The mode of transport that is used in *The man in the Moon* is a flying contraption that is powered by swanlike birds. Which in the book is described as following: “*Upon the seashore, especially about the mouth of our river, I found great store of a certain kind of wild swan (before-mentioned) feeding almost altogether upon the prey, and that (which is somewhat strange) partly of fish, partly of birds, having (which is no less strange) one foot with claws, talons and pounces, like an eagle, and the other whole, like a swan of water-fowl. [...] These being strong and able to continue a great flight, [...]*”²²

The birds, however strong they are, have to pause twice on their ascension to the moon. Once on mount El Pico and once on some kind of hellish asteroid in between the earth and moon. The birds fly up to the moon because it is their natural migration, according to Godwin, when they disappear from our lands in the winter they migrate to the moon.

The protagonist in *The man in the Moon* is very much convinced of the earth moving. However he withholds comment when it comes to the discussion of the sun being the centre

²⁰ Francis Godwin. (1638). *The Man in the Moon*. Ed. John Anthony Butler. (publications of the Barnabe Riche Society, 3.) Ottawa: Dovehouse Editions, 1995.

²¹ Editor DRS. S. de Vries. (1976) *Winkler Prins Grote Wereldgeschiedenis: de nieuwe geschiedenis deel 4*. Amsterdam. Elsevier.

²² Francis Godwin. (1638). *The Man in the Moon*. Ed. John Anthony Butler. (publications of the Barnabe Riche Society, 3.) Ottawa: Dovehouse Editions, 1995. Pag. 79.

of the universe, though the movements of the earth he describes suggest it is the centre. The light of the moon is caused by reflections of the sunlight. Like in Kepler one side of the moon is forever withheld from the sight of the earth. Most of the moon is covered in water, it has two large oceans, a land mass and several islands in one of the oceans.

All things living on the moon are exceedingly large. The trees are easily three times higher than our highest trees and five times as broad. Gonzalez explains that no animal looks like anything he has seen on earth except for all the birds and other flying creatures that migrate during winter and who go to the moon, according to the author.

Gonzalez encounters intelligent life as well, they are also extremely tall, though they come in three different sizes that all have different life spans as well. The shortest of them are hardly taller than we are and live up to 80 years. The tallest of them are 20 foot or higher, they are the most noble and can live for thousands of years. They all have different lifestyles as well. The shortest kind are regarded the lowest rank while the tallest are the most noble ones. The shorter kind cannot stay awake during the hours the sun shines, the middle kind can stand sunlight a little bit, but grows weary from it as well, the tallest kind can stay awake under the sun. Gonzalez finds himself dead tired under the sunlight as well, like the short kind of Lunars.

As for the moral compass in *The man in the Moon*, it is interesting to see that the Lunars worship God and Jezus, but not Mary. Which could suggest a tendency towards Protestantism. There is no such thing as crime of murder among the Lunars, thus they do not need courts. Very rarely they banish one of their own to the earth. All in all, the Lunar society and world seems to represent the Golden Age as described by *Ovid*. A perfect utopian society. It is interesting that Gonzalez, and through him the author, refrains from commenting on the sun as the centre of the universe. Perhaps this has something to do with the fact that Francis Godwin was a bishop after all.

The functions of *The man in the Moon* in Renaissance society

The man in the Moon is a utopian text, it portrays a perfect, ideal and impossible society. The Lunars have no crime, they do not need courts. The Lunars do not become sick and they have certain plants that heal all ailments, even decapitation! They do not need to produce food because the land produces it for them. This society mirrors the Golden Age of Ovid, this is not strange. It is very likely that the author, Godwin, read Ovid's *Metamorphoses*, because in the Renaissance period the ancient Greek and Roman authors were considered to be the example to follow. An utopian society is a society that reflects the ideal of the author (or the ideal of the narrator, or protagonist) in this case, the ideal society that is being reflected is a rather generic ideal. Who would not want a society where there is no crime, no labour and there are no diseases? Another part of an utopia is the fact that it is actually too good to be true. The fact that Godwin places this society on the moon, demonstrates how much of a fantasy it actually is. In the Renaissance period, it was just as likely to walk on the moon, as it was to have a perfect society. And even on the moon the society is not completely perfect, they do mention that on a rare occasion they banish one of their own to the earth because he or she cannot conform. An utopia is a narrative way to express ideals, but at the same time place them in perspective. Godwin realizes such a society is not possible, but he suggests striving towards it any way. Therefore, in a way, one could say that rising moral and social standards was an intended function of this work.

In *The man in the Moon* Godwin suggests the motion of the earth, at the very least expressing his opinion that the earth moves around its own axis and that this movement causes the difference between night and day, rather than the sun orbiting around the earth. Hereby confirming at least a part of Copernicus' and Galileo's ideas. Yet the protagonist and through him the author, refrains from commenting on the matter of the earth or the sun being the centre of the universe. The protagonist refuses to talk about it, even though he explains that he could clearly see the centre of the solar system on his route up to the moon. Why would the protagonist, and through him the author, refrain from speaking about such an important topic? Godwin was a bishop so he had to tread carefully when it came to matters such as the centre of the universe. It is not unlikely that he was reluctant to accept the entire idea of a heliocentric universe even if he agreed with most observations that Galileo and Copernicus had made. His protagonist Gonzalez quite ruthlessly dejects the ideas of ancient mathematicians and scientists who would have us think that the earth does not move. He

rejects the medieval worldview of the Primum Mobile, but does not want to conform to the heliocentric worldview. The story functions as a conformation, at least a partial conformation, supporting unorthodox ideas.

Life on the moon in *The man in the Moon* is large and beautiful, or at least most the intelligent creatures are. The animals are strange and unlike anything he has ever seen. The Lunars reach heights and ages we cannot dare to imagine. Yet, these Lunars do not seem so unlikely, that they cannot possibly exist. Some of the Lunars are like us in height and age. In fact, to “prove” the existence of these Lunars the author refers to a boy and a girl who were very beautiful and richly clothed that could not stand the sunlight. The suggestion is made that these children were Lunars. Still the author does not attempt to really defend the idea of life on the moon. It seems to be considered more as a possibility than a true belief.

Cyrano de Bergerac's *The Other World*²³.

Like Godwin's and Kepler's works, Cyrano de Bergerac's *The Other World* is written from a first person perspective. The narrator seems to be Cyrano himself, who recounts the story of how he supposedly travelled to the moon and what he found there. Unlike Kepler, it does not seem like Bergerac feels the need to distance himself from his work. This is surprising as it contains many elements that do not conform with the mindset of his time, as I shall explain later on. Since the story is written from a first person perspective, the protagonist of the story is Bergerac himself.

The protagonist in *The Other World* first conceives the idea of travelling to the moon after a discussion with his friends upon what the moon truly is. Part jesting, part serious the protagonist suggests the moon is a world that is like our own, which sees the earth as a moon itself. The more he thinks about this idea however, the more he is convinced that this is in fact the truth. When he arrives home he suddenly notices a book opened on his table where there was none before. The book was written by *Cardano*, the narrator recounts that in the book the philosopher is visited by two lunar inhabitants. The book seemingly having moved itself and opening on this passage, convinces the protagonist that this is a sign of the heavens, it must be his destiny to convince the world the moon is another world.

In *The Other World* several modes of transport to get to the moon are discussed. The protagonist's first attempt is to cover himself in bottles partially filled with dew, which as the sun heats them lift him up into the sky. This works, but Bergerac becomes frightened and smashes a couple of bottles so he returns to earth and lands in Canada, even though he went straight up and straight down. To Bergerac this proves that the earth does in fact turn on its axis. Bergerac's second attempt is made by use of a flying machine, his first experiment fails but later on, others strap fireworks on the machine to make it seem like a dragon, Bergerac intervenes, and steps on right as the rockets are lit. He is launched a great way into the air, but at some point the fireworks are burned out and the machine falls down again. He however keeps on rising, this is due to the ointment of marrowbone he used on himself to recover from his previous bruises. In the 17th century it was a common superstition to believe that the moon had influence on the marrowbone of animals. On full moon the bones would be filled with marrow, but when the moon was waning it would suck the marrow up. This influence only works after Bergerac has already passed two thirds of the journey, because otherwise the pull

²³ Cyrano de Bergerac. *De andere wereld of, De Staten en Rijken van de Maan*; transl.[from French] (1657), preface and notes by Jan H. Mysjkin. Antwerpen; Baarn : Houtekiet, 1993.

of the earth was still too big. This is the way Bergerac travels to the moon, but in the Earthly Paradise on the moon, a couple of other ways to travel to the moon are suggested. *Henoch* achieved this feat by filling two barrels with the smoke of the holy offerings to god and strapping them underneath his arm pits. Because the smoke wished to rise to the divine premises, it lifted Henoch as well. *Elijah* build a chariot of a lightweight iron. He took a large amount of magnetic metal and condensed it into one small magnetic ball. By standing on the chariot and throwing the magnet up in the air he rose into the air and up to the moon. Noah's daughter *Achab* was on the arc when the flood rose so high that one could leap to the moon, only she realized it was the moon and paradise. She could not convince the others to go with her. Finally, Bergerac learns from the Spanish man he meets outside of Paradise that he rose to the moon by means of birds. It seems that Bergerac intended this Spanish man to be the protagonist from Godwin's *The man in the Moon*, proven by his method of flying, the posture of the man and his place of birth. However, Godwin's protagonist and Bergerac's Spanish man differ on many accounts, Bergerac having edited the character to his liking. Interesting enough, despite all these methods to rise to the moon in the end Bergerac returns to the earth by means of a demon who takes him down.

Not much is explained on the geographical details of the moon itself, like its equator or the existence of oceans and mountains, but through context and discussions it is made clear that the moon and earth orbit around each other and the sun, within an endless universe. From the story we can also derive that there is a place on the moon that is The Garden of Eden and another place where strange (in)human creatures life. There are some very detailed descriptions of lunar flora and fauna. Because the story divides the moon into Earthly Paradise and the other part of the moon so shall I.

The Earthly Paradise on the moon is described as a beautiful fresh place of eternal spring. There is a strong aroma of flowers that pleases the nose. There are no weeds and all flowers seem extremely beautiful. Birds constantly sing like nightingales. One specific mentioning of flora are the apples of the trees of knowledge and life. The apple of the tree of knowledge is treacherous, because it has a shell around it that causes stupidity or forgetfulness. The fruit itself however gives the one who eats it complete knowledge. On the rest of the moon the flora and fauna seems very much like our own. Creatures such as baboons and birds are mentioned. Before the protagonist encounters the (moon)humans he meets a couple of strange animal human monsters that reminded him of Greek Mythology, satyrs and sirens. The humans are like us in most ways except for the fact that they are twelve el (which is about six meters) tall and they walk on their hands and knees, which makes them

roughly the same height as us. Standing up on two legs is an inferior position according to them and the most of them do not wear clothes. These people do not eat, rather they cook and fill themselves with the aroma of these meals, which are nutrient by themselves.

When we look at the moral judgement and dilemma's treated in the book we must regard it as a highly philosophical book. Take for instance the discussions upon whether the protagonist is a (moon)human or not. That he can talk is not enough prove for these creatures that he is not an animal, rather he has to be able to argue and discuss on their level. Then there is also the discussion on whether or not God exists. Though there is a religious sector on the moon, there are also those who argue that the universe is infinite and filled with tiny self monitoring and creating particles, atoms, that make up everything and that therefore no God is actually needed. Interesting enough, the young man who suggests this possibility is frowned upon, but still very much respected for his rational mind. His acts seem to be condoned in favour of his sharp mind, that is until the very end where a demon grabs hold of him and brings him down to the earth, possibly to hell which is believed to be inside of the earth. Even so, despite him being a sinner, the protagonist considers him a friend and tries to save him from the demon, by clinging to its back. He falls of his back on earth, however and nothing more is mentioned of the young man. The young man is not the only one in the book who advocates the idea of atoms. The Spanish man that the protagonist encounters also argues for the existence of such tiny particles.

Overall *The Other World* is filled with opposites of our planet and opposites of the morals that were held high on earth in the 17th century. For example, on the moon, the young are considered wise and the old are considered bad and decaying. Being buried and mourned upon by friends is shameful, where being stabbed to death before a natural death comes to you, you blood drunken by your friends and your body left to be fornicated with by young women is considered the highest honour. We stand up walking, they are on all fours. We cloth ourselves, to them clothing is considered ridiculous and nudity is the norm. On earth virginity is valued highly, on the moon it is considered a sin. This a typical burlesque kind of swap where good is bad and black is white. Bergerac was known for his burlesque kind of writing so this is not surprising.

The functions of *The Other World* in Renaissance society

Like *Somnium* and *The man in the Moon*, *The Other World* by Bergerac also seems to have a supportive function when it comes to the ideas of Copernicus, Galileo and Kepler. In the narrative it is clearly stated that the earth moves, orbiting the sun. It also dedicates some attention to the way celestial bodies are seen from the moon. However it is not as clearly scientific as Kepler's work *Somnium*. Though his work seems to support the ideas of a heliocentric universe, it is apparent that Bergerac was not a mathematician or an astronomer. He was an educated man, but he did not specialize like Kepler did. He demonstrates some of his knowledge however when he describes the various ways in which man has reached the moon. The modes of transport chosen by Bergerac are almost all based on scientific phenomena, like the evaporation of water, the tendency of hot air to rise and the magnetic powers. We now understand that it is not possible to travel to the moon by these means, but for his time Bergerac's ideas are remarkable and at the very least demonstrate a minimal amount of knowledge on the field of physics.

The work is not as utopian as *The man in the Moon*, even though it is often defined as a utopian work. The society of the Lunar inhabitants is presented as highly rational and every "strange" custom they have, has a perfect argumentative base. Still the reader cannot escape the feeling that something is not right. If they are the perfect rational creatures, why can't they recognize a real human when they see one? The fact that they cannot, shows a flaw in this otherwise so perfect society. It is not without reason that Bergerac ends *The Other world* with the words: "I admired a thousand times the omniscience of God who had brought all heathen people together by nature so they could not corrupt the ones I love, and where they, as a punishment for their haughtiness, were left to their own complacency." The society of the Lunar inhabitants is not an ideal society, rather the issues addressed in the story are meant to make you wonder about your own society. They are meant to make you question the power of religion and clergy. To make you wonder about the position of man above animal. A function of *The Other World* is to make the reader think.

Intelligent life on the moon in *The Other World* is humanoid, but large and strange. They walk on their hands and feet and altogether seem very unrealistic. They function as a comical aspect in the story as well as a means of explaining certain issues. It does not seem like these massive creatures were meant to be considered real or existing.

Finally, there is the function of entertaining as well. As stated before, Bergerac was a burlesque author. Apart from making you want to question social habits, the burlesque text

was also written to entertain. Making a man dance and pull faces as if he were a monkey, locking him up in a giant cage as if he is some strange kind of bird, is absurd and in its absurdity is it entertaining. Bergerac satirises the pompous Spanish protagonist of Godwin by placing him in his own story. Rather than him being treated well, like in *The man in the Moon* the Spanish character in *The Other World* is locked up, mistaken for some kind of hairless monkey.

The Other World was received very well, despite its rather unorthodox and almost heretic nature. Or maybe it was precisely these profanities that made the work so popular. It was only published completely post-mortem, in a censored version at first, but there were many incomplete versions circulating at the time, since the manuscript was stolen. Later two complete versions of *The Other World* were found, both were not manuscripts and it is not possible to determine which one is closest to the original.

Jules Verne's *From Earth to the Moon*²⁴.

Jules Verne's *From Earth to the Moon* is situated after the American Civil war from 1861 till 1865, so it was very up to date in the year it was written (1865). It takes place on the continent of America, which is striking considering Jules Verne was a French man. The narrator is a heterodiegetic all knowing narrator. He does not expose himself or addresses the reader directly. However, it is clear this narrator has its personal preferences, especially considering certain countries. The story is actually written in two parts, *From Earth to the Moon* and *Around the Moon*. *Around the Moon* was written five years later but I shall accept it as part of *From Earth to the Moon* and treat the story as one, because *Around the Moon* is a sequel to *From Earth to the Moon*.

Since in *From Earth to the Moon* there are three people launching themselves into space by use of a giant cannon and aluminium bullet, there are also three motivations to be considered. The first motivation we should look at is the motivation of Mr. Barbicane. He is the president of the so called Gun-club. A society which is devoted to the creation and perfecting of guns and other artillery ware. After the war the society seems to have lost its purpose and therefore the president decides to give the Gun-club a new purpose, to achieve glory and write history by reaching the moon. Initially, it is not his plan to actually send someone to the moon, but merely sending an object to it. This changes when a French man Michel Ardan, announces he is coming to the United States and that he wishes to man the bullet that is to be launched into space. There are very little arguments made for his motivation. Mostly the reader gets the impression that, though very brave and sympathetic, Michel Ardan is slightly simple, or perhaps a little bit insane. He considers everything a new adventure and relishes in the glory he will receive. He does not even care that he will most likely die on the moon because he cannot return. The third passenger is Captain Nicholl, Barbicane's nemesis. He and Barbicane are actually dragged into this by Ardan. Nicholl and Barbicane are about to duel with pistols when Ardan shows up and stops them. If their argument is really about him going to the moon or crashing back down on earth, he argues, then they both should come with him to check on, where he is going. This is why Nicholl and Barbicane end up joining Michel Ardan.

To reach the moon the Gun-club decides to use a kanon of 900 feet (approximately 274 meters) with barrel having sides of 6 feet (approximately 1.8 meters). In it, shall be

²⁴ Jules Verne. (1865) *From Earth to the Moon*. In 28 days and 12 hours. 1976. The Netherlands. Amsterdam. Elsevier.

placed a hollow aluminium bullet with a radius of 4.5 feet (approximately 1.3 meters). They decide that the explosive material that shall be used is nitrocellulose, guncotton. Both guncotton and aluminium were fairly new inventions in 1865, this, along with the many pages of cosmic explanations, demonstrates Verne's knowledge. They take rations with them and two tanks of Potassium Chlorate (KClO₃) and Caustic Potash (KOH). These gasses are meant to prevent them from dying from a lack of oxygen and an overdose of carbon monoxide.

Verne gives us a very detailed description on the lunar geography. He explains the names the barren wastelands, which we assume to have been seas at some point, have gotten. He also gives us the names of the mountains. In particular the two most clearly visible mountains on the moon as seen from the earth, Kepler and Tycho. The moon, according to him, has no seasons and the side that does not see the earth is cold. He explains that there is discussion over the possibility of the moon having an atmosphere, but a very low one. There is also discussion on the centre of gravity of the moon, some say the moon is slightly egg shaped and therefore the centre is towards the side we cannot see. The suggestion is made that because of this, all the water and possible life should be on that side.

The three passengers of the bullet to the moon conclude there is no life on the moon, at the very least there is no life on the side that the earth sees. Because of a miscalculation they orbit around the moon. When they reach the other side of the moon, where all is dark, they witness an incredible volcano eruption. This eruption lightens that side of the moon for a second and it is suggested that they see seas, forests and lands. However when the travellers return to the other side they are all quite convinced that there is currently no life on the moon. They do say however that they believe that there used to be life on the moon, many years ago.

The only judgement that is passed in *From Earth to the Moon* is judgement on other countries by the narrator, in a very subtle way. The English come of the worst, according to the narrator they are jealous of the Americans and therefore they do not donate any money. The Dutch do donate money, but being the cheapskates they are, they ask for a five percent discount on paying cash. Interesting in this judgement of the countries is the way that France is represented. France donates an average amount of money to the project, but what is really special is that Michel Ardan is French. The character of Ardan is slightly insane, as was previously suggested. This quirk of character however is attributed to the fact that he is French. This is strange considering Jules Verne was French himself.

The functions of *From Earth to the Moon* in the 19th century

Unlike in the 17th century, in the 19th century there was no longer discussion on the matter of the centre of the universe. Almost everyone agreed that the sun was the centre of our solar system and that there were other solar systems where other stars could be the centre. Though *From Earth to the Moon* describes the position of the earth and moon among the stars, it does not elaborate on it, and it does not need to, because Verne does not need to defend the idea of a heliocentric worldview. What is described in great detail however is the surface of the moon. The author names the mountains and oceans that astronomers have discovered and named. He explains theories on the surface of the moon and the possibility of life on it. On their way up to the moon the protagonists discuss the functioning of gravity, the temperature of space, the lack of oxygen in space and many other things. Before the projectile is fired the use of relatively new inventions such as guncotton and aluminium. All this information on the moon, gravity and new substances seem like a way to demonstrate the knowledge of the author. This would then be a function of the text, to demonstrate the knowledge of the author.

Apart from demonstrating the knowledge of the author, *From Earth to the Moon* has other functions as well. It demonstrates the belief in technical advancement. The experiment of sending a projectile to the moon does not succeed completely, but the passengers survive their return to the earth. The moral of the story seems to be that thanks to the technological advances in the 19th century, theoretically, mankind should be able to launch himself into space soon, as far as Jules Verne was concerned, at least. The story seems to radiate a positive feeling, a feeling of accomplishment. The text functions as a message that technological advances are here to help mankind, to make us feel better and work less.

The last function of the story of *From Earth to the Moon* is to entertain. Even in the 19th century it was still impossible to think of travelling to the moon. It is a work of fiction, meant to amuse the reader. Little can be found on the reception of the work at the time, but it was adapted as an opera in 1875, *Le voyage dans la lune*, with music by Jacques Offenbach.

Conclusion

Having found some of the functions in the Renaissance period for the individual stories we have discussed, what can we say for the function of the subgenre, the cosmic travel story, as a whole, in Renaissance society? Can we identify recurring themes? Is there one function of the cosmic travel story that predominates in the early modern Renaissance period? In the three 17th century texts that we have studied we have seen at least one recurring theme. The matter of cosmic order.

In the last half of the 16th century Copernicus published a radical new theory post-mortem. He suggested that the earth moved around the sun rather than the sun around the earth. This idea was disputed by both the Catholic church and the Protestants. However, this didn't stop other astronomers and scientists from agreeing with his theories. Galileo, for example, agreed on the Copernican worldview and so did Kepler. But the 17th century was the time of the inquisitions and plainly expressing your heretic worldview was dangerous. The cosmic travel story functioned as a relatively safe outlet for representing unconventional ideas, such as a heliocentric worldview. Because it is a fictional narrative genre, it provided some sort of protection for the author who could always say it was just a story.

The genre of cosmic travel stories was a way to open up new discussions. To make the reader wonder about current events or philosophical questions like the position of a human compared to animals. Through the cosmic travel stories one could criticize society and current events. It was also a means of demonstrating the authors knowledge. By implementing specific references to Greek mythology or the latest scientific discussions, the authors demonstrated their knowledge.

Finally, some of the stories in the genre of the cosmic travel story had the function of entertaining. To spark one's imagination and make them feel pleasurable, while at the same time addressing more serious topics.

If one compares these functions to the functions of the cosmic travel story from the 19th century, we see that the most important function has changed. It is no longer a means of expressing radical views, but rather it is mostly a means of entertaining. The author can still demonstrate his knowledge through the story and express his opinion on current social events, but the need to do this in the disguise of a fictional narrative is gone. There is no severe threat of persecution, so there is nothing to stop an author from just publishing a nonfiction work on the matter.

It seems that the function of the cosmic travel story is time bound and does not surpass the ages. In fact, the function of the cosmic travel story is very narrative specific, especially in the Renaissance period and needs to be researched for each individual story. This may be time consuming, but it provides an interesting view on the reception of narratives in the modern Renaissance period.

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Image 1. St- Andrews. Mandeville's races of people. <<http://www-ah.st-andrews.ac.uk/mgstud/africa/jpgs/item2B.jpg>> last checked on 15-06-2011

Image 2. Columbia linguistics. The Ptolemaic system.
<<http://columbialinguistics.files.wordpress.com/2009/10/ptolemaic-system1.jpg>> last checked on 28-06-2011

Glossary

Echtraí: Genre name for a travel story to the Other World. Often confused with Immrama. It is almost always about a famous person who is invited to the Other World. The story is not about the journey, but the adventure in the other world. It is not uncommon for the hero to stay in the Other World. It is a story that describes only one journey and only one location.

The Dutch East Indian Trading company: Founded in 1602, the VOC, or Vereenigde Oostindische Compagnie, was a Dutch state supported trading company. It is seen as the first multinational and for years it had the monopoly on the trade between Europe and Asia. It was allowed to arm itself and it was allowed by the Dutch government to arrange law and order in some colonized areas. It was possibly the first company to have bonds. The Dutch East Indian Trading company lost power at the end of the 18th century.

Golden Age: A reference to the Greek Golden Age of men, as described by Ovid in the *Metamorphoses*. In the Golden Age of men there is eternal spring. No justice system. No need to cultivate the land for food, for there is always plenty of it, ripe from the trees and fields. There are no weapons, no army. Milk, honey and nectar is abundant. There is equality for all and there is no crime.

Immrama: Genre name for tales over roaming about. In the immrama the main character was not initially a famous person, though it is not unlikely that he will become one after the journey is completed. The main character in an immrama often goes out to seek an entrance to the Other World for personal reasons. In the immrama the account of the journey and its preparation are very long, but the adventures in the Other World are only part of the framework. The hero always returns home. In the immrama the hero visits a multitude of islands.

Fingal: the slaying of a family member, a common theme in Irish mythology

Mac scrine: the theme of a person setting adrift in a boat, common in Irish mythology

The Other World: The Other World is a term frequently used when referring to the mythological world of the fairies or fey folk. It is often located in a remote place, in hills (a síd), under the earth, in lakes, under the water, in the wilderness and beyond the ocean. Especially in Celtic stories, going into the wilderness signifies the proximity of the Other World. Stones are often associated with boundaries between the civilized world and the Other world. The Other World has many names, Mag Mell, Tír na mBéo, Tír na nÓg, Tech Duinn or Hy Brasil are just a few of them. The other world is filled with gold and silver. It looks a

lot like our world only it has more precious materials and unusual materials, like a glass boat for example. It is considered a second world on our world, but also as parallel layer world that lies over our world like a shroud. The people there are either really pretty or really ugly, they wear green cloaks, gold, purple, silver, bronze, jewels, findruine (silver alloyed) and red gold. Their cloaks are often five folded.

The Primum Mobile: In the Middle Ages the astrological worldview was based on a geocentric universe. Above the earth there were nine heavenly spheres, the sphere of the moon, the sphere of Mercury, the sphere of Venus, the sphere of the Sun, the sphere of Mars, of Jupiter, of Saturn, the sphere of the unmovable stars and finally the primum mobile. The primum mobile means as much as the first moved. This sphere is moved by its love for the light of God (which is above it) and therefore it turns really fast. In a reaction to this movement the sphere of the unmovable stars turns in the opposite direction pushing all the other spheres into motion as well. This system is also called the Ptolemaic system.

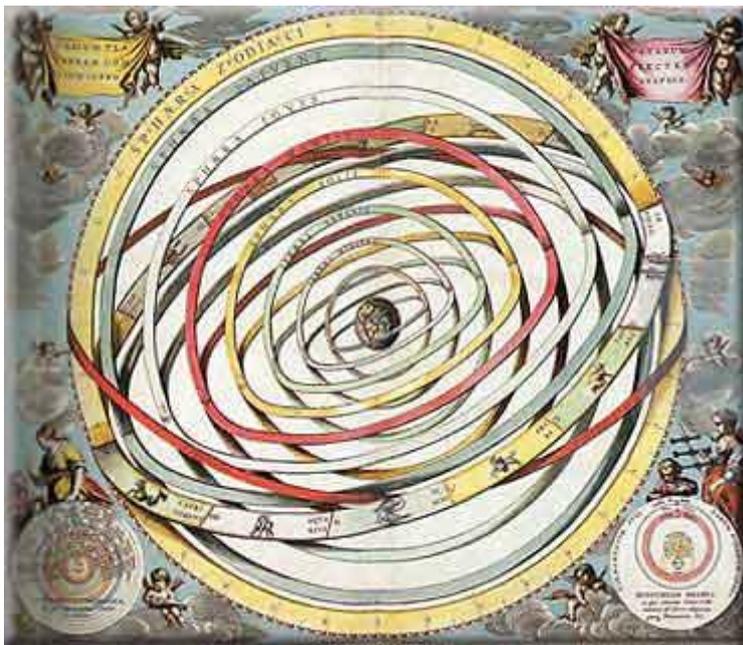


Image 2. The Ptolemaic system

The Roman Inquisition: In the Renaissance period there have been several inquisitions, the most famous of them being the Spanish Inquisition. The Spanish Inquisition was of a different character than the Roman Inquisition which came slightly later than the Spanish Inquisition. Both roughly started at the second half of the 16th century. The Spanish Inquisition was mostly focussed on the relationships between religions. It mostly persecuted Jews and a couple of Muslims. The Roman Inquisition mostly focussed on heresy, which is taken as a rather broad concept. The Roman Inquisition had a system of long trials and interrogations, though they also had the proceso somario, the quick trials. During this period the Roman Catholic Church also came up with the Index of banned books, thereby enacting censorship.

Satyrs: Satyrs were male woodland deities with the ears and legs of a goat who worshiped Dionysus, god of wine, often in a state of sexual excitement.

Sirens: The Sirens were nymphs often depicted with birdlike bodies, who sang such enticing songs that seafarers were lured to their death.

The Spanish Armada: The armed war fleet of Spain, known as invincible. It consisted of 130 ships and 30000 men. Due to bad weather and the Dutch blocking the harbour at Duinkerken the Armada attack was easily fended off by the English in 1588.

The Spinning Jenny: The spinning Jenny is a large spinning frame which has multiple spools. It was invented in 1764. The device was able to produce more yarn in a shorter period of time. It's invention is often indicated as the trademark of the start of the industrial revolution.

The Trojan war: the war between the Greeks and the Trojans, as a reward for picking Aphrodite as the most beautiful goddess the Trojan Paris kidnaps the most beautiful woman on earth Helen with the help of the goddess Aphrodite. Unfortunately Helen is already married to Menelaus and he declared a war upon Troy, because of a treaty all of Greece is obliged to fight in this war. The war lasted for ten years until the Greek hero Odysseus came up with the plan of the Trojan Horse.

List of Names mentioned

Achab: (Hebr.= brother of the father) King of Israël from 874 till 853 b. C. Had a dispute with the Prophet Elijah. In the bible Achab is not mentioned as the daughter of Noah.

Alexander the VI: Rodrigo de Borja. Pope of the Roman Catholic Church from 1492 until 1503.

Dante Alighieri: (1265- 1321) Italian medieval author born in Florence. He was banished from Florence in 1301. His most famous work is the *Divina Commedia*, the divine comedy.

Apollo: Greek God, son of Zeus and Leto. Twin brother of Artemis. God of reason and intelligence, music and trade, harmony and order.

Neil Alden Armstrong: American cosmonaut, commander of the Apollo 11. On 21 July of 1969, at 3.56 GMT he was the first human to step onto the moon.

Artemis: Ancient Greek Goddess, daughter of Zeus and Leto. Twin sister of Apollo. Greek virgin goddess of the hunt and of wisdom. She is closely identified with Selene and Hecate.

Beatrice: Name of Dante's imaginary ideal love. In reality she was most likely Beatrice Portinari, the wife of Simone de' Bardi.

Brandaan: Irish saint, known from the Brandaan story. St. Brandaan is ordered by an angel to roam on the sea with 80 companions as a punishment for his disbelief.

Carnado: (1501- 1576) Hieronymus Cardanus, also named Gerolamo Carnado. An Italian mathematician, medic and astronomer. Bergerac remembers the passage incorrect. Carnado wrote about his father meeting seven men who claimed to come from the moon.

Chang Xi: Chinese God, whose name means eternal life.

Chang E: Chinese Goddess, whose name means eternally enlightened, later she became goddess of the moon

Christopher Columbus: (1451- 1506) Cristoforo Colombo. Italian 15th century explorer, discovered America in 1492.

Darwin: (1809- 1882) Charles Robert Darwin. An English naturalist born in Shrewsbury. Famous because of his theory on natural selection and his plea for evolution.

Elijah: (Hebr.= My god is Jah) the name of the prophet who at the time of king Achab fought for the worshipping of Jahwe against the Cult of the Tyric Baäl. According to Kon. 2:11 he wrote to heaving in a fiery chariot.

Galileo: (1564- 1642) Galilei, Galileo. Italian physicist and astronomer born in Pisa. He is mostly known for his conflict with the Church because of his support for Copernicus, his

trials became worldwide renowned. Galileo was the first astronomer to use a telescope to study the celestial bodies.

Helios: Ancient Greek God of the sun. Son of Hyperion and Theia. Father of Phaëthon.

Henoch: Name of a very pious man of whom the bible tells nothing more other than that he got to live 365 years. He walked with God and God took him away. Presumably to paradise.

Homer: (approximately 800- 720 b. C.) Greek epic poet. Homer is attributed the famous poems *Iliad* and the *Odyssey*. It is said that Homer was blind.

Hyperion: Ancient Greek God of the sun, father of Helius and Selene, husband of Theia.

Lucian of Samosata: (approximately 125- 180 b. C.) A Greek novelist and rhetorician. He wrote the work *True History*, in this work he wrote about voyages to the moon and Venus, about extraterrestrial life and about war between planets. Some consider this work the first science fiction work.

Maccuill: Character in the Irish story *Vita of St. Patrick*

Sir John Mandeville: Self-proclaimed author of the work *The Travels of Sir John Mandeville*, a work written in Anglo-Norman French, which started circulating between 1357 and 1371.

Odysseus: Ancient Greek Hero, the inventor of the Trojan Horse, famous from the epic poem *Odyssey*, written by Homer.

Ovid: (43 b. C. – approximately 17 a. C.) Publius Ovidius Naso, was born in Sulmo near Rome. He was a Roman Poet. He initially began his career in public service, but he interrupted this career to focus on poetry. He was banned to Tomis in 8 a. C. without any court process, it is not clear why he was banned. He is thought to have died in Tomis during his exile.

Pius V: (1504- 1572) Metele Ghiseleri. Pope from 1566 to 1572. Fought strongly against heresy and Protestantism. He lived during the time of a huge conflict between France and Spain. He was slightly prejudice in favour of Spain. He was declared a saint, later on in his life.

Marco Polo: (approximately 1254- 1324) An Italian merchant presumably born in Venice. He was an explorer and trader, he travelled through Asia and met with Kublai Khan. He became an ambassador for Khan. He wrote of his travels throughout Asia.

Poseidon: Ancient Greek God of the oceans. Brother of Zeus, Hera, Hestia, Hades and Demeter.

Sir Walter Raleigh: (approximately 1554- 1618) English Aristocrat, writer, soldier and explorer born in London. He made an account of strange races of people, like Mandeville did. He was trialled and found guilty of treason, however his life was spared and he was locked in

the tower until 1616. He was released to conduct an expedition to Venezuela. On this mission they attacked a Spanish outpost. On his return the Spanish ambassador demanded that the king would sentence Raleigh to death after all. He was beheaded on 29 October 1618.

St. Patrick: (approximately second to third century a. C.) Christian Patron Saint. He is especially worshiped in Ireland. His feast is on the 17 of March, Saint Patrick's Day.

Theia: Ancient Greek Goddess. Mother of Helios and Selene. Wife and sister of Hyperion

Yi: Chinese hunter God.

Appendix A: Moon Fact Sheet

Moon/Earth Comparison

Bulk parameters

	Moon	Earth	Ratio (Moon/Earth)
Mass (10 ²⁴ kg)	0.07349	5.9736	0.0123
Volume (10 ¹⁰ km ³)	2.1958	108.321	0.0203
Equatorial radius (km)	1738.1	6378.1	0.2725
Polar radius (km)	1736.0	6356.8	0.2731
Volumetric mean radius (km)	1737.1	6371.0	0.2727
Ellipticity (Flattening)	0.0012	0.00335	0.36
Mean density (kg/m ³)	3350	5515	0.607
Surface gravity (m/s ²)	1.62	9.80	0.165
Surface acceleration (m/s ²)	1.62	9.78	0.166
Escape velocity (km/s)	2.38	11.2	0.213
GM (x 10 ⁶ km ³ /s ²)	0.0049	0.3986	0.0123
Bond albedo	0.11	0.306	0.360
Visual geometric albedo	0.12	0.367	0.330
Visual magnitude V(1,0)	+0.21	-3.86	-
Solar irradiance (W/m ²)	1367.6	1367.6	1.000
Black-body temperature (K)	270.7	254.3	1.064
Topographic range (km)	16	20	0.800
Moment of inertia (I/MR ²)	0.394	0.3308	1.191
J ₂ (x 10 ⁻⁶)	202.7	1082.63	0.187

Orbital parameters (for orbit about the Earth)

	Moon
Semimajor axis (10 ⁶ km)	0.3844
Perigee (10 ⁶ km)*	0.3633
Apogee (10 ⁶ km)*	0.4055
Revolution period (days)	27.3217
Synodic period (days)	29.53
Mean orbital velocity (km/s)	1.023
Max. orbital velocity (km/s)	1.076
Min. orbital velocity (km/s)	0.964
Inclination to ecliptic (deg)	5.145
Inclination to equator (deg)	18.28 - 28.58
Orbit eccentricity	0.0549
Sidereal rotation period (hrs)	655.728
Obliquity to orbit (deg)	6.68
Recession rate from Earth (cm/yr)	3.8

Mean values at opposition from Earth

Distance from Earth (equator, km)	378,000
Apparent diameter (seconds of arc)	1896

Apparent visual magnitude -12.74

* These represent mean apogee and perigee for the lunar orbit. The orbit changes over the course of the year so the distance from the Moon to Earth roughly ranges from 357,000 km to 407,000 km.

Lunar Atmosphere

Diurnal temperature range: >100 K to <400 K (roughly -250 F to +250 F)
Total mass of atmosphere: ~25,000 kg
Surface pressure (night): 3 x 10⁻¹⁵ bar (2 x 10⁻¹² torr)
Abundance at surface: 2 x 10⁵ particles/cm³

Estimated Composition (particles per cubic cm):

Helium 4 (4He) - 40,000 ; Neon 20 (20Ne) - 40,000 ; Hydrogen (H₂) - 35,000; Argon 40 (40Ar) - 30,000 ; Neon 22 (22Ne) - 5,000 ; Argon 36 (36Ar) - 2,000; Methane - 1000 ; Ammonia - 1000 ; Carbon Dioxide (CO₂) – 1000; Trace Oxygen (O⁺), Aluminum (Al⁺), Silicon (Si⁺); Possible Phosphorus (P⁺), Sodium (Na⁺), Magnesium (Mg⁺)

Composition of the tenuous lunar atmosphere is poorly known and variable, these are estimates of the upper limits of the nighttime ambient atmosphere composition. Daytime levels were difficult to measure due to heating and outgassing of Apollo surface experiments.

Appendix B: A summary of Kepler's *Somnium*

Johannes Kepler's *Somnium: the Dream, or posthumous work on lunar astronomy*, tells us the story of a young Icelandic man. It is written down in a frame story, the narrator, who in this case represents Johannes Kepler himself, tells us that in 1608 after reading about Bohemia and watching the stars and the moon the narrator fell into a deep sleep. In his sleep, he dreamt he read a book, written by a young man named Duracotus. This man claims to be from Iceland, where he and his mother Fiolxhilde lived an plain life. That is, until Duracotus cuts up one of his mother's sold herbal pouches and to pay for the damage Fiolxhilde offers her son to the sailor to whom she had sold it. The sailor takes Duracotus and brings him to Tycho Brahe²⁵, who takes him in as one of his students. The skipper returns to take him back but doesn't succeed in doing so. Under Brahe's watchful eye, Duracotus learns about the moon and stars. After several years he returns to his home country where he is reunited with his mother. His mother is delighted to discover how much her son has learned and considers him wise enough to learn all of her knowledge. She explains that she has received her knowledge in a different way than most people do. She received her knowledge from nine chief spirits and one in particular whom she often speaks to. Fiolxhilde summons her teacher in the presence of her son in a ritual that takes place in Springtime, when the moon was a crescent and in conjunction with the planet Saturn in the sign of the Bull. After having completed the ceremony, she beckons her son to be silent and covers both their heads with cloth. A voice speaks to them, who identifies himself as a deamon from Levania. The demon speaks on where he comes from, the moon, and how he would transport a human being up to the moon if he or she is considered fit to be transported to the moon. After having explained this the narrators perspective shifts from the deamon to Duracotus who continues to tell what the deamon presumably told him from the first person perspective. What follows is a description of geographical details of the moon and its place in the universe and how they perceive celestial movement from a lunar perspective compared to our terrestrial perspective. The description ends with a short summary of the flora and fauna on the moon and how their behaviour during day and night. After this, the narrator perspective returns to the primary narrator of Kepler himself, who is woken from his sleep by wind and the rattle of rain, he

²⁵ Tycho Brahe (1546-1601) a Danish astronomer who suggested a system that was in between the Ptolemaic system and the Copernican system where, the sun and moon rotated around the earth but all the other planets around the sun. He was mostly famous for his useful cosmic observations however, which he noted down in countless calculations.

finds himself lying in bed, covering his head like Duracotus and Fiolxhilde had, with his pillow.

This is a short summary of the storyline, but far more interesting perhaps are the cosmological ideas that Kepler wished to convey in this story. For Kepler the moon was not just an empty globe in the sky. It was a planet with its own eco system like ours. Unlike most people of his time, Kepler was a devote Copernicus believer. In 1543²⁶ Copernicus had claimed that the earth revolved around the sun rather than the other way around.

According to what is claimed in *Somnium* the moon, which is called Levania in the book, encircled the earth in an ellipse, while the earth made its orbit around the sun. The moon spins around its own centre in such a slow pace that one side is always turned towards earth, this side is called Subvolva, the other side that is deprived of the sight of the earth, which is called Volva by the Levanians, goes by the name of Privolva. One lunar day and night together, make one terrestrial month. So one lunar year consists of only twelve lunar days and thirteen nights. So though the lunar day may vary in length with the terrestrial day the lunar year does not differ. This makes sense because if the moon orbits the earth and the earth orbits the sun and we define a year as the period of time in which the heavenly body orbits around the sun then naturally the moon must orbit the sun in a similar amount of time as the earth does. When we on earth experience a lunar eclipse the Levanians experience a solar eclipse and the other way around.

The days and nights are almost of the same length, however, on Subvolva the nights are slightly shorter in perspective to the days and on Privolva the nights are slightly longer than the days. When the sun rises for the middle and centre of Subvolva then the moon appears to us in its first quarter. When the sun rises for the middle and centre of Privolva the moon appears to us in its last quarter. On the equator the sun passes at noon almost exactly over the middle of the sky, on two opposite days of the year it actually does so. The summer and winter period vary over time. In a period of ten years the period summer shifts rather randomly. Many more of such observations are made in the book and explained in the Notes and Appendixes added by Kepler. All in all, Kepler tries to advocate the idea of a moving earth by demonstrating the way heavenly bodies move as seen from the moon.

²⁶ Govert Schilling. (2009) *Atlas van Astronomische Ontdekkingen*. 2008. Fontaine Uitgevers. 's Graveland. Nederland.

Appendix C: A summary of Godwin's *The man in the Moon*

Bishop Francis Godwin's *The man in the Moon* tells the story of a Spanish noble bred, Domingo Gonzalez. Gonzalez is on his way to join the army to spend some time in the wars against the Low Countries, when he is robbed of his money and possessions by certain Guises²⁷ near Antwerp. He enters the service of Marshal Cossey, a French noble man. Cossey has been sent as ambassador to the Duke of Alva and brings Gonzalez along. They fight the followers of the Prince of Orange in France and during that fight Gonzalez gains a lot of money from the enemy. Now having money for himself again he takes his leave from Cossey and goes to join the court of the Duke of Alva. He is well accepted there, though often mocked because of his short stature. When the duke goes home to Spain, Gonzalez goes with him and he is released from his services to return home. Once home he marries the daughter of a Portuguese merchant. He has a disagreement with a Pedro Delgades and kills him in a duel. He flees the country to Lisbon until things have settled, but unfortunately a powerful duke returns who objects to Pedro's death and to pay him off without leaving his family poor, he decides to go to the Indies to do some trading. He does really well there and returns with a lot of money and rare gems. Unfortunately on his way back he gets sick and needs to stop on St. Helena to recover. He is left there together with a negro servant Diego. On this island he and Diego live for a long time in perfect happiness. Diego living on the other side of the island they devise several ways of communicating over long distances, some of them involving the taming of animals such as birds, to which Gonzalez takes a fancy. At some point he takes it to him to domesticate a flock of swanlike birds, training them to fly to and from him at the sign of a white flag. He also teaches them to carry a burden and after a while, he devises a construction which allows his "gansas" to lift him up in the air with him. He shows his flying machine to the captain of the fleet that comes to pick him up and the captain agrees to take the birds and machines in as well. Their small fleet encounters a fast English fleet who attack them for their riches. One boat sinks, one boat escapes and the largest one, on which Gonzalez is, tries to make its way back to the island, but crashes on the shores. Gonzalez, seeing his death nearing in on him, brings his bird-flying device up on the deck and flies away. His birds make for the Azores, mistaken by Godwin for the Canaries, landing on Pico Island, which is perhaps taken for the "pico" on Teneriffe. On this island savage people prepare to attack him and Gonzales tries to direct his birds to take flight again, they do so but rather than going

²⁷ The followers of Henry, duc de Guise, who was the leader of an ultra-Catholic party in France.

where he wants them to go they fly upwards, all the way until they leave the earth and land on some asteroid in between the earth and the moon. On this asteroid Gonzalez meets strange spirits and demons who offer him food and help from their master (Satan). He accepts the food and fills his pockets with it. After this they leave him alone with the promise to return him to Spain on Tuesday. But when he is left alone his birds stir again and set off. Still strapped in his device Gonzalez is taken up into the sky once again and this time his birds take him to the moon. Their journey to the moon takes several days. On the moon everything is very large and he discovers all the animals that have wings and migrate in the winter migrate to the moon. He is approached by exceedingly large intelligent creatures who fall on their knees when he cries out "Jesus Maria!". They embrace him and take him to their leader, who is even taller than them. This leader brings him to one of the 29 princes, this one called Pylonas. He pays his respect to this prince by offering him and his wife some gemstones. This prince questions him in gestures but since by gesturing Gonzalez cannot answer his questions to his satisfaction the Prince orders him to be taken to a room, fed and clothed well and he orders that they teach him to speak their language. After he has learned this, the Prince and his guards explain him a lot about this world. Gonzalez meets with the supreme ruler Irdonozur, whom he also offers a couple gems. This gift is well received and Gonzalez is honoured with several precious stones which have nearly magical properties. In the end Gonzalez longs to return home to his wife and children that he is reluctantly given leave to go. He flies home again, this time within eight hours. He lands in China where he is taken captive after having hid the precious magical stones he got from the Lunars. He is taken to the Mandrin, who promises the crowd to punish him for his perceived magic but rather only holds him captive in his house. When Gonzalez learns a little Chinese, in the farmer dialect, he is able to talk to the Mandrin and he grows in his estimate. The Mandrin takes him with him to Peking where he meets a couple of European traders with whom he is allowed to return to Europe and eventually Spain.

Appendix D: A summary of Bergerac's *The Other World*

After discussing with his friends what the moon could possibly be, Bergerac conceives the idea that the moon is perhaps another world on which there is life that might consider the earth as a moon. He returns home to find a book opened on his desk that was not there before. His servant ensures Bergerac that he has not placed the book there. Bergerac studies the book and is surprised to find that it is opened at a passage where two inhabitants of the moon visit the earth and explain all about themselves to the author. The protagonist believes that this cannot possibly be a coincidence and he becomes convinced that he should show the world that the moon is another world like the earth. To do this, he figures he has to go to the moon first. His first attempt to rise up in the air by means of bottles filled with dew fails because he panics and smashes a couple of bottles. He lands in Canada, where he builds a flying machine to attempt it once again. Together with fireworks and a marrowbone ointment that is rubbed all over his body he succeeds and crashes down on the Tree of Life in the Garden of Eden on the Earthly Paradise that the author has situated on the moon. The sap of these fruits save his life and rejuvenate him. He walked around and is amazed by the splendour of Paradise when he encounters Elijah. Elijah explains to him how things are done in paradise and how the others that are there have managed to get up there. Bergerac manages to insult Elijah by making a heretic remark and Elijah decides to send him away from paradise. Before Bergerac complies he steals an apple from the Tree of Knowledge. When he gets out of paradise he decides he is hungry but instead of grapping one of the innocent fruits he has in his pockets he eats from the fruit of Knowledge without getting rid of its shell first. He manages not to forget everything about the Earthly Paradise on the moon because his teeth also hit the real fruit and its juices preserve some of his knowledge. He forgets the location of paradise however. He is stranded in the middle of nowhere. He starts walking and soon he encounters some strange human animal hybrids, one of these creatures throws him on its back and takes him to a city. In this city he encounters a very large type of humans who walk on their hands and knees. Because he, in comparison, is so small and he walks on his hands and knees, he is considered to be an animal by these people. It is decided that he should be brought to the king and queen who had such another specimen. They think he is female and that the two of them might be able to breed. Before the protagonist is taken to the king and queen he is first taken into the custody of a nobleman. He keeps Bergerac and prods him to make him do tricks while the people marvel at him. At some point in time, a man approaches his cage and starts talking

Greek to him. He explains that he is an inhabitant of the sun who has visited the earth in the past, therefore he can speak Greek. He identifies himself as the demon of Socrates and from then on is referred to as the demon. They talk a while and the demon explains that his people used to teach his kind a lot of things but they no longer wanted to do so as they became arrogant. The demon visits him daily after that but has to leave him again and not long after the protagonist has take a trip to the palace of the king and queen. During this journey Bergerac encounters this demon again and it explains many things to him, like the way they eat dinner on this planet, by inhaling the fumes. At the palace of the king and queen he encounters Spanish man who, trying to find a country where they would not persecute him for his ideas arrived on the moon as well and was taken captive by the king and queen as one of their price primates. They place the two together, hoping that they will produce offspring together since they consider him a female of his kind. By observing the noble men and woman that come to gaze upon them the protagonist learns a little of their language. As he learns to speak, the discussion is opened on whether or not the protagonist is a human after all. The “church” highly disputes this, apparently frightened that this may cause people to doubt their word. To prove that he is a human he has to answer numerous philosophical questions to which he cannot possibly give the right answers since his primary believes are so much different from theirs. After this he is considered a type of parroting bird and placed into a large cage, separated from the Spanish man, where he continues to perfect his knowledge of their language. Once again the debate upon him being a human of not rises and when he tells everyone he is from the earth, and the earth is a world like their world he has to defend his case in court against the “church” who wishes to see him sentenced to death. In the end the demon from the sun pleats his case and after declaring, dressed in a most shameful way, that he is in fact not from earth and that it is not another world like that world, he is released into freedom and accepted as an intelligent person. The demon takes him to a young master and two philosophers with which they discuss all sorts of things, like the feelings and intelligence of plants. At some point the philosophers leave and the protagonist and the young master are left their own and they often come to discuss the subject of the existence of god. The young master, being an atheist who is blessed with an exceedingly rational mind and well taught in rhetoric, often confuses the protagonist and makes him doubt his beliefs. The demon of the sun intervenes and gives Bergerac the proper response. During one of such religious discussions the young master is suddenly grabbed by a monstrous creature, called a demon in the book, but certainly not the same demon as the demon of Socrates. Bergerac tries to safe his heretic friend and jumps on his back. The demon flies to earth and Bergerac is cast of its

back when he cries out: “Jesus Maria.” Once he is fully awake and aware again, the young master and the demon are nowhere to be seen. Bergerac has landed somewhere in Italy and he is taken to a city by a couple of shepherds. In this town the dogs chase him, until Bergerac locks himself up in a house and cleans himself of the scent of the harmful moon by sunbathing. After that he goes to the harbour and returns to France by ship.

Appendix E: A summary of Verne's *From Earth to the Moon*

The story of *From Earth to the Moon* is set in America. It starts with an explanation about the Gun-club and what it is. The Gun-club is a society of men, it is dedicated to the invention and improvement of artillery. It was founded during the years of the American Civil War, but now that the war is over it lacks a purpose. The president of the Gun-club, Mr. Barbicane therefore decides that the Gun-club should organize a project. Since all of the members of the Gun-club are experts in the art of artillery, they should use their knowledge to write history and achieve glory and honour outside of the battlefield, on the field of science. Mr. Barbicane proposes the Gun-club to establish the first contact between the moon and the earth by sending a projectile to the moon. This proposal is accepted with much enthusiasm. Because the Gun-club is such a large society the press soon finds out about this plan and enthusiastically reports on it. The project become known worldwide and is the talk of the day. The Gun-club meets on several occasions to discuss the subjects of the canon they shall use, the projectile they will send and the type of explosive they will use. Meanwhile Mr. Barbicane contacts the observatory in Cambridge to do some calculations on the speed their projectile should have to stand a chance at reaching the moon, the angle the launch, the best location and best date for this enterprise. After having decided on the canon, the projectile and the type of explosive, based on the answers of the Cambridge observatory, the Gun-club starts collecting money. The press has made sure that the enterprise is well known across planet and the people are very enthusiastic. All sorts of documentation on the moon is given to the people who grown curious about this object in the sky. The international collection goes well in most countries, though England refuses to give any money. Meanwhile there are also people who do not approve of this plan. Captain Nicholl is one of these people, he places a couple of bets on the impossibility of success in this plan. In total he bets 15000 dollars on the entire enterprise failing, of which he has to pay 5000 to Barbicane when he loses the first two bets he made about the making of the canon and the loading of it. At this point in the story a French man makes his way to America announcing by telegraph that he wishes to board the projectile that is send to the moon. After some initial doubt this is agreed upon. When this man, Michel Ardan, and Mr. Barbicane hold a press conference however, one man keeps on objecting to Michel Ardan launching himself to the moon. Declaring the man insane and the enterprise impossible. After the conference Mr. Barbicane and this man meet, it is Captain Nicholl, his nemesis. They decide to dual in the forest, when the Gun-Club's secretary, Maston, discovers this he pleads with Michel

Ardan to come with him and stop the two men, because he does not want Barbicane to die. If he would die the entire enterprise would stop after all. Ardan ends the hostilities by declaring that both Barbicane and Nicholl shall accompany him on his journey to see who is right after all. After many tense days all preparations are complete and everyone gathers in Florida where the launching shall commence on the fourth of December. Ardan, Barbicane and Nicholl enter the bullet-like projectile with two dogs and wait for the countdown. They are successfully blasted into the air and on their way to the moon. On their way to the moon Barbicane and Nicholl seem to put aside their differences and come to have some sort of friendship. The two of them are better schooled than Ardan and they often confuse him with their difficult explanations and questions. On their way one of their dogs dies, they dispose of his body by throwing it out the window in the bottom of their vessel as quickly as possible. In time he starts to float next to them because of the gravitational pull. They almost have a run in with a large fireball that soars right past them. Confused by this unknown celestial body they conclude it must be a second satellite to the earth but they have never seen it on earth because it was relatively small in comparison to other celestial bodies. This fireball knocks them slightly of course, because of this they do not land on the moon as they intended but are sent into orbit around it. To escape the endless circling around the moon, they decide to use their firework rockets, which were intended to aid them on their landing, to launch themselves to the moon after they have done a full orbit around the moon and they come to the point of zero gravity again, where the gravity of the earth and moon equal each other. Their idea fails and rather than sending them on their way to the moon the firework rockets send them on their way back to the earth. They crash into the front of a ship on sea and are lost for a couple of days. All sorts of rescue operations are set up to fish them from the bottom of the ocean but they all fail. They have just given up when they spot a strange kind of buoy with an American flag on it. It's the projectile that floated back up and in it are Ardan, Barbicane and Nicholl playing domino. They are received as heroes and not much later another society is founded, the National society of cosmic transport. The three of them, and Maston, get the most important seats.