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Joseph Wright of Derby: Illustrating Scientific Progress

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INTRODUCTION

Connections between science and art, as they exist in today's society, are not always easy to find. Harsh boundaries, symbolic “Caution” tape, surround the disciplines and are rarely crossed. My personal experience with both entities has largely been separate until I came across the artwork of Joseph Wright of Derby. His paintings demonstrated that there are actually many intersections between the history of art and the history of science. The emergence of science and the practice of art coincided during the period of the Enlightenment. Artists, mostly engravers, took this opportunity to portray science in an artistic medium. Wright of Derby’s works of fine art, however, were unprecedented and are commonly researched as representations of science during the Enlightenment.

Joseph Wright of Derby’s depictions of science and experimentation were widely unprecedented. The other eighteenth century works depicting laboratories and scientists are very different from Wright’s scientific pieces. Many of the paintings and drawings of science during this time were used as text supplements in books, magazines or manuals. These paintings normally served a practical purpose and illustrated scientific procedures. Louis-Jacques Goussier frequently produced engravings for magazines and even appeared in Diderot’s Encyclopédie. One of his engravings, Laboratoire et table des Raports (1772, Figure 1), depicts a practical chemistry laboratory. These engravings illustrated the modern eighteenth century technology and industries without referencing the science of the past. Wright’s paintings, on the other hand, juxtapose the old with the new to make the contrast even more apparent.

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1 Denis Diderot, Encyclopédie, ou Dictionnaire Raisonné des Sciences, des Arts, et des Métiers (Paris: André le Breton, 1751-72), 11.
Wright’s three scientific paintings, *A Philosopher Lecturing on the Orrery* (1766, Figure 2), *An Experiment on a Bird in the Air Pump* (1768, Figure 3) and *The Alchemist in Search of the Philosopher’s Stone* (1771, Figure 4) each represent different aspects of scientific progress and the Enlightenment. Wright includes elements in each of these paintings that contrast the scientific knowledge of the past to the advances of the eighteenth century. *A Philosopher Lecturing on the Orrery*, illustrates an orrery demonstration, representing that movement of planets around the sun in the solar system. Wright juxtaposes astronomy and astrology in order to illuminate scientific advances in this painting. *An Experiment on a Bird in the Air Pump* illustrates a scientific demonstration and highlights the varying reactions of the onlookers to the experiment. This painting contains references to science of the seventeenth century in comparison to the more modern, eighteenth century technology.

Lastly, Wright’s final scientific painting, *The Alchemist in Search of the Philosopher’s Stone*, shows the ancient practice of alchemy. Alchemy was not a respected scientific discipline during the eighteenth century and it was associated with magic. This painting was Wright’s way to show the progress that science has made since the time of alchemy. The concept of progress through science and the Enlightenment is a very important theme in Joseph Wright of Derby’s paintings. Wright’s dramatic and artistic interpretation of science appealed to many people during and after the eighteenth century. These scientific history paintings have long fascinated viewers with their secular subject matter. Wright’s talent was clearly recognized during his lifetime; however, his artistic contributions have been instrumental to scholars attempting to bridge the gap between science and art.
The artist, Joseph Wright, was born in Derby in 1734 to a family of attorneys. His father attempted to thwart his artistic interests at a young age, however, the ever-persistent Wright continued to draw and paint from nature. He continued his training in London under the portraitist, Thomas Hudson. As a child and young man, Wright’s interests ranged from technology to history and everything in between. He constantly sought new information and has a true passion for learning. Wright was especially interested in industry and science. He spent most of his life in Derby, England where he met the physician, Erasmus Darwin. Wright’s relationship with Darwin strengthened throughout his lifetime and also granted Wright access to information about the Enlightenment and science.

The Enlightenment served as a transition period for most of Europe. Philosophers and scientists alike were collaborating and championed this movement towards rationalism and away from religion. One group, in particular, perpetuating these ideals was the Lunar Society. Members of this organization were on the forefront of scientific experimentation, discovery and were also major players in the philosophical debates of the time. The ideals of the Enlightenment inspired influential men from around England to unite as the Lunar Society. Wright’s acquaintance, Erasmus Darwin, was the patriarch of this society. The Lunar Society had a small, elite membership of influential scientists, philosopher and overall rational thinkers.

**The Enlightenment**

The scientific Enlightenment began in France with Galileo Galilei, Johannes Kepler, René Descartes, Isaac Newton and Jean-Baptiste le Rond d’Alembert (1717-1783) but came
to fruition in the eighteenth century.\textsuperscript{3} D'Alembert described the movement as "the discovery and application of a new method of philosophizing, the kind of enthusiasm, which accompanies discoveries, a certain exaltation of ideas, which the spectacle of the universe produces in us."\textsuperscript{4} The French named the movement as the \textit{siecle des lumières}, or the "century of light," while the English more commonly referred to it as the Enlightenment. Immanuel Kant, the German metaphysician, coined this term to describe the Scientific Revolution.\textsuperscript{5} This Scientific Revolution began as a movement solely focused on the advancement of mathematics and astronomy. However, in the second half of the eighteenth century, the movement extended to include the natural sciences as well.

The Enlightenment was not limited to academia and participating philosophers were also passionate about the changes in human thinking and nature. Philosophers began to strive for "reason" and a complete understanding of the world around them.\textsuperscript{6} The Enlightenment thinkers moved away from religion and priests as the main sources of knowledge towards reason, nature science and rational thinking.\textsuperscript{7} John Locke, the seventeenth century philosopher, helped establish the importance of nature by equating it with religion. Sir Isaac Newton was one of the most influential philosophers during the Enlightenment. Originally from England, Newton researched the movement of the planets and studied the forces of gravity. During the eighteenth century, the different sciences were named and placed into the categories widely accepted today. The creation of these disciplines marked a turning point in scientific history.

\textsuperscript{4} Ibid., 1.
\textsuperscript{5} Ibid., 2.
\textsuperscript{6} Ibid., 2.
Joseph Wright of Derby explores the transition from religion to rationalism in many of his “scientific” works where the scientist is in the stance of a priest gesturing towards heaven on the brink of an important experiment or discovery. For example, *The Alchemist In Search of the Philosopher’s Stone* includes an alchemist in a priest-like pose, praying for the success of his experiment. Wright clearly had a vested interest in the Enlightenment and the scientific movement of his time through his association with the Lunar Society. Despite this interest in reason and science, he deliberately chose not to move from Derby to a bigger city. He was fascinated enough with the culture and scientific proceedings of Derby to ever relocate.

Wright’s scientific works illustrate his many interests and curiosities ranging from experiments to industrialization. He was not, however, a “scientific illustrator” merely concerned with “technical accuracy.” Wright, instead, painted his scientific works through his own unique lens. Wright was particularly fond of painting from life rather than his imagination. He often employed friends and colleagues to pose as subjects in his works, as he supposedly did in *The Experiment on a Bird in the Air Pump*. Wright used scientific textbooks and demonstrations as models for his scientific works. Overall, the following three paintings epitomize the spirit of the Enlightenment and scientific discovery.

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8 Ibid., 74.
CHAPTER 1  

Erasmus Darwin  

Erasmus Darwin was an eighteenth century "Renaissance man" with many talents and interests. Darwin's prominent position in society allowed him to become very influential in the Enlightenment. He exemplified the revolutionary movement with his willingness to contribute to scientific progress. Darwin was the youngest of four brothers born in Nottingham on December 12, 1731. He won the prestigious Exeter Scholarship to study medicine at Cambridge, and he graduated in 1755. He then moved to Lichfield in 1756 and started a successful medical practice. Darwin was known for his "bold and unconventional medical methods and striking personality." Upon his arrival in Lichfield, Darwin became acquainted with Canon Seward. Seward's house served as the town's intellectual hub at the time of Darwin's arrival. Darwin's skill as a physician was renowned across England. He was a benevolent physician and often treated the poor without charge and made house calls to his more wealthy patients. Darwin's distinctive and unconventional medical approaches set him apart from other physicians. He had the ability to think beyond the present and anticipate into the future, in medicine and other disciplines.

Darwin's second wife disliked living in Lichfield, so the family relocated to Derby. When Darwin moved to Derby he missed the Lunar Society meetings and his fellow

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13 Ibid., 86.
16 Ibid., 87.

King George III commented on his talent and requested Darwin's service as his own physician. Darwin was certainly was not immune to disease and ailments. He had small pox and the disease left scars on his skin. He married Mary (Polly) Howard on December 30, 1757, and the couple had three children. Howard unfortunately passed away from liver cirrhosis when their youngest son was only four years old. Darwin found
members so he founded two other organizations. In 1779, he started the Lichfield Botanical Society as an outlet for his love of botany, and in 1783 the Philosophical Society of Derby.  

The Derby Philosophical Society began in 1784, but never gained the popularity that its predecessor, the Lunar Society, achieved. Its meetings were more formal than those of the Lunar Society, and the members focused predominantly on publishing papers and research.  

While in Lichfield, Darwin kept up regular letter correspondence with the Lunar Society members in Birmingham. Darwin’s health declined and he eventually died from pneumonia on April 18, 1802 at age 70.

In addition to Darwin’s career as a physician, he also published many books and poems. His poetry mainly consisted of information about botany and gardening and influenced the later Romantics. As evidenced by his interest in literature, Darwin’s intellectual curiosity expanded well beyond the limits of his medical practice. Darwin was also an avid researcher and inventor. He recorded his interactions with patients and scientific research. One of his most celebrated contributions was a design for a carriage axle, used to prevent carriages from overturning during commutes. Erasmus Darwin’s first published scientific paper was about cloud and air expansion in response to temperature. The paper

new love following Howard’s death in Mrs. Chandos/Elizabeth Pole. The couple married in 1781 and had seven children together, four boys and three girls.

20 Henry Carrington Bolton, “The Lunar Society, or, the Festive Philosophers of Birmingham One Hundred Years Ago,” (1888): 5.
was published in the Royal Society's *Philosophical Transactions*.\(^{24}\) Darwin was also an advocate for the education of women and girls, which was a revolutionary stance. He published *A Plan for the Conduct of Female Education in Boarding Schools* in 1797, which was a very progressive plan that emphasized the importance of proper education for males and females.\(^{25}\) This information is interesting to consider in light of Joseph Wright of Derby’s decision to include women and girls in his scientific paintings. It is possible that Wright was trying to show women as educated, empowered and enlightened in his works, especially if he was at all influenced by Darwin’s agenda to improve female education.

Joseph Wright of Derby painted a single portrait of Erasmus Darwin in 1792-93 (Figure 6). Although Darwin had interests in many disciplines, Wright chose to portray him as a writer, following the publication of his poem, “The Botanic Garden.” Wright and Darwin met when Darwin returned to Derby and began treating Wright for liver disease and depression.\(^{26}\) Darwin’s portrait establishes both his physical and intellectual presence. He is shown as a stout, scholarly man. Wright draws attention to Darwin’s weight and size by the clumsily buttoned jacket, barely containing his protruding stomach. Wright includes a feather pen in Darwin’s right hand to emphasize his literary achievements. The quill, in a linear fashion, points to Darwin’s forehead from his hand, the source of his intelligence.\(^{27}\) Darwin’s gaze extends beyond the picture frame, leading the viewer to believe that he may have been deep in thought. This portrait illustrates Wright’s talent as a portraitist as well as his ability to incorporate science into his paintings.


\(^{25}\) Ibid., 70.

\(^{26}\) Derby Art Gallery and Museum, Derby, England, wall label (accessed November 2012)

\(^{27}\) Ibid.
The Lunar Society

Major discoveries in the fields of cosmology, optics, and physics took place well before the time of Darwin and the Lunar Society. The definitions of “science,” “philosophy” and “literature” were in transition during the Enlightenment. Until the second half of the eighteenth century, “science” was defined as “any systematically achieved knowledge,” expanding to philosophy. The Lunar Society meetings were outlets for intellectuals to discuss their many interdisciplinary interests. At this time, the lines between science, art and literature were very blurry. The Society members discussed issues pertaining to science, medicine, education and art. They did not view disciplines such as philosophy and astronomy as separate entities; instead they viewed intelligence as being a well-rounded and educated individual. The Lunar Society is best known as an informal organization of men who met monthly to discuss innovations in science and other disciplines. They began meeting in the mid-1760s up through the late eighteenth century. This Society was undoubtedly the most influential philosophical and scientific society in England during the eighteenth century. The few records of the Lunar Society indicate that their members were predominantly focused with “experimentation” and “improvement.” The Lunar Society was not the only organization of its kind in England. The Manchester Literary and Philosophical Society, the Derby Philosophical Society, the Literary and Philosophic Society of Newcastle-on-Tyne and the philosophic clubs of Liverpool, Bristol and Leeds were also in existence.

30 Ibid., 90.
31 Ibid., 89.
Unfortunately, Lunar Society members left no official records of their meetings and there is no evidence that they had a secretary or ever recorded minutes. Joseph Priestley, the chief correspondent for the organization mainly recorded names and professions of the society members. Priestley’s records also contain limited information about the society’s purpose and what the members discussed. Scholar Samuel Smiles performed extensive research on the few existing Lunar Society records. He found the work of Matthew Boulton and James Watt to be most helpful and comprehensive. However, the majority of the documents collected were letters sent between members. Smiles’ research revealed details about the nature of the Lunar Society gatherings. Most of the members lived near each other and interacted on a daily basis. Members living outside of Birmingham kept up constant correspondence with other members, usually averaging at least a letter per week. The meetings were important to maintaining the foundation of the society. However, it seems as if information was more readily spread outside of the actual meetings rather than during them.

The idea of the Lunar Society began after Matthew Boulton and Erasmus Darwin met in 1760. Darwin and Boulton, residing in Birmingham and Lichfield respectively, shared a love of science and admired Benjamin Franklin. Franklin would meet with the Lunar Society when he visited England. He also kept up frequent correspondence with the members overseas. The title, “Lunar Society,” was derived from their meeting time. The name was adopted in 1775, and they always met monthly on the full moon to ensure that there would be

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33 Ibid., 409.
34 Ibid., 409.
35 Ibid., 411.
36 Ibid., 411.
37 Ibid., 411.
enough light to guide their travels home.\(^{39}\) A typical meeting began around 2:00 PM and lasted until 8:00 PM. The men would discuss literature, science and arts at length. Each member was allowed to bring a non-member guest with him to contribute to the discussion.\(^{40}\) The Lunar Society began with very small, informal meetings between Darwin, Boulton and Whitehurst. After 1765, the members adopted the name “The Lunar Circle.” They began expanding their membership to include William Small, Josiah Wedgwood, Richard Edgeworth and Thomas Day.\(^{41}\) The Society never grew very large. Records suggest that there were never more than 8-10 members in the Society at any given time.\(^{42}\) Josiah Wedgwood and Erasmus Darwin were particularly close friends. Their relationship began when Wedgwood sought medical attention from Darwin for his recurring illnesses. The friends shared an interest in Erasmus’s inventions.\(^{43}\) In addition to advocating for reason and science, Darwin and Wedgwood were also human rights advocates. Darwin fought for more humane therapy and treatment of criminals and the insane.\(^{44}\)

The Lunar Society members believed that their talents would be best practiced in inventing new technologies to “better exploit the material world.”\(^{45}\) The members not only discussed scientific experiments, but they also were innovators and inventors. Since some Lunar Society members had to travel great distances to attend meetings, they often discussed transportation improvements. They commonly pooled their knowledge to invent worthwhile

\(^{39}\) Ibid., 89.
\(^{40}\) Henry Carrington Bolton, “The Lunar Society, or, the Festive Philosophers of Birmingham One Hundred Years Ago,” (1888): 3.
\(^{42}\) Henry Carrington Bolton, “The Lunar Society, or, the Festive Philosophers of Birmingham One Hundred Years Ago,” (1888): 3.
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and useful tools that they could advertise globally. For example, society member, Boulton, began designing the steam engine along with James Watt. Erasmus Darwin also focused on transportation, designed carriages to help facilitate long-distance transportation. Joseph Priestley took an interest in chemistry and discovered oxygen and discovered a way to make carbonated water. In addition to inventing these items, the members also discussed ways to market them. The Lunar Society members were interested in inventing and marketing. They discussed items ranging from transportation methods to fashion. Erasmus Darwin focused on the cloth industry and sought out improvements of stocking-frame designs. These men were not only leaders in the Industrial Revolution, but they also furthered the European “consumer society.”

Overall, the Lunar Society members were a highly recognized and influential group. Many scientists in the Society were elected as Fellows of the Royal Society. Therefore they were not only recognized in Birmingham but were also celebrated throughout England. The Lunar Society members were emblems of progress, both in the scientific and political fields. Led by Darwin, members were constantly discussing ways to improve society through technology. In addition, their philosophical stances on human rights and women’s education further solidify their position as some of the most progressive and liberal thinkers of their time.

47 Ibid., 89.

The members also established the Pneumatic Medical Institute in addition to their scientific research. This was a short-lived business venture but it was an organization that helped support consumption research. The study of consumption was of particular interest to Lunar Society members since they had previously lost members to the disease.
The Lunar Society began to decline in 1781. This year marked the beginning of the "Lunar Apogee," and lasted for a decade. Riots occurred in the summer of 1791 in Birmingham. These mobs took possession of the town and destroyed a great deal of private property. The animosity was caused by political and religious intolerance, especially directed against Dr. Joseph Priestley and the Lunar Society members. Society member, James Keir, was especially involved in politics and the French Revolution. He embraced the Revolution as "the sole triumph of reason." Keir and Priestley were both subjects of the 1791 riots.52 It was widely known that the Lunar Society accepted and supported the French Revolution, and the rioters were vehemently opposed to the changes53. The rioters were fighting for the "church and king forever," and actively opposed "philosophers," calling the Lunar Society members, "Lunatics." The turmoil caused Priestley to flee London for safety.54 This summer, therefore, marked a further decline in the Society. They gradually drew into a deeper decline towards the end of the eighteenth century. Prominent members began to pass away or relocate. The few survivors "found its [the Lunar Society] associations too painful to be continued."55

**A Philosopher Lecturing on the Orrery**

The Lunar Society's many interests, ranging from science to art, come full circle with the art of Joseph Wright of Derby. Wright was a fringe member of the Lunar Society who painted both portraits of Society members and scientific experiments and demonstrations.

54 Ibid., 10.
55 Ibid., 11.
Wright painted *A Philosopher Lecturing on the Orrery* in response to the growing interest in the planetary movement around the sun. This painting was Wright’s first venture into scientific subjects and includes references to scientific progress and the Enlightenment by juxtaposing “soft” and “hard” sciences. Wright alludes to astronomy and astrology in *A Philosopher Lecturing on the Orrery*, and his dramatic lighting functions to symbolize the physical and intellectual enlightenment of the viewers around the orrery. Through Wright’s connections to Erasmus Darwin and the Lunar Society, the artist would have been privy to the type of demonstration shown in the painting. Additionally, his personal scientific curiosities led him to seek out opportunities to learn more about science and technology.

Wright painted *A Philosopher Lecturing on the Orrery* without a commission. However, Washington Shirley, the 5th Earl Ferrers eventually purchased the painting. Shirley was a British Naval officer and an amateur astronomer who owned an orrery in his personal collection. The painting was later included at the Society of Artists exhibition at Spring Garden, London, and was first exhibited in 1766.56

The young boy and girl, faces illuminated by the light, interact with the planet models of the orrery. The boy in the foreground of the work hides the light source. This source is an oil lamp placed in the center of the orrery, representing the sun.57 Each member of the audience is one of Wright’s friends/colleagues and is meant to be recognizable.58 Unlike the young girls in *An Experiment on a Bird in the Air Pump*, these children seem very interested and unafraid of the scientific demonstration. Both smile and engage with the model. A young woman adorned with a large hat stares attentively at the orrery with her hands either in

her lap or underneath the table, cranking the orrery. Another female, enveloped in the shadows, but we can tell that her face is illuminated by the candlelight. This painting utilizes light in a similar fashion to the *Experiment on a Bird in the Air Pump* by illuminating the spectator’s faces and representing their intellectual enlightenment.

Each of the individuals in the painting is well dressed, indicating that they were most likely well-educated middle- to upper-class citizens. The four men in the painting each occupy a different role. The two individuals on the right engage with different aspects of the demonstration. The demonstrator commands attention from the viewer in a few ways. His crimson red sleeves stand out against the black background. His attire and his grey hair contribute to his scholarly and wise air. His gaze falls upon the dark-haired man on the left. This man, dressed in powder blue, records notes on the experiment while the demonstrator inspects his records. The man in brown looks up at the demonstrator as the man in blue stares contemplatively at the model, itself. Unlike *An Experiment on a Bird in the Air Pump*, where two people establish eye contact with the viewer, none of the figures in *The Orrery* look out at the audience. Furthermore, none of the individuals in the painting establish eye contact with one another. The demonstration room is cloaked in darkness and shadows, dramatizing the scientific atmosphere. A bookshelf filled with large books haphazardly stacked is covered in a drape or curtain. Wright purposely covers the light source in order to cast shadows on the figures. He also uses highlights in order to heighten the intensity of the work and show his skill at depicting light sources. The demonstrator of this type of experiment would often place a lamp at the center of the orrery to represent the sun. This is the predominant light source in *A Philosopher Lecturing on the Orrery*, and illuminates the onlookers’ faces. Wright’s use of the oil lamp not only dramatizes the painting aesthetically,
it also physically and intellectually enlightens the viewers. The men and women gain knowledge and insight about astronomy by watching the demonstration. The manmade oil lamp is significant because it is the source of light as well as the source of the onlookers’ enlightenment. The light from the oil lamp represents the transfer of knowledge about the orrery to the viewers. Therefore, Wright uses this painting to illustrate how the Enlightenment successfully disseminated science through demonstrations, like the one shown.

Orreries, telescopes and planetariums increased in popularity during the 1740s and were used for scientific lectures.59 They demonstrated the movement of the solar system on a smaller scale. James Ferguson lectured in and around Derby in July 1764, and it is likely that Wright may have observed one of Ferguson’s demonstrations before he painted the A Philosopher Lecturing on the Orrery and An Experiment on a Bird in the Air Pump.60 Ferguson was a Scottish scientist who used machines to demonstrate different scientific theories of “Mechanics, Hydrostatics, Pneumatics and Astronomy.”61 Tickets for these public demonstrations were available from John Whitehurst, a friend of Wright’s and a Lunar Society member.62 However, the use of an orrery for a demonstration was not always widely accepted. The representative nature of the apparatus was controversial for some people. They claimed that it was not on the same scientific level as the air pump, which instead, demonstrated “hard science.”63 Overall, the orrery were successful teaching aids that allowed people to conceptualize the planets in motion and in relation to the sun.

62 Ibid., 11.
The man making notes has been recognized as Peter Perez Burdett, one of Wright’s friends, a surveyor, mathematician and artist. There was also a suggestion that Washington Shirely, the fifth Earl Ferrers and his nephew are depicted. Others claim that Wright deliberately painted Washington Shirley with many of the same physical characteristics as Sir Isaac Newton (1643-1727). In his *Principia* (1687), Newton unified the terrestrial and celestial worlds. *This Principa* demonstrated that terrestrial bodies, which fell “naturally” on Earth, and celestial bodies obeyed the same law of universal gravitation. This connection to Isaac Newton could establish this work as a “scientific” history painting, as it does represent a significant element in the history of science. Additionally, this painting is very large and has the same naturalistic style as the history paintings of the time.

Susan Siegfried proposes an entirely new interpretation of *A Philosopher Lecturing on the Orrery* by recognizing the intellectual roles that women played during the Enlightenment. She references how women served as the “animating mistresses of conversation” in some scientific forums and that they did play a role in scientific development. For example, Erasmus Darwin, patriarch of the Lunar Society and the Philosophical Society of Derby, permitted certain women to view their experiments. Outside of the home, women frequently attended public lectures and demonstrations on science. Wright’s *A Philosopher Lecturing on the Orrery* features a woman who appears to be participating in the experiment. Her hands are concealed either in her cape or under the table and she may have operated the crank of the orrery; a function laypeople were not allowed to perform. Considering Darwin

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66 Ibid., 42.
67 Ibid., 43.
68 Ibid., 44.
and the Lunar Society’s stance on promoting education for women, it is likely that Wright would have shown women in an educated position.

The minute details in Wright’s paintings can often be clues to the artist’s message and intents. For example, the border of the orrery is labeled with the months of the year as well as the astrological signs. The labels, “Leo,” “Gemini” and “Cancer” are most clearly visible on the bottom left of the painting. The inclusion of these astrological names on the orrery is another interesting element to consider. Astrology, like alchemy, was not a “hard” science like chemistry or physics. The orrery’s main function was to demonstrate astronomy and planetary movement. Instead of only depicting that in his painting, Wright also includes astrological information. He mingles this “softer” science with an astronomy demonstration, to juxtapose astronomy and astrology and show the evolution of scientific knowledge. Overall, this painting shows how the Enlightenment contributed to a better understanding of the world through a scientific lens.
CHAPTER 2

_An Experiment on a Bird in the Air Pump_

Dr. Bates of Aylesbury, England, commissioned Wright’s _An Experiment on a Bird in the Air Pump_. Wright completed the painting and delivered it to Bates in 1765. However, it was not exhibited in London until 1768 when the Society of Artists developed an exhibition to honor the King of Denmark.\(^6^9\) This painting depicts a scientific demonstration on the properties of oxygen. This type of experiment was common for the eighteenth century, and Wright would have been familiar with its representation. Wright includes references to modern scientific advances throughout the work while also alluding to science of the past, creating a juxtaposition allowed him to illustrate the triumph of scientific progress and the Enlightenment.

The understanding of oxygen and its importance was a widely disseminated concept during the Enlightenment. _An Experiment on a Bird in the Air Pump_ (1768) represents a typical scientific presentation or lecture being given to a diverse audience. Contrary to popular belief, this painting does not represent an actual Lunar Society gathering.\(^7^0\) Unlike a typical Lunar Society meeting, this painting shows an experimental procedure separated from specific laboratory research and discussion. These types of scientific demonstrations were important during the Enlightenment. They were used as a vehicle to propagate scientific knowledge throughout society. These paintings, as well as the traveling scientists, made the

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\(^{6^9}\) National Gallery. _Experiment on a Bird in the Air Pump_ Dossier (London, England)

\(^{7^0}\) Olga Baird, “Joseph Wright of Derby: Art, the Enlightenment and Industrial Revolution,” _The Revolutionary Players_.

scientific advances of the Enlightenment much more accessible to the masses. Many people were exposed to this knowledge through public lectures, entertainment and demonstrations.\footnote{Marek H. Dominiczak, “Science, Alchemy and Light: Paintings by Joseph Wright of Derby,” \textit{Clinical Chemistry and Laboratory Medicine} 40, no. 1 (2002): 74.}

The painting takes place in a dark, untidy room. The advanced lab demonstration equipment on the table contrasts with the exposed wood and brick walls and doorway in the background. There are two prominent light sources in the work: the full moon through the window and the candle on the table, which is hidden by the vase of liquid. The full moon in the top right of the painting shines in and illuminates the scene.\footnote{National Gallery. \textit{Experiment on a Bird in the Air Pump} Dossier (London, England)} These two light sources, one natural and one “man made” are also very significant. They serve as a foil to one another and the greater Enlightenment/Scientific Revolution. Therefore, the moonlight could represent the religious devotion of the past while the candlelight and vase of liquid symbolize science and rational Enlightenment thinking. Wright includes many symbolic elements in his scientific paintings that serve as reminders of the past and the future. Wright literally illuminates the passion for discovery and experimentation that came with the Enlightenment using the candle and moon.\footnote{Jane Wallis. \textit{Joseph Wright of Derby} (Derby: Derby Museum and Art Gallery, 1997), 11.}

The demonstrator in the painting uses an air pump to explain the importance of air in order for living organisms to survive. As he performs the experiment, the scientist makes eye contact with the viewer, drawing us into the experiment and the scene. The boy on the
right, hidden by the shadows, holds a rope in preparation to open the cockatoo’s cage, hanging above his head. The boy also stares directly at the audience. He is poised and ready to pull the red rope connected to the cockatoo’s cage. The cage door is shown open in the image; therefore, the boy may have actually been poised to pull the door shut. This would suggest that the oxygen deprivation from the experiment would kill the cockatoo.

*An Experiment on a Bird in the Air Pump*, for example, prominently features two girls with horrified reactions to the procedure.74 One girl, the elder of the two, hides her eyes, unable to watch the fate of the cockatoo. The younger girl looks up at the bird with curiosity and fear. A male figure, most likely their father, leans down to comfort and reassure them. This shows how it was common for a strong male figure to come and “rescue” the delicate, emotional females. Susan Siegfried argues that Wright may have included women and girls in his works as a way to show the emotions of fear and astonishment that were not acceptable for men to exhibit.75 Therefore, according to Siegfried’s argument, Wright was very interested in depicting the emotions of shock and fright in this painting as a way to represent the various responses from society to the growth of science. The other older female in the painting is oblivious to the experiment and instead stares lovingly into the eyes of her fiancé. The couple is disconnected from both the viewer and the circumstances in the painting. The two men seated on the left are both clearly fascinated with the demonstration. The man in green holds a stopwatch, timing the removal of oxygen from the glass bowl. Finally, the elderly man seated on the far right is detached from the experiment and stares contemplatively down at the tabletop.

75 Ibid., 38.
Otto von Guericke (1602-1686) invented the air pump in Magdeburg, Germany in 1650.

Robert Boyle and Robert Hooke introduced the air pump’s introduction to England in the mid-seventeenth century.\textsuperscript{76} Boyle and Hooke built their first experimental air pump in 1659.\textsuperscript{77} These devices were commonly used to demonstrate science discoveries in lectures. The common procedure, as explained by James Ferguson, is “if a fowl, a cat, rat, mouse or bird be put under the receiver, and the air be exhausted, the animal is at first oppressed as with a great weight, then grows convulsed, and at last expires in all the agonies of a most bitter and cruel death.”\textsuperscript{78} Ferguson explains the most gruesome circumstances of the procedure. The demonstration usually took a much less graphic and inhumane approach.

Normally, demonstrators would substitute a lungs-glass machine for the live animal. This machine contains a bladder, which mimics the decompression of the lungs of an animal.\textsuperscript{79} It is curious as to why Wright chose to portray the more cruel demonstration in his painting. The artist, most likely, wanted to heighten the drama and leave the audience on the edge of their seats: will the bird die or will oxygen be returned to the container just in time?

Cockatoos were brought to England from the East Indies on overseas journeys in the 1770s. The white cockatoo used for the demonstration, likely the family pet, was an expensive and rare commodity during the eighteenth century. The bird also represented the Holy Spirit, a symbol of inspiration, with its resemblance to a white dove. Baudot also equates the cockatoo with an emblem of love and a luxury good.\textsuperscript{80} If these connections are true, then this

\textsuperscript{76} Olga Baird, “Joseph Wright of Derby: Art, the Enlightenment and Industrial Revolution,” The Revolutionary Players.


\textsuperscript{78} Olga Baird, “Joseph Wright of Derby: Art, the Enlightenment and Industrial Revolution,” The Revolutionary Players.

\textsuperscript{79} Ibid.

painting not only depicts an experiment, but also represents the triumph of science over religion. The air pump and vacuum are literally sucking the life out of the cockatoo, representative of religion. Therefore, Wright not only depicts the most dramatic moment of the experiment, but he also represents the pivotal moment in history when views shifted from religion to rationalism. Wright may have seen white cockatoos at the Sir Ashton Lever’s Museum or in other paintings.

Laura Baudot proposes another explanation for Wright’s scientific subject matter and composition. She draws the viewer’s attention to the presence of vanitas symbolism within the painting juxtaposed with empirical and scientific symbols. Baudot’s research was primarily centered on the air pump, and she sought to identify the specific kind of air pump Wright used as a model for this painting. Interestingly, the air pump in An Experiment on a Bird in the Air Pump contains elements from both the seventeenth and eighteenth centuries. The featured air pump is shown with a seventeenth century glass receiver, from Boyle and Hooke’s machine Boyleana, situated above an eighteenth century double-barreled pumping mechanism. Wright would have had extensive knowledge about the different types of air pumps through his connections to the Lunar Society. He also had access to scientific historical sources, such as the New Experiments Physico-Mechanical Touching the Spring of the Air, a book that included detailed engravings of Boyle and Hooke’s original air pump.

Wright was very attentive to detail, and it is likely that he consulted these historical sources as well as the more modern models. Therefore, he would have had complete knowledge of

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81 Ibid., 3.
82 Olga Baird, “Joseph Wright of Derby: Art, the Enlightenment and Industrial Revolution,” The Revolutionary Players.
84 Ibid., 6.
the old and new air pumps styles and features. Wright further references the older air pump designs by painting the disc-like objects on the table in front of the older seated man on the right. Otto Von Guericke called Magdeburg spheres in his air pump and vacuum design.\textsuperscript{85} The spheres, in Wright’s painting, reference science of the past and the evolution of the air pump.

The antiquated glass receiver that Wright depicted has a large hole at the top, where animals and specimens were inserted for demonstrations. This hole was large enough to insert the cockatoo and the demonstrator’s light hand appears to be gesturing to this hole, indicating how the cockatoo was inserted into the receiver. However, the hole had to be cemented shut in order for the experiment to work. Therefore, previous claims that the demonstrator’s left hand poised on the stopcock waits to release air back into the receiver are disproven. The stopcock in seventeenth century air pumps was actually located at the base of the glass globe, while the stopcocks of eighteenth century air pumps, with the double-barreled pumping mechanism shown in Wright’s painting, were placed at the base of the leather tube that connects the glass receiver to the pump.\textsuperscript{86}

Based on the design of the apparatus, it appears that the demonstrator was not planning to revive the cockatoo since his hands are nowhere near the stopcocks. The demonstrator’s right hand, instead, gestures toward the skull in the glass container on the table. Baudot suggests that the demonstrator draws the viewer’s attention to the vanitas symbolism of the skull. He incorporates the religious superstitions and memento mori elements of the past.

\textsuperscript{85} Ibid., 9. 
\textsuperscript{86} Ibid., 7.
with the scientific experiment.\textsuperscript{87} This combination also alludes to the Enlightenment and references the tension between religion and rationalism.

The elevated glass globe recalls the \textit{vanitas} symbols and compositions typically utilized in Dutch seventeenth century still lives. The glass receiver in Wright’s painting is directly above the glass vessel on the table that, according to Laura Baudot, contains a skull suspended in fluid.\textsuperscript{88} The glass receiver, similar to the bubbles featured in Dutch paintings, and the skull both allude to \textit{vanitas} and \textit{memento mori} symbols, reminding the viewer of the transience of life. \textit{Vanitas} symbols often allude to the rejection of material goods and the “emptiness of moral existence.”\textsuperscript{89} The Dutch seventeenth century artists utilized rotting fruit, bubbles about to burst, mirrors, wilting flowers, skulls, musical instruments and candles as \textit{vanitas} symbols. The glass receiver also reflects light and part of the scene, functioning like a mirror, another \textit{vanitas} symbol.\textsuperscript{90} Wright’s composition parallels Pieter Van Roestraeten’s Dutch still life, \textit{A Vanitas} (n.d., Figure 9). Van Roestraeten places a large bubble directly above a skull in his painting, clearly serving as a \textit{memento mori}. The demonstrator drains the glass receiver, functioning as a vacuum, of oxygen while suffocating the cockatoo. Therefore, upon the cockatoo’s death and the completion of the experiment, the moral and scientific question is: what remains in the glass receiver? Scientists and viewers of the demonstration would have known that no gases remained in the receiver after the oxygen had been released. Many of Wright’s other paintings also shared the “bubble” motif. One of his series of paintings featured young children either blowing up or fighting

\textsuperscript{87} Ibid., 11.
\textsuperscript{88} Ibid., 9.
\textsuperscript{89} Ibid., 3.
\textsuperscript{90} Ibid., 9.
over bladders (which were typically used in oxygen demonstration) typically in candlelight.\textsuperscript{91} Therefore, this is not a new subject for Wright and shows his continued interest in \textit{vanitas} elements.

Wright’s composition also contains another example of the juxtaposition of empiricism with \textit{vanitas} and religion. The old man seated on the far right stares intently at the skull in the glass jar instead of engaging with the scientific experiment. The skull in the jar is backlit by a candle.\textsuperscript{92} These \textit{vanitas} elements and the man’s old age reference \textit{memento mori} and the impermanence of life. They also allude to the religious superstitions of the past, then understood in opposition to rational thinking. A younger man on the left side of the painting is juxtaposed with with the old gentleman. He engages with the experiment and appears to be timing it, as evidenced by the stopwatch in his hand. Due to the nature of the experiment, the man appears to be recording how long the cockatoo will survive without oxygen in the receiver.\textsuperscript{93} The young man, unlike the older man contemplating death and the skull, is captivated by the scientific demonstration and has a much more empirical expression. The two men sit equidistant from the air pump and parallel one another, both in the painting as also as representations of the transitions during the Enlightenment. Wright shows the conflict between religion and rationalism during the eighteenth century by depicting both sides in \textit{An Experiment on a Bird in the Air Pump}.

Wright’s \textit{An Experiment on a Bird in the Air Pump} not only illustrates scientific progress by combining elements from seventeenth and eighteenth century air pumps, but it also juxtaposes empiricism and \textit{vanitas}. Wright attempts to show the different reactions to the Enlightenment from the different reactions of the onlookers to the experiment. The

\textsuperscript{91} Ibid., 10.
\textsuperscript{92} Ibid., 12.
\textsuperscript{93} Ibid., 12.
spectators, by extension, represent the different views and reactions to the Enlightenment: fascination, apprehension, horror and even indifference. Wright also illustrates the tension between religion and rationalism during this time by using the two men as foils to one another. As a viewer, it is difficult to initially sense the conflict in the painting. However, upon closer inspection, the inconsistencies in the air pump and composition bring different interpretations to light. Overall, this painting illustrates scientific progress through the juxtaposition of old and new science. The use of *vanitas* references and religious symbolism further address the Enlightenment and science as the “new religion.”

Joseph Wright of Derby’s depictions of science and experimentation were widely unprecedented. The other eighteenth century works depicting laboratories and scientists are very different from Wright’s “scientific pieces.” Many of the paintings and drawings of science during this time were used as text supplements in books, magazines or manuals. These paintings normally served a practical purpose and illustrated the science without juxtaposing old science with new science. Louis-Jacques Goussier frequently produced engravings for magazines and even Diderot’s *Encyclopédie*. One of his engravings, completed in 1772, depicts a practical chemistry laboratory. These engravings illustrated the modern eighteenth century technology and industries without referencing the science of the past. Wright’s paintings, on the other hand, juxtapose the old with the new to make the contrast even more apparent.

Charles-Nicolas Cochin (1715-1790) was an eighteenth-century engraver. Cochin engraved many different subjects, including one of the main chemistry images used in

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Diderot’s *Encyclopédie*. However, his 1739 engraving *Experiment with Electricity*, demonstrates a more primitive representative of experimental science. This engraving does not evoke nearly the same emotional response as Wright’s paintings; however, it does represent an important moment in the history of science. Instead of depicting a demonstration or lecture like Wright’s scientific works, Cochin’s engraving captures an experiment in action. The male scientists appear to be experimenting with the effects of electricity by using another scientist as a test subject. Not only is the subject different from *An Experiment on a Bird in the Air Pump, A Philosopher lecturing on the Orrery* and *The Alchemist in Search of the Philosopher’s Stone*, but Cochin’s engraving is also very formally different than Wright’s paintings. Cochin does employ light throughout the engraving and there appears to be light sources at both the right and left sides of the work. However, it is much more difficult to depict naturalistic and industrial light in an engraving, and Wright’s paintings are much more powerful. His use of light and human emotion leave a greater impact on the viewer. Overall, Cochin captures the spirit and excitement of scientific experimentation in its beginning forms. He depicts the growing interest in science by showing scientific discovery in the laboratory.

The paintings of the eighteenth century French artist, Charles-Amédée-Philippe van Loo (1719-1795) also acknowledge the advances of science without referencing where the advances originated. Van Loo studied at the Académie Royale in Paris and won the Prix de Rome in 1738. He was a highly regarded academic painter who became very interested in Italian art during his time in Rome. Van Loo was initiated into the French Académie in 1747.96 Van Loo also painted *Soap Bubbles* in 1764.97 Despite their similarities in scientific

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96 “Charles-Amédée-Philippe van Loo,” Groves Oxford Art Online.
subject matter and showing the interaction between people and science, Wright and van Loo’s artistic styles greatly differ. Wright’s use of tenebrism and large-scale “history” paintings differs from van Loo’s more muted color palette and smaller scaled works. Van Loo’s *The Camera Obscura* (1764, Figure 7) represents advancing scientific knowledge. The growing interest in optics during the eighteenth century led to the invention of a camera obscura, which was employed by artists to paint more naturalistically. Although this painting precedes Wright’s scientific paintings, it serves as a relevant comparison.98 Van Loo, like Wright, includes women and children in *The Camera Obscura*. The young boy and girl gaze at the camera obscura, captivated and curious. The woman, on the other hand, looks inquisitively out at the viewer, inviting the audience to participate in their exploration of the camera obscura.

*The Encyclopédie*

Denis Diderot and Jean-Baptiste le Rond d’Alembert jointly edited and published the *The Encyclopédie, the reasoned dictionary of the sciences, arts and crafts, published by a society of men of letters* (1760). The concept of an all-encompassing dictionary began with Francis Bacon in the seventeenth century.99 The purpose of the *Encyclopédie* was to demonstrate

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97 Frances Gage, *French Paintings of the Fifteenth through the Eighteenth Century*, (Washington, D.C.: The Collections of the National Gallery of Art Systematic Catalogue, 2009): 419. Similarly to *The Camera Obscura*, he depicts young boys and an older woman interacting a soap bubble. The young boy at the top left blows the bubble bigger and bigger while the other two figures wait for it to pop. The bubble not only represents scientific experimentation and curiosity, but could also serve as a *vanitas* or *memento mori* element. The *vanitas* bubble is similar to the glass receiver in *An Experiment on a Bird in the Air Pump*. However, the soap bubbles are not overtly scientific like the air pump. The transience and fleeting existence of the bubble could also represent that life is finite.

98 Ibid.

scientific progress and illustrate modern technology. The finished *Encyclopédie* served as an organized "presentation of knowledge," specifically of the sciences. Encyclopedias were common during the Enlightenment which manifests itself in Wright’s paintings. Wright illustrates scientific progress in his paintings by contrasting the old science to the new. However, the purpose of the *Encyclopédie* was to mainly illustrate and describe the modern eighteenth century technologies, making Wright’s approach unique.

Like Erasmus Darwin, Diderot had a variety of interests including theatre, art, music, medicine and the classics. He understood the publications of Bacon, Lock and Newton and became well known for his writing. His text is ordered alphabetically and divided into three faculties: reason, memory and imagination. The pages of the *Encyclopédie* include text accompanied by 2,900 corresponding engravings. These engravings were extremely important supplements to the text. The engraving plates depicted each of the trades visually. The *Encyclopédie* depicted common scientific experiments, apparatuses and processes. The plates came from a genre called, “technical illustrations” which originated during the Renaissance depictions of anatomy and mechanics. For example, Vesalius’ *On the Fabric of the Human Body* (1543) used technical illustrations to show the human body and its skeletal and muscular components. These illustrations show an earlier intersection of medicine and art. The illustrations of industry in the *Encyclopédie* included the textile trades of Richard Arkwright and James Watt’s steam engine. Both men were also affiliated with the Lunar Society and advocated for the scientific revolution.

100 Ibid., 12.

During the eighteenth century, Isaac Newton served as a major figurehead for the progress of science. He was a major player in the popularization of physics and mathematics, which were relatively new disciplines. However, Diderot’s inspiration for the *Encyclopédie*, stemmed more from Francis Bacon than from Isaac Newton.

101 Ibid., 25.
To this day, the Encyclopédie remains the primary document for the Enlightenment, as its focus was to make science more accessible to the masses.¹⁰² Some people, however, feared that the text would inspire a revolutionary mentality and encourage a more liberal state of mind. Diderot and d’Alembert never intended for the Encyclopédie to generate a revolutionary atmosphere, however, it became an extremely powerful text that inspired governmental change around the world.¹⁰³ The revolutionary message aligned perfectly with the revolutionary ideas spread by the Lunar Society. They, like the Encyclopédie, set revolutionary ideas in motion that led to riots against the members. The growth in science gave people another entity to explore other than God.

The Encyclopédie and the Lunar Society members both touted progress and technology. An entire section of the Encyclopédie was devoted to describing techniques involved in extraction. Specifically, the engravings show illustrations about iron extraction. Although metallurgy became a widely accepted scientific industry, the demonic associations of alchemy and greed, in the vain pursuit of gold, lingered. Superstition was alive and well in the eighteenth century and even managed to infiltrate the pages of the Encyclopédie.¹⁰⁴ For example, Diderot illustrated how the element, mercury, was extracted, and the accompanying text discusses the importance of mercury to alchemists. Alchemists viewed mercury as a pure, “principle” metal and they, unlike chemists, sought to discover the “secret” of mercury and gold. Alchemy, however, was not a respectable practice during the eighteenth century. Wright’s painterly style, however, is drastically different and more dramatic than the

¹⁰² Ibid., 17.
Jean-Baptiste le Rond d’Alembert and Denis Diderot both began working to publish the Encyclopédie. However, d’Alembert eventually removed himself from the project and left Diderot to complete the work. Jean-Baptiste le Rond d’Alembert was the scientist of the team while Diderot handled the writers and engravings for the Encyclopédie.
¹⁰³ Ibid., 19.
¹⁰⁴ Ibid., 122.
engravings, the notion of progress is common to both. Later plates 137 and 138 describe the extraction of gold in mills without mentioning alchemy.\textsuperscript{105} Therefore, Diderot and d’Alembert appear to take a very rational approach to depicting industry and technology. The engravings serve as visual demonstrations about the actual industry processes of the time, attempting to explain the practices to common people. Wright, however, takes a more dramatic and aesthetic approach with fine art. Nonetheless, the message of scientific progress and Enlightenment is the same.

\textsuperscript{105} Ibid.,165.
CHAPTER 3

The Alchemist in Search of the Philosopher’s Stone

Wright’s final scientific painting, *The Alchemist in Search of the Philosopher’s Stone*, illustrates an alchemist in the midst of the scientific discovery of the element phosphorous. The painting’s full title, *The Alchemist, in Search of the Philosopher’s Stone, Discovers Phosphorus, and Prays for the Successful Conclusion of his Operation, as was the Custom of the Ancient Chemical Astrologers*, references many different facets of this painting: alchemy, the discovery of phosphorous, prayer and religion. Wright depicts an alchemist at work in his laboratory and, he also introduces religion and superstition into the painting with the alchemist’s pose. However, the alchemist’s accidental discovery of the element phosphorous places the painting in a new, more scientifically legitimate context. Despite references to old science and religion, the main purpose of this painting is to show the triumph of new science over that of the past.

*The Alchemist in Search of the Philosopher’s Stone* was not a commissioned work and Wright actually had difficulty selling the painting. He brought the work with him to Rome in the hopes of finding a buyer but it didn’t generate any interest.106 After his trip to Italy, Wright reworked portions of *The Alchemist in Search of the Philosopher’s Stone* but the painting remained unsold until after Wright’s death.107 Instead of glorifying modern science, this painting makes a spectacle of science in an unfavorable light at first glance. However, closer inspection reveals Wright’s intention of illustrating scientific progress through juxtaposition of the past and present. Despite this argument, it is likely that the initial absurdity and unsophisticated nature of the painting made it undesirable to buyers.

107 Ibid., 14.
The science of alchemy, the production of gold from base metals, emerged during the late seventeenth century. Prominent scientists, such as Isaac Newton, were self-proclaimed alchemists who believed in the viability of alchemy. Charles Webster said, when discussing alchemy, “We have come to accept an almost perfect correlation between the rise of science and the decline of magic.” A section of the *Encyclopédie* described techniques and materials involved in metal extraction. Specifically, the engravings show illustrations about iron extraction and also include pictures of Mt. Vesuvius, one of Joseph Wright of Derby’s favorite subjects. Although metallurgy became a widely accepted scientific industry, the demonic associations of alchemy and greed lingered. Superstition was alive and well in the eighteenth century and even managed to infiltrate the pages of the *Encyclopédie*. Diderot also illustrated how the element, mercury, was extracted and the accompanying text discussed the importance of mercury to alchemists. These alchemists viewed mercury as a pure, “principle” metal and they, unlike chemists, sought to discover the “secret” of mercury and gold.

Alchemy, however, was not a respectable practice during the eighteenth century. Plate 136 contrasts the mercury extraction process from the sixteenth and eighteenth centuries. The increase in sophisticated technology is extremely evident. This juxtaposition, however, is very similar to Wright’s approach. Although Wright’s painterly style is drastically different and more dramatic than the engravings, the notion of progress is common to both. Later plates 137 and 138 describe the extraction of gold in mills without mentioning

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Therefore, Diderot and 'Alembert took a very rational approach to depicting industry and technology. The engravings serve as visual demonstrations about the industry processes of the time, attempting to explain the practices to common people. Although some engravings reference past practices, the majority illustrate modern industries. This approach, although in text and engravings, is similar to Joseph Wright of Derby’s scientific paintings of the air pump and orrery. Wright, however, takes a more dramatic and aesthetic approach with fine art. Nonetheless, the message of scientific progress and Enlightenment was the same.

David Teniers painted an alchemist in 1769 entitled, *L’alchimiste* (Figure 4). This scene takes place in a filthy, disorganized and dark dungeon-like laboratory. The alchemist appears to be using pots and pans and outdated equipment to perform his experiments. The laboratory spaces in Wright’s *The Alchemist in Search of the Philosopher’s Stone* and *L’alchimiste* are very similar. Both alchemists use antiquated equipment and techniques. However, Teniers’ portrayal of alchemy is much less idyllic than Wright’s. His scene is, however, also very dark like Wright’s. The two artists use similar color palettes but Wright employs light in a much more effective way. Teniers’ alchemist sits passively at his desk while Wright’s alchemist is animated and engaged in the experimentation. Overall, Wright’s painting is much more dramatic, ichnographically and stylistically, than Teniers’.

Wright of Derby also subtly references religion in this painting. He alludes to an earlier time by situating the alchemist in a striking medieval stone room with gothic arches and high, pointed windows instead of a seventeenth century laboratory. The alchemist kneels in front of a brilliantly shining vessel of dazzling light. His gaze fixates on the light emitted by the experimental reaction. The alchemist’s prayer-like position alludes to religion and how he

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appears to be worshipping science, instead of God. The common name for Phosphorus was
the ‘Devil’s element’, relating the painting even more to superstition and religion.\textsuperscript{111} The
alchemist is unshaven, disheveled and dressed in a loose robe. The men in the back work
over a flame, which illuminates their faces. The laboratory resembles a Platonic and Gothic
cave with its bizarre and mysterious props and tools.\textsuperscript{112} Many of these characteristics were
not attributions of eighteenth century laboratories and reference the science of the past. Lab
notes, articles and manuals lay scattered on a shelf among pottery and glassware above the
scientist. The irrational, unscientific cave-like atmosphere is further evidenced by the
inclusion of celestial globes throughout the laboratory, which have no use in chemical
experimentation.\textsuperscript{113} Wright’s treatment of the scientific instruments, glass vessels and books
does, however, refer to serious study. They are reminiscent of the accurate laboratory
engravings in Diderot’s \textit{Encyclopédie}, or in the Macquer’s book. The retort and glass
receiver were contemporary instruments and would have been used by Wright’s Lunar
Society acquaintances.\textsuperscript{114} This painting visibly references the old, disorganized and irrational
science of alchemy. However, Wright’s juxtaposition with the discovery of elemental
phosphorous connects the work with more contemporary science. Therefore, Wright
inadvertently illustrates scientific progress by emphasizing the discovery of phosphorous
over the science of the past.

I assert that Wright’s depiction of \textit{The Alchemist In Search of the Philosopher’s Stone}
illustrates the discovery of phosphorus by the Hamburg alchemist Hennig Brandt in 1669.

\textsuperscript{111} Olga Baird, “Joseph Wright of Derby: Art, the Enlightenment and Industrial Revolution,” \textit{The Revolutionary Players}.
\textsuperscript{114} Olga Baird, “Joseph Wright of Derby: Art, the Enlightenment and Industrial Revolution,” \textit{The Revolutionary Players}. 
Brandt distilled phosphorous from urine using a similar chemical procedure to what Wright shows in his painting. This was the very first elemental finding that was directly connected to a known discoverer. The story was often printed in popular chemical books and was widely known during the eighteenth century. Wright could have found more about it through his friend and member of the Lunar Society, James Keir, who was translating Macquer's *Dictionary of Chemistry* (1771) into English at the time. Although Wright does not identify the alchemist, the experimental set up is very similar to that used by Brandt. In order to produce phosphorous, Brandt heated and evaporated urine through a retort. The retort is the large metal vessel on the far right of the painting. The urine traveled through copper wires in the retort to absorb heat. Subsequently, the heated urine flowed through a tube into the glass flask near the alchemist. This protocol produced white phosphorous, which glows when exposed to oxygen. This was a groundbreaking discovery among the scientific community. Although Brandt failed to produce gold, his accidental discovery of phosphorous proved to be even more valuable.

The research surrounding this particular work remains unclear and historians still disagree about whether or not Wright is glorifying or mocking alchemy. However, in contrast to Wright's previous scientific paintings, it seems obvious that Wright wanted to dramatize the unsophisticated scientific practices of the past. One interpretation was that Wright was acknowledging the Lunar Society's achievements and superior reason by mocking the past age of science and alchemy. Wright likely intended to commemorate the scientific progress stemming from the superstitions and absurdities of the past in his painting.

117 Interview with Larry Eng-Wilmot, PhD., Rollins College, Winter Park, FL
The original discovery of phosphorous actually inspired the research of other scientists, leading to information about combustion and chemistry.\textsuperscript{119} Either way, it can be concluded that Wright was trying to demonstrate progress, in one way or another.

CONCLUSION

Wright’s paintings are largely unequaled, both in their style and subject matter. However, a few eighteenth century painters have produced similar works. Charles-Nicolas Cochin (1715-1790) was an eighteenth-century engraver who produced images featured in Diderot’s Encyclopédie. However, his 1739 engraving, Experiment with Electricity, demonstrates a more primitive representative of experimental science. This black and white engraving does not evoke nearly the same emotional response as Wright’s paintings; however, it does represent an important moment in the history of science. Instead of depicting a demonstration or lecture like Wright’s scientific works, Cochin’s engraving captures an experiment in action. The male scientist researches the effects of electricity while using a fellow scientist as a test subject. This engraving is formally different than Wright’s large history paintings. Although Cochin employs light throughout the engraving, the lightning in Wright’s paintings are much more powerful. Overall, Cochin captures the spirit and excitement of scientific experimentation in its primary forms.

The paintings of the eighteenth century French artist, Charles-Amédée-Philippe van Loo (1719-1795) also acknowledge the advances of science without referencing where the advances originated. Van Loo’s The Camera Obscura (1764, Figure 7) represents advancing scientific knowledge. Although this painting precedes Wright’s scientific paintings, it serves as a relevant comparison. Van Loo, like Wright, includes women and children in The Camera Obscura. The young boy and girl gaze at the camera obscura, captivated and curious. The woman, on the other hand, looks inquisitively out at the viewer, inviting the audience to participate in their exploration of the camera obscura. The growing interest in

optics during the eighteenth century led to the invention of a camera obscura, which was employed by artists to paint more naturalistically. Van Loo also painted *Soap Bubbles* (Figure 8) in 1764 and despite their similarities in subject matter; Wright and van Loo take very different artistic approaches.121 Wright’s use of tenebrism and large-scale “history” paintings differs from van Loo’s more muted color palette and smaller scaled works.

*The Alchemist in Search of the Philosopher’s Stone* was Wright’s final scientific painting in 1771. Two years later, Wright married Hannah Swift and the couple had six children, three of which died in infancy.122 Their marriage was poorly documented, possibly due to Swift’s “inferior situation of life,” which made Wright reluctant to mention the union in his early correspondences.123 Wright delayed telling his older brother about his marriage until five months after the wedding.124 He does, however, write about his wife’s declining health in 1774. She suffered from two consecutive miscarriages, which may have also led to depression.125

After his marriage, Wright traveled to Italy in 1773 and spent sixteen months in Rome and Naples.126 Roman antique works, Michelangelo, the Roman fireworks and the landscape

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121 Ibid., 419.
Similarly to *The Camera Obscura*, he depicts young boys and an older woman interacting a soap bubble. The young boy at the top left blows the bubble bigger and bigger while the other two figures wait for it to pop. The bubble not only represents scientific experimentation and curiosity, but could also serve as a *vanitas* or *memento mori* element. The *vanitas* bubble is similar to the glass receiver in *An Experiment on a Bird in the Air Pump*. However, the soap bubbles are not overtly scientific like the air pump. The transience and fleeting existence of the bubble could also represent that life is finite.
125 Ibid., 9.
126 Ibid., 13.
Many of the existing records of this trip are letters that Wright sent to his sister, Nancy. Wright quickly became fascinated with the culture of Rome and enjoyed watching the carnival festivities. He was 40 years old at the time and seemed to use the trip as both a honeymoon and a vacation from Derby.
scenes of the eruption of Mt. Vesuvius influenced Wright’s later works.\textsuperscript{127} These scenes were also nocturnal and allowed Wright to depict both moonlight and fire. Light always fascinated Wright, particularly the differences between natural and industrial light. Therefore, his vacation to Italy allowed him to paint natural light scenes, such as the eruption of Mt. Vesuvius. Wright was one of the few British artists known for his candlelight scenes, a recurring motif in his scientific works. The Romans applauded him for his ability to depict candlelight, especially in his forge and blacksmith shop scenes. They claimed that these scenes “were superior to anything of that kind which had been done in Italy.”\textsuperscript{128} During and after Wright’s trip to Italy, he became deeply interested in landscape paintings and enjoyed depicting moonlight.\textsuperscript{129} Wright never painted another scientific painting and shifted his focus to literary subjects and landscapes. Despite Wright’s artistic success, he suffered from many medical ailments. Many of Wright’s letter correspondences beginning in the 1760s discuss his struggle with depression. By the year 1783, his condition was severe and he had started to develop anxiety.\textsuperscript{130} Wright frequently visited his doctor and friend, Erasmus Darwin, until the end of his life. The artist’s depression worsened when his wife died in


\textsuperscript{130} Derby Art Gallery and Museum, Derby, England, wall label (accessed November 2012)
August 1790.\textsuperscript{131} One year after her death, Wright developed liver disease and became more reclusive and died on August 24\textsuperscript{th}, 1797.\textsuperscript{132}

The success of his three scientific paintings did not reach its peak until after Wright’s death. They remain, to this day, the subjects of debate and speculation. However, based on my research, these three paintings have never been connected in an argument. Despite their differences in subject matter, the works are all connected by light, science and progress. Each painting utilizes a main light source (candle, oil lamp and glowing phosphorous), which illuminates and enlightens the individuals in the painting. Wright’s artwork served as a bridge connecting the scientific and art worlds in the eighteenth century.

Each painting has its own unique characteristics representing the Enlightenment. Wright’s use of contrasting science of the past to eighteenth century technology illuminates the scientific progress promoted by the Lunar Society and the Enlightenment. His association with Lunar Society members and his general curiosity of science and technology helped Wright become a liaison between art and the sciences. Erasmus Darwin was Wright’s connection to the Lunar Society. This relationship put Wright in close proximity to the scientific progress of the eighteenth century, which he illuminates in these paintings. Research suggests that Wright was well aware of the experiments and demonstrations he depicts, showing his personal inquisitiveness. Wright then adds elements such as light and the juxtaposition of religion and empiricism to connect his works to the Enlightenment and to one another. Although Wright was only a fringe member of the Lunar Society, I would be willing to argue that his artistic contributions to science during the eighteenth century were unparalleled. Wright’s paintings made science accessible to the masses by visually

\textsuperscript{132} Jane Wallis, \textit{Joseph Wright of Derby} (Derby: Derby Museum and Art Gallery, 1997), 15.
representing experiments and discoveries. His artistic foray into the world of science was unprecedented and the artist certainly left his mark on the history of art.
Images
Figure 1: Louis-Jacque Goussier, *Laboratoire et table des Raports*, 1772
Figure 2: Joseph Wright of Derby, *A Philosopher Lecturing on the Orrery*, 1766
Figure 3: Joseph Wright of Derby, *An Experiment on a Bird in the Air Pump*, 1768
Figure 4: Joseph Wright of Derby, *The Alchemist in Search of the Philosopher’s Stone*, 1771
Figure 5: David Teniers, *L'alchimiste*, 1769
Figure 6: Joseph Wright of Derby, *Erasmus Darwin*, 1792
Figure 7: Charles-Amédée-Philippe van Loo, *The Camera Obscura*, 1764
Figure 8: Charles-Amédée-Philippe van Loo, *Soap Bubbles*, 1764
Figure 9: Pieter Van Roestraeten, A Vanitas, n.d.
Appendix Figure 10: Joseph Wright of Derby, *The Old Man and Death*, 1773
Appendix

I. **Erasmus Darwin**

Darwin was the youngest of four brothers born in Nottingham on December 12, 1731. He won the prestigious Exeter Scholarship to study medicine at Cambridge, which he graduated in 1755. Darwin’s skill as a physician was renowned across England. He was a benevolent physician and often treated the poor without charge and made house calls to his wealthier patients.\(^{133}\) King George III commented on his talent and requested Darwin’s service as his own physician.\(^{134}\) He then moved to Lichfield in 1756 and started a successful medical practice. Darwin was known for his “bold and unconventional medical methods and striking personality.”\(^{135}\)

Darwin, himself, was certainly was not immune to disease and ailments. He had small pox and the disease left scars on his skin.\(^{136}\) He married Mary (Polly) Howard on December 30, 1757 and the couple had three children. Howard unfortunately passed away when their youngest son was only four years old from liver cirrhosis.\(^{137}\) Darwin found new love following Howard’s death in Mrs. Chandos/Elizabeth Pole. The couple married in 1781 and had seven children together, four boys and three girls.\(^{138}\)

\(^{135}\) Ibid., 85.
\(^{136}\) Ibid., 85.
\(^{137}\) Ibid., 86.
relationship, Darwin’s second wife disliked living in Lichfield, so the family relocated to Derby.\textsuperscript{139}

In addition to Darwin’s career as a physician, he also published many books and poems. His poetry mainly consisted of information about botany and gardening and influenced the later Romantics.\textsuperscript{140} As evidenced by his interest in literature, Darwin’s intellectual curiosity expanded well beyond the limits of his medical practice. Darwin was also an avid researcher and inventor. He constantly recorded his interactions with patients and scientific research. One of his most celebrated contributions was a design for a carriage axle, used to prevent carriages from overturning during commutes.\textsuperscript{141} Erasmus Darwin’s first published scientific paper was about cloud and air expansion in response to temperature. The paper was published in the Royal Society’s \textit{Philosophical Transactions}.\textsuperscript{142}

\section*{II. Lunar Society}

The Lunar Society was not the only organization of its kind in England. The Manchester Literary and Philosophical Society, the Derby Philosophical Society, the Literary and Philosophic Society of Newcastle-on-Tyne and the philosophic clubs of Liverpool, Bristol and Leeds were also in existence.\textsuperscript{143}

The Lunar Society of Birmingham was the best-known society in England; however, there is a shortage of information regarding the group. Lunar Society members left no official records of their meetings and there is no evidence that they had a secretary or ever

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recorded minutes. Joseph Priestley was the chief correspondent for the organization, but he mainly recorded names and professions of the society members.\textsuperscript{144} Priestley’s records also contain limited information about the society’s purpose and what the members discussed. Scholar, Samuel Smiles, performed extensive research on the few existing Lunar Society records. He found the work of Matthew Boulton and James Watt to be most helpful and comprehensive. However, the majority of the documents collected were letters sent between members.\textsuperscript{145} Smiles’ research revealed details about the nature of the Lunar Society gatherings. He found that the actual meetings were relatively unimportant to the society. Most of the members lived near each other and interacted on a daily basis. Members living outside of Birmingham kept up constant correspondence with other members, usually averaging at least a letter per week.\textsuperscript{146} The meetings were important to maintaining the foundation of the society. However, it seems as if information was more readily spread outside of the actual meetings rather than during them.\textsuperscript{147}

The Lunar Society thought that their talents would be best practiced in inventing new technologies to “better exploit the material world.”\textsuperscript{148} The members not only discussed scientific experiments, but they also were innovators and inventors. Since some Lunar Society members had to travel great distances to attend meetings, they often discussed transportation improvements. They commonly pooled their knowledge to invent worthwhile and useful tools that they could advertise globally. Society member, Boulton, began designing the steam engine along with James Watt.\textsuperscript{149} Erasmus Darwin, also focused on

\begin{footnotesize}
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\item[144] Ibid., 409.
\item[145] Ibid., 409.
\item[146] Ibid., 411.
\item[147] Ibid., 411.
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transportation, designed carriages to help facilitate long-distance transportation. Joseph Preistley took an interest in chemistry and discovered oxygen and discovered a way to make carbonated water. In addition to inventing these items, the members also discussed ways to market them. The Lunar Society members were interested in inventing and marketing most anything. They discussed items ranging from transportation methods to fashion.

Erasmus Darwin focused on the cloth industry and sought out improvements of stocking-frame designs. These men were not only leaders in the Industrial Revolution, but they also furthered the European "consumer society."

Society member, James Keir, was especially involved in politics and the French Revolution. He embraced the Revolution as "the sole triumph of reason." Keir and Priestley were both subjects of the 1791 riots. It was widely known that the Lunar Society accepted and supported the French Revolution, and the rioters were vehemently opposed to the changes.

III. Other Paintings by Joseph Wright of Derby:

Although *An Experiment on a Bird in the Air Pump* is Wright’s most famous scientific history painting, he addresses scientific subjects in other works as well. *The Old Man and Death* (1773), a lesser-known genre scene by Wright that combines elements of a landscape painting. Wright most likely adopts the story from Aesop’s Fables with the moral that “it is
better to suffer than to die." 156 Wright’s focus in this work is the figures in the foreground. However, he is also able to paint an elaborate background to tie into the storyline. The skeleton, embodying death, is extremely accurate. Wright most likely referenced Bernhard Siegfried Albinus’s *Tables of the Skeleton and Muscles of the Human Body* (1749) when painting the skeleton 157. This work shows Wright’s many talents as a genre, landscape and scientific artist.

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