John Pringle Nichol and the Influence of Astronomy on George Eliot's First Novel

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John Pringle Nichol and the Influence of Astronomy on George Eliot’s First Novel

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A Thesis in the Field of English
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Abstract

“Up to this point their orbits were individuals—without connection or unity.”

That statement appeared in John Pringle Nichol’s *The Phenomena and Order of the Solar System* (1842), a scientific text which so transfixed the English writer George Eliot, who at that time had yet to write fiction, that she exclaimed in a letter to a friend that she had been “in imagination winging my flight from system to system, from universe to universe.” This paper examines the influence of science on Eliot’s first novel, specifically through two texts by the Scottish astronomer John Pringle Nichol. While other scholars have examined Eliot’s works through the lens of science, those have largely addressed the influence of works by Auguste Comte, G.H. Lewes, and Charles Darwin. This paper focuses on the pre-Darwinian works of Nichol, utilizing Eliot’s letters and journals to analyze her first novel, *Adam Bede*, through a lens based on Nichol’s first two astronomical texts. This analysis provides an examination of Eliot as observational narrator, the role of observation between characters, and the impact of invisible yet significant connections between characters, all of which serves to underscore Eliot’s role as realist and truth-teller.
Dedication

For Mary,
for everything.

For Bill,
who is the universe.
Acknowledgments

I must first thank my mother, who created in me an early love of books that has never gone away and which over time has only grown more abundant and frankly costly. I thank her also for her steadfast enthusiasm for this project, even when she could not remember what it was about. Her pride in me means more to me than I could ever put into words, though I try.

To Dean Michael Shinagel, the Dean of Deans, whose knowledge and wisdom I am perpetually amazed by and which I have frequently benefitted from, I thank from the bottom of my heart and the top of my brain for his unceasing encouragement, sense of humor, gentle nudges to keep going, and most of all, for his confidence in me. I have been truly fortunate to study under him and I lay all blame for my Victorian mania at his feet.

To professors and friends, some of whom are both, I wish to express my thanks for their wisdom, kindness, and enthusiasm, particularly Andrea Gardiner, Talaya Delaney, Elisabeth Sharp McKetta and Sue Weaver Schopf. Their cheerful presences in my life have added immeasurable joy and knowledge.

Finally, infinite thanks to my dearest Bill, for endless support, kindness, cheerful willingness to procure books I may or may not need, encouragement and joy. You believed in me when I did not and still do. Thank you.
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January 2, 1842. In a small English city, a young woman, barely out of her teenage years, is locked in a sorrowful battle of wills with her widowed father. Although young in years, the woman is possessed of a keen intelligence and a desire to learn much about the world around her. Her father, little dreaming the direction this would take her, has long indulged her love of books and learning, even paying for private lessons in German, Italian and Latin. After a period of alarming — to some of her family, at least — religious fervor, the young woman has cast off the chains of organized religion, refusing to attend church with her father. It is a scandalous act of rebellion. Relieved and liberated by her disavowal, the young woman continues her life-long pursuit of knowledge, gloriying in the pages of works on topics such as geology, philosophy, and natural history. Upon reading a work on the history of astronomy and the mechanics of the night sky just a few months before the “holy war,” the young woman was so transported by what the work describes that she wrote to a friend that she had been “in imagination winging my flight from system to system, from
universe to universe” (Letters, Vol. I, 107). The books that so inspired the girl — the works of John Pringle Nichol — are now largely only regarded by Victorian scholars, but the young woman, then known as Mary Ann Evans, lives on in cultural memory as the great English novelist George Eliot and the impact of Nichol’s work on the author is worthy of continued study.

For many readers, to explore the novels and short stories of George Eliot is not so different from Eliot’s reaction to Nichol; reading Eliot, one finds oneself dazzlingly immersed in exquisitely crafted worlds, peopled by characters of great complexity and realistic behaviors, feelings and expression. In her writing, Eliot has created unique spheres — miniature universes, if you will — places of ordinary human adventures, joys and tragedies, gossip, birth and death. From the most prominent of characters — *Scenes of Clerical Life*’s bewildered Reverend Amos Barton— to the tiniest child — Totty Poyser, the lively toddler of *Adam Bede* — each character is written so carefully, so full of dimension, as to seem alive beyond the page. Crucially, this minutely-crafted realism is reflected in the environments in which the characters develop: tiny cottages, farmhouses, villages and the rural world beyond, each one a portrait of rural life in England at its most genuine, largely free from bucolic romanticism or bland generalization. Yet what makes Eliot’s works achieve more than simply finely wrought characterization and stand out above other contemporary works is her abundant emphasis on the natural world as a critical aspect of her character’s lives and environments. This emphasis is found throughout Eliot’s works in a variety of ways: metaphors linking humans to the natural world around them, allusions to nature, and even the personification of Nature as an active component of life, rather than God. If one looks closely, one may find ideas and theories on topics such as geology and
astronomy translated to the page through village social life, subtle interactions between
characters, and the invisible, long-lasting repercussions that words and actions have on
others.

At the heart of this emphasis on nature is Eliot’s intense interest in and understanding
of the natural sciences. In placing so much of those sciences in the context of human life,
Eliot emphasizes the connections — often invisible but nonetheless extant — between all
life. And while Eliot was certainly influenced by the presence and works of her companion,
George Henry Lewes, I argue that the greatest influence on Eliot was science itself; therefore,
it is my intention to show the ways in which Eliot was influenced by the natural sciences
while a young woman and before the introduction of Lewes into her life. Furthermore, I
argue that Eliot’s works deserve to be examined in the light of lesser-known scientific works,
those that have slipped from cultural memory in the shadow of the brighter name of Darwin.
The works of Nichol, as well as those of Herbert Spencer, Charles Lyell, Sir James Lubbock,
etc., created a means of viewing the world through the lens of its processes and development,
which Eliot utilized to create and describe communities and individuals.

And yet, it is important to state that Eliot was not simply regurgitating scientific
theories for her readers; rather, Eliot absorbed what she read, expanding her knowledge and
vocabulary, as well as her sense of personal philosophy. In the letter to Maria Lewis in
which she exclaims over Nichol, dated 3-4 September, 1841, Eliot ends the letter with “…my
love to you grows by accretion not by expansion,” a delightful astronomical metaphor
inspired, no doubt, by the Scotsman’s work. (Letters, Vol. I, 108). In the same letter, Eliot
refers to her mind as “fast losing its little specific gravity.” At a time when other, lesser
writers might have simply stated that they were feeling out of sorts, Eliot utilized her recent
readings in astronomy to make her point.

For the purposes of this thesis, Eliot’s first novel, *Adam Bede*, will be examined through the lens of one field of science: astronomy. To do so, the works of Nichol, which a young Eliot so ardently read, will be used as the framework and lens by which to explore Eliot’s works, particularly in terms of observation and mechanics. I argue that Nichol’s engrossing descriptions of both the history of astronomical study and the how of observation helped to lay the groundwork for Eliot’s own early writings and her realistic creations, specifically in three ways: the role of Eliot as narrative observer, the role of observation in the lives of the characters—that is, how they do or do not observe each other, how they can or cannot see beyond what is in front of them—and the subtle role of connectivity, through forces such as resonance, gravity, repulsion and perturbation.

It is important to note that the concept of exploring the influence of science on the works of George Eliot is not a new one. Preparatory reading for this thesis has proven to be both fascinating — who was George Eliot? — and enlightening in regards to prior scholarship. Previous examinations on this topic have been largely focused in three specific areas: the impact of Charles Darwin’s *On the Origin of Species*, particularly in the novel widely regarded as Eliot’s finest, *Middlemarch*; the works of Eliot’s common-law husband, G.H. Lewes; and the works of Auguste Comte. Most notable in this field are texts which have become highlights and standards by which other works are judged: Sally Shuttleworth’s *George Eliot and Nineteenth-Century Science*, George Levine’s *Darwin and the Novelists*, and Gillian Beer’s *Darwin’s Plots*. An examination of these works reveals an exceptional depth of scholarship and analysis of Eliot’s works within a scientific and/or Darwinian framework. The works by Beer and Levine highlight Darwin’s intricate impact on Eliot’s
works, particularly on *Middlemarch* through concepts of interconnectivity and development.

Of particular interest in relation to this thesis is Shuttleworth’s *George Eliot and Nineteenth-Century Science*, published in 1984. Shuttleworth does devote some space to Darwin, but focuses much more exclusively on the influence of G.H. Lewes and Comte. In particular, Shuttleworth focuses on Eliot’s work as a reflection of the growth of organic theory; that is, the view of social life as, or similar to, an organic form of life. I do not disagree with Shuttleworth’s views on organic theory, but where I believe I will be able to diverge with her work, and create a new perspective, is by examining other works — beyond Lewes and Comte — that must have influenced Eliot and which are overdue for examination. By focusing her work on Lewes and Comte, Shuttleworth has kept the door somewhat open for other scholars to explore lesser-known figures whose works should be justly considered as having had a profound influence on Eliot. Shuttleworth does not, for example, refer to Nichol and her only references to astronomy refer to Eliot’s 1876 novel *Daniel Deronda*, which will not be covered in this thesis.

Early in her work, Shuttleworth refers to Eliot as “adher[ing] to the methodology of natural history; the artist, like the natural historian, was to be guided not by theory or imagination, but by concrete observation” (*Nineteenth* 1). While Eliot is noted for her observation of her characters and their environments and this will play a major role in this thesis, my work will diverge from Shuttleworth somewhat on this assertion. Rather, I would assert that Eliot, though clearly a careful and analytical observer, was both observer and imaginer, for she was the creator and assembler of the worlds she so painstakingly detailed. Eliot’s literary worlds were of her own creation: every stratum that she might observe was placed by her pen and imagination.
It should be noted that Nichol was by no means the only author Eliot read, prior to Darwin, whose work should be considered as influential on Eliot. Beyond Nichol, numerous other works read by Eliot provide theories and statements on subjects of the natural world that link to and may be seen in Eliot’s fictional worlds. Thomas Rymer Jones’s *A General Outline of the Animal Kingdom, and Manual of Comparative Anatomy*, for example, focuses on the relationships between living beings, large and small, and the effort to create a familiarity with the “intimate composition” of varying forms of life (Rymer Jones vii). In her fiction, Eliot seeks to explore the intimate inner and outer worlds of her characters. How Eliot may have viewed her characters as objects of study and classification is, in this author’s opinion, a valuable topic for future study.

What is striking above all else is Eliot’s extraordinary depth as a reader and intellectual. Fluent in several languages, including German and Italian, Eliot had little interest in reading that might be described as frivolous. Indeed, even as a young woman still living at home, her reading materials were quite advanced, focusing largely on religious matters but also showing hints of Eliot’s inclination towards natural science. One such work that Eliot enjoyed was John Pye Smith’s *Relation between the Holy Scriptures and Some Parts of Geological Science*, published in 1832, which presumably Eliot read while still a teenager (*George Eliot* 36). As Eliot grew older and moved from her father’s home, her role as uncredited editor of the *Westminster Review* provided her not only with the opportunity to read extensively on a variety of academic topics, but also to write about them in a critical and analytical fashion. In 1857, Eliot noted in a letter to her friend Sara Sophia Hennell, “I get more hungry for knowledge every day, and less able to satisfy my hunger” (*Letters*, Vol. II, 412). Insights such as these are possible thanks to the rich history of Eliot scholarship, but
even more so to the publication of Eliot’s letters, edited by Gordon Haight and published in nine volumes.

With any exploration of Eliot’s works and her career as a writer, it is critical to study and attempt to understand the context of the world she lived in. Thus, this work will examine Eliot’s works through four lenses: biographical, psychological, intellectual and through close reading of the works themselves. In many ways, these lenses are interconnected; for example, Eliot’s life-long propensity for reading and learning becomes intertwined with her intellectual life. Just as this thesis will show that Eliot’s works highlighted the vast and subtle connections throughout life, the author’s own life was a complex web as well. Eliot was a formidable, highly intelligent author with an intimidating array of interests and a sense of personal and moral philosophy that she brought from life—as she experienced it—to the page.

Who, then, was George Eliot and how did she become an author famous and adulated in her own time and still revered today? The woman who would become known as George Eliot was born Mary Anne Evans in Nuneaton, Warwickshire, England, on November 22, 1819. Her father recorded her birth simply, and without embellishment, in his diary, noting her arrival as being at five a.m. Nuneaton was then, and still is, a well-settled town in a county largely devoted to an economy based on the land: in Eliot’s era, mining, brick-making, and farming were important industries, as were weaving and leather crafts. Robert Evans, Mary Anne’s father, became an estate manager who, though lacking in extensive formal education, was regarded as a fair and intelligent man. Eliot herself said of her father, “he raised himself from being an artisan to be a man whose extensive knowledge in very varied practical departments made his services valued through several counties” (Cross 11).
The youngest of six children—twin boys born in 1821 would die only a few days after their birth—Mary Anne was very much her father’s pet, often accompanying him on his rounds throughout the estate and surrounding countryside and making the acquaintance of the various families in the area, both rich and poor. As will be explored in greater depth later, the pastoral countryside of Warwickshire and the people who inhabited it would make a lasting, vivid impression on the girl: from the scent of rich soil to the distinctive manner of speech found throughout the county, Eliot absorbed it all. As an adult essentially exiled from her family, it is sadly logical that it was the rural world of Warwickshire she would return to in her writings.

Eliot’s early life was marked by opportunity. Owing to her father’s increasingly valuable position to his master, in 1820 the Evans family moved from a farm on the Arbury Hall estate to Griff, also on the estate, but evidently of a more genteel nature (it still exists today, much renovated as a small hotel and restaurant). Eliot would refer to Griff as “the warm little nest where [my] affections were fledged” (Cross 3). The years at Griff were some of the most profound in Eliot’s development, and it was there that she developed into a deeply serious child, more at home with books and adults than with other children. In a particularly telling incident, which Eliot recalled in a letter later in life, she attended a children’s dance where she sat to the side, looking dull and bored. When approached by a courteous adult neighbor, the young girl noted that no, she was not having fun, for she preferred the company of adults. It was as though the small, dainty girl had been born wise and mature beyond her years and fellow children were unfathomable to her as companions.

Precocious in her interactions with others, Eliot was also charmingly bright. Though she was slow to learn to read—her brother Isaac claimed this was due not to a lack of intelligence
but rather a preference for playtime—books became an early love of Eliot’s and would remain so until her death. She loved to learn and, for the most part, her father was pleased to indulge her. All her life, Eliot treasured a small book he had given her, the first she could recall truly adoring. Tellingly, the book’s subject matter would prove to be a precursor for much of the reading she would absorb as an adult: that of the natural world. The book was *The Linnet’s Life*, a small volume of poems and engravings describing the life cycle of a single linnet, a small bird common in Europe. Late in her life, Eliot would give the book to her only legal husband, John Walter Cross, and of it she wrote, “It made me very happy when I held it in my little hands and read it over and over again; and thought the pictures beautiful, especially the one where the linnet is feeding her young” (Cross 19). In that image, the linnet perches with thin feet on the edge of a nest, surrounded by dense green foliage. Below her, tiny, eager young mouths are frozen open, awaiting their nourishment. One can only guess at why the image was so captivating to a little girl; perhaps young Mary Ann saw in the image the joy of burgeoning life and the richness of the world. Perhaps she was reminded, then and later in life, happily and then sorrowfully, of her own mother, who would die when Eliot was only sixteen years old. Whatever the appeal, the linnet made a mark on the small girl: the theme of birds as metaphors would appear later in Eliot’s life in her career as a writer and the connection of man to the natural world was set.

In 1824, at the tender age of five, Eliot was sent to boarding school. Although the school was close to home and Eliot found many cheerful playmates there, the experience was not entirely ideal: little Mary Anne was tormented by nightmares and keenly missed her father, as well as her brother Isaac. As Mary Anne and Isaac grew, their relationship changed and Isaac became too busy for his energetic, willful little sister. Though fond of the girls at her
school—they called her “little Mamma,” reflecting her serious mien—Mary Anne found great psychological comfort as well as joy in learning and in books. As she grew older, and was sent home to be companion to her father, Eliot would continue to read as much and as often as she could. In April of 1840, Eliot reported to a friend that she had begun lessons in German, which would have been sanctioned and paid for by her proud and perhaps somewhat indulgent father. Her subtle understanding of the German language was to become so masterful that she would take on significant acts of translation while still quite a young woman.

Her natural curiosity, as well as her precocious maturity, often made her seem older than her years and showed her to be a sweet, caring, and devoted member of the Evans family. Her passion for learning was matched only by her growing passion for religion and her desire to be loved and needed by her family. The passion for religion was most likely germinated by her teacher, Maria Lewis, with whom Eliot would remain friends into her early adulthood. Only when Eliot broke away from the church would the deep friendship begin to wilt. As Eliot grew out of her girlhood, she matured into an extraordinary woman whose life, as viewed from Victorian standards, was highly unusual.

Today, the Victorian period is studied from a variety of perspectives and including a wide array of disciplines. Victorian literature, history, politics and art are but a few of the realms in which the period is studied. In order to understand an artist such as Eliot, it is of vital importance that the time period in which she lived be studied and in some ways understood, so as to provide context for the author’s life. This thesis does not propose to offer a complete history of Victorian life and culture; for that, see A. N. Wilson’s *The Victorians* and other, similar works. Instead, what will be read here will be an overview of specific elements of the
early Victorian period to serve as a framework for understanding the context of Eliot’s time.

Eliot lived in a time of tremendous change, which ranged from major political events to small, personal revelations. The roles of women were both highly controlled but also moving toward the revolution of the New Woman. Throughout her life, Eliot would be increasingly looked to for support by nascent feminists and women who advocated for increased education and rights for women. Women throughout the nineteenth century were expected to take on a highly domestic role, whether it be as daughter, spinster aunt, or wife. By examining primary texts, we are able to glean some sense of the realities of everyday life for women in the period. An excellent example is the published, illustrated diaries of Maud Berkeley, who grew up on the Isle of Wight. Although Berkeley was some years younger than Eliot, her diaries nonetheless provide a view of the day-to-day existence of a young woman in Victorian England. We know, for example, that courtship and socially-sanctioned time spent with the opposite sex had great importance, for it was these interactions that allowed young men and women to become better acquainted and in doing so consider marriage and family.

Family was truly the centerpiece of Victorian life. While economics and position that a career made possible were incredibly vital considerations, for they decided how a family might live and in what fashion, it was ultimately of secondary importance to the family itself. Young men and women were expected, by society as a whole and their families, to marry and produce children. Women were expected to reign in the domestic sphere and create a comfortable home life for her husband. The female of the household was also expected to create a similar sense of comfort for her children, whether she cared for them herself or engaged nurses and nannies; all aspects of home life were her domain and it was her
responsibility to ensure that the house ran efficiently. Essentially, the world outside of the home was of significantly less priority than the inner, domestic sphere. Activities outside the home that were considered acceptable for women to partake in, such as shopping, were nevertheless connected to the home life. Everything that made a home comfortable, from bedding and draperies to decorative touches, were the responsibility of the woman of the house. As Judith Flanders notes in her examination of Victorian home life, *Inside the Victorian Home*, it was a clear expectation in society that a woman was to make the home as comfortable and stress-free for her family as possible. Men were not to be bothered or troubled by any lapses in housekeeping, shoddy cooking, or drafty parlors. In Victorian England, the home—from all that was within it to the very neighborhood it stood in—was a clear and vibrant representation to the rest of society of what kind of people lived in it. While the man of the family worked to provide for the family, the domestic sphere was, again, the realm of the wife and mother.

While this emphasis on domesticity was rampant in Victorian society, it must have also placed a great deal of pressure on women. Then, as today, emphasis on comfort, the appearance of wealth, and living in the “right” neighborhood meant that women were judged by their peers and their own families for how they lived and ran their households. This societal pressure was not lost on authors of the period, Eliot included. Eliot’s *The Mill on the Floss* provides an excellent example of this in Mrs. Tulliver’s sisters, who seem to perpetually look down their noses on their sister’s husband and their way of life. Mrs. Tulliver is greatly affected by any domestic criticisms and any disapproval of her husband and children is either directed at or felt by her. Eliot herself felt, from a young age, her want of beauty and was undeservedly hard on her other qualities, though she astutely recognized
that beauty was not all: “What extrinsic charm have I, to make people care for me a little more than my qualities might deserve? Certainly none from the landscape about me, and as little from the carpets and curtains and other recommendations of an elegant interior which have often helped to fix a man’s choice of his partner for life…” (Letters, Vol. I, 86)

But if the Victorian period was notable for its emphasis on an orderly and correct domestic sphere, what of the women who eschewed such pressures and expectations? Eliot, it must be clear, was not an ordinary Victorian woman. By comparing her life to that of Maud Berkeley, as an example, we know that Eliot was undoubtedly unusual in many respects: beginning in her youth, Eliot placed a high personal priority on education and her surviving letters and journals offer no hint of an interest in romance, dances, or any of the other traditionally feminine activities that her contemporaries may have been participating in. While Eliot may have enjoyed creating a home with G.H. Lewes in her adulthood, she did so without the benefit of marriage, a state uncommon in the age, and one which brought scorn upon Eliot. Eliot’s family refused to have any contact, former friends gossiped about her and shunned her in public, and it was only due to her growing fame as an author that many notables chose to socialize with her. Some of Eliot’s contemporary female friends were forbidden, by their own families, from visiting her in her “marital” home, for fear of the influence she might have had on them.

In addition to Eliot’s domestic uniqueness, she was also firmly an intellectual, although she herself might have disavowed such a title. Able to nominally support herself through writing and early work on the Westminster Review, Eliot dedicated her life to reading and writing. In Lewes, Eliot found the perfect partner and it was with great joy that the two devoted their time and often meager funds to trips to the continent for purposes of research,
or to the English seaside to perform fieldwork for Lewes’ researches. Eliot wrote wherever she found herself; writing was a necessity to her existence and she was not overly hampered by tasks of housekeeping or attending to children (Lewes’ sons were adored by Eliot but did not live with the couple while they were children). The expectations that Victorian society placed on women were largely ignored by Eliot in that she refused to conform to them, all the while painfully aware of the impact her refusal had on her.
Chapter II.

John Pringle Nichol and a Changing Eliot

John Pringle Nichol was born near Aberdeen, Scotland in 1804, fifteen years before the birth of Queen Victoria, twenty-seven years before the advent of the first passenger railway in Scotland and, most importantly, fifteen years before the birth of Mary Ann Evans. Nichol was the son of a gentleman farmer from England and a Scottish mother. Although he excelled in the sciences, graduating with honors in physics and mathematics from Kings’ College, Aberdeen, his early career path was in the ministry. However, that career did not last, for Nichol experienced a change in views and left the ministry shortly after his ordination. Such a change in views, or a move away from religious belief, was common in the 19th century, as scientific knowledge expanded and was disseminated with larger scope among the reading public. As noted earlier in this paper, Eliot herself experienced such a change in views, which was in its infancy either at the time she read Nichol, or occurred shortly thereafter.

Following his abandonment of the ministry, Nichol began a career in education which he had shown an affinity and talent for as early as age seventeen, first as a headmaster of a grammar school and then an academy, and then educator and lecturer. He would become well-known and revered for his public lectures, delivered to Scots of all classes, as well as his lectures at the University of Glasgow, many of which he offered for free to any interested student. It is said that the future Lord Kelvin was one of Nichol’s early students who was enraptured by the professor’s lectures on science. So persuasive were Nichol’s lectures that
they have been called, oratorically speaking, “works of art” (*Memoirs*). One topic which became one of Nichol’s primary interests in his personal and professional life was that of astronomy. In 1836, Nichol was named Regius Professor of Astronomy at the University of Glasgow. According to the 1886 book, *Memoirs and Portraits of One Hundred Glasgow Men*, Nichol was elected to the post over the likes of Thomas Carlyle. Although the same book notes that professors of astronomy at the university at that time did not need to have any particular expertise in astronomy, Nichol was nonetheless fascinated by, and up to date on research of, the night sky. Because of his skill in physics and mathematics, Nichol ably comprehended much of the technicalities inherent in astronomical study. In 1841, with Nichol’s assistance in raising funds, the University purchased the Observatory on Horselethill Hill in Glasgow and Nichol became the University’s official Observer. In addition to making observations, Nichol would be responsible for the purchase of equipment, and for the promotion of the observatory as an important astronomical center. It was his work at the observatory, and in astronomy in general, that Nichol created some of his finest work and for which he is still highly respected today.

In addition to his work as university professor, Nichol wrote several texts on astronomy that were designed not for his fellow scientists, but for the average member of the reading public. In those works, Nichol explored the history of the field of astronomy, from the ancient Greeks to his near contemporaries, as well as providing the reader with an engaging understanding of what one sees when observing the night sky. Nichol was able to skillfully translate the sometimes obscure and complex aspects of astronomy into language that any reader could understand. In addition, the works are rich in wonder and awe at the universe, encouraging the reader to share in Nichol’s joy at viewing the heavens and through that act of
observation, understanding the distant objects that make up the universe. Nichol’s skill as a
writer, coupled with his obvious enthusiasm for his work (his adulation for his astronomical
forebears often veers dramatically into the hyperbolic), enabled him to share with his
audience theories proposed by other scientists on the composition and nature of the universe
that he believed deserved a wider audience. After his death, his son John would say of his
father, “everything he thought was noble, and everything he said was inspiring, and
everything he did was majestic” (Clark). Of particular note is Nichol’s steadfast support of
the work of William Herschel, who studied distant nebulae and proposed theories on how
nebulous matter, floating through the cosmos, collected to create stellar systems, a crucial
step in understanding how stellar matter is attracted, re-formed and creates new objects.

On the page, Nichol explored the universe through a series of very popular works,
starting in 1837 with A View of the Architecture of the Heavens—a volume which would turn
out to be so popular that it would be reprinted seven times—and culminating with The Planet
Neptune, published in 1855, four years before his death in 1859 at the age of fifty-five and
only nine years after the planet’s discovery. For the purposes of this thesis, the focus will be
on Nichol’s first two astronomical works: A View of the Architecture of the Heavens and his
second work, The Phenomena and Order of the Solar System, for those are the works that we
know with certainty that George Eliot read. Eliot refers to Nichol only twice in her collected
journals and correspondence, largely in a letter dated 3 September 1841, written to her
former teacher and dear friend, Maria Lewis, but her enthusiasm is marked. In the letter,
Eliot rapturously describes her reading of Nichol’s work, exclaiming that she has been, “in
imagination winging my flight from system to system, universe to universe” (Letters, Vol. I,
107). She yearns for a fellow scholar to study with her, to share in her academic labors and
joys.

Up to this point in her life, much of Eliot’s voracious reading—made possible by the extensive library available to her through her father’s employer, the master of Arbury Hall—was rooted in popular poetic works, early novels, and a deep well of religious texts. The arrival of Nichol in Eliot’s sphere of self-education marks a unique point in the young woman’s life: this was roughly the time when her interest in religion waned as she explored her personal views on the subject, while her interest in the natural sciences rapidly grew. Eliot’s reading of Nichol occurred only a few months before she made the shocking decision to stop attending church services, an act which would have repercussions throughout the Evans family. It is impossible to know the full extent of Nichol’s impact on Eliot, but a close reading of Nichol gives significant clues about the writer Eliot would become, as well as her philosophical views on man and the natural world. In *The Phenomena and Order of the Solar System*, Nichol makes a curious comment that may refer to his own change in religious views, and which well could have influenced Eliot: writing of Copernicus, “…he threw from him the weight of the belief of ages, and quietly asked whether that fundamental tenet…might not be false” (52). Though his reference is to Copernicus’ disavowal of the Earth’s lack of motion, it also reads as the words of an intellect struggling with long-held beliefs in God and the sanctity of the Bible.

An understanding of the times, that is, the change in religious feeling that was occurring throughout England in the nineteenth century, is ably described in the historian A. N. Wilson’s work, *The Victorians*, as well as *The Victorian Frame of Mind*, written by Walter Houghton and published in 1957. In his work, Wilson conveys to the reader how, as printed works were increasingly disseminated, the increased access the ordinary citizen had to
scientific ideas and writings, and the ideas expressed in those works, led many to what Wilson refers to as “the destruction of ‘creationist’ thought…” (Victorians 97). That is to say, as awareness of and interest in scientific developments spread throughout England, from university halls to roadside taverns, many individuals and groups of individuals came to view religion in a new, more objective manner. Wilson describes “independent scientific inquiry” prevailing over “blindly” believing in the lessons of the Bible (Victorians 97). Adding to this understanding is Houghton’s work, which describes the Victorian pursuit of a sense or understanding of universal truth, whether that included God or not.

A thoughtful, analytical examination of the personal letters of Eliot shows a young woman who took such a journey, moving from ardent faith in God and the Bible to a firm belief that the Scriptures were no more than “histories consisting of mingled truth and fiction” (Letters, Vol. I, ). As noted in the works of Wilson and Houghton, Eliot lived in a period of great cultural and religious change. The pursuit of truth was the impetus for the work of many 19th century intellectuals, just like Eliot. Ultimately, for many, the casting off of organized religion was seen as a means of liberation: freeing the individual to seek and discover new truths and ideals, both personal and cultural. Curiously, Nichol himself refers to truth repeatedly throughout Views and Phenomena, ten times in the former and eight times in the latter. Nichol’s devotion to the ideal of truth and ebullient phrases such as “with the world as with the individual, truth is to be attained only and slowly, by labour” (Phenomena 48) and “exhibiting a thirst for truth” (Phenomena 103) may have struck a chord with Eliot at a crucial time in her intellectual and spiritual development. Years later, in the text of the novel Adam Bede, Eliot as narrator plainly wrote, “…I am content to tell my simple story…dreading nothing, indeed, but falsity…falsehood is so easy, truth so difficult” (160).
Eliot’s early letters to friends, which provide the reader with a clearer view of the young woman’s feelings and beliefs, are dense with religious allusions and quotations from the Bible and other religious works, such as the poetry of Edward Young. At the time, Eliot’s devotion to religious works was a profound one and in moments of self-doubt, poor health, or ill humor, she wrote of seeking and finding strength in religion and God for herself and also for others. Hers was a deep, ardently stated religious passion that verged on obsession. In a letter dated 20 July, 1840, Eliot wrote to her then dear friend Maria Lewis:

“It is an inexpressible mercy, enough to absorb our finite gratitude and leave none for other gifts, to feel that the ‘Lord God hath opened our ear’ to His voice, which is to be heard in every note of the scale to which His dealings in the Kingdom of Grace and of Providence are set; from the still and gently drawing whispers of His Spirit in the soul to the deep-toned and almost stunning thunder of his power when whole nations, while falling a sacrifice on the shrine of His incensed justice, subserve at the same time the designs of His compassion by putting others in fear that they may know themselves to be but men. (Letters, Vol. I, 58)

It is a rather pedantic earful from a young woman who was not yet twenty. Yet for all of the religious fervor and devotion, for the sense of sounding important and wise beyond her years, the passage nevertheless holds hints of the author that Eliot was to become: poetic, deeply philosophical, and absorbed in her beliefs. Early letters such as these show hints of Eliot’s natural affection for nature and the resonance that the natural world held in her thoughts and feelings. In a letter a friend dated less than a year after the above letter to Maria Lewis, Eliot would write that she was eager to write to said friend, as she was “at liberty to stretch the wings of thought and memory beyond my own nest and bush…” (Letters, Vol. I, 92). Often insecure and self-conscious, Eliot appears to have found comfort not only in her pen—at the time simply through expressing herself in letters—but also in the sights and smells of the world around her.

Eventually, Eliot came to see the act of attending church as superficial and hollow,
describing the act as largely “conform[ing] to popular beliefs without any reflection or examination” (Haight 34). Eliot, so painfully self-conscious, thoughtful and questioning, sought more out of life than mere affectation to belief. In a letter to a friend and neighbor dated 28 January, 1842, only a few weeks after she stopped going to church around the New Year, Eliot reassured her concerned friend, “do not fear that I will become a stagnant pool…for my part, I wish to be among the ranks of that glorious crusade that is seeking to set Truth’s Holy Sepulchre free from a usurped domination” (Letters, Vol. I, 125). The emphasis on truth is Eliot’s own, reflecting Houghton’s assertion that a desire for truth was one of the intellectual hallmarks of the period, as well as Nichol’s passionate description of Copernicus, in which he wrote that “…his mind kept itself near the fountain of truth” (Phenomena 68). In a letter to her uncle, dated before her refusal to attend church and after her reading of Nichol, Eliot plaintively wrote that “…the mode of action most acceptable to God, is not to sit still desponding, but to rise and pursue my way” (Letters, Vol. I, 113), a sentiment echoed the following year when she wrote to Maria Lewis, “…the greatest torture…would be to run counter to the dictates of conscience…” (Letters, Vol. I, 127).

As her circle of friends formed and grew and as her auto-didacticism developed, Eliot’s passion for religious literature and personal spiritual belief was eclipsed by her enthusiasm for works of natural science. This turning point, which would see Eliot remain ardently immersed in natural science for the rest of her life, set the stage for an intellectual development that I would argue influenced her writings in a profound way: Nature in all its power, beauty and infinite complexity, would take the place of God. A key to that would be in the early works of John Pringle Nichol, where Nature, in the form of the night sky, would take center stage.
One of the most significant themes connecting the early published works of John Pringle Nichol and those of George Eliot is that of observation. Nichol’s works place great emphasis on the importance not just of observing or looking at an object, but of analyzing and understanding the object that is seen. That is to say, making the act of observation one that enables the viewer to draw inferences from what is seen. The purpose is to know and understand, or, as Nichol phrases it in Views, “to fulfill the best purpose of truth—which is to instruct and elevate the general mind…” (4). Nichol further notes in Views that to view and revel in “…the firmament, with its countless and glorious orbs, [which] is doubtless vast — perhaps inconceivably so…” (6-7) is to “remove the veil” from ones mind; that is, to be open to grand ideas and to see more deeply. This concept of observation and the importance of it provides a wonderful and critically fertile link to the works of Eliot, as it marks the subtle yet significant tone of her narrative observation: Eliot does more than describe her characters, she uses observation of them to analyze and better understand the character’s thoughts, feelings and behaviors and to present a fuller, more realistic character to her reader. Nichol’s writing on effective observation form the basis of the following chapter, as varying facets of successful observation are explored.

In his introduction to The Phenomena and Order of the Solar System, Nichol writes of an observer of the heavens, that “curiosity impels him to examine more closely, that so he may unravel the order and significance of the vast and remarkable changes which meet his view”
I argue that Eliot, in creating her fictional works, created not simply characters, but whole worlds, inclusive of the cottages, rolling fields, churchyards and woods that make up the environment in which her characters exist; these are worlds that have their own distinct structure as individual units and are perfectly developed so as to encourage critical observation. As a student of the natural sciences, Eliot’s keen sense of description of the natural world and her characters’ place in it, suggest an authorial curiosity about the machinations of those worlds. Imagine if you will, a Wardian case: glass walls and roof, resting in a place of pride in Eliot’s home. Inside the case, tiny figures are placed like dolls: Adam Bede, Dinah Morris, and Hetty Sorrel. Even Adam’s dog, Gyp, is there as well. In the case, surrounding the figures, is an infinite quantity of tiny details, placed by the author: trees, the Bede cottage, the village green, milch cows, birds, and low hills. A gust of wind, a trill of a bird, and the figures begin to move. The author, curious, observes them in their miniature world, noting how they behave, what they say and do, and as a result of her observations begins to understand them. She sees beyond the facade of each face, interpreting their behavior as indicative of what is beneath the surface, what may be hidden to others who do not observe as closely. If the novels are viewed as a series of observations, much as one would study a group of sea anemones or a comet over a period of time, one can see the significance and the order of that system, as a discrete world, from large systems to small details, what Nichol describes as “one stupendous system, bound together by fine relationships” (Views 9). Like other scientists, Eliot focuses on the how of her worlds, not the why, and in doing so develops a richer sense of realism.

The early works of George Eliot, noted for their realism and indeed, seeming vibrantly alive to the reader, possess that realism because the author is a keen observer of her own
creations and utilizes a critical, scientific mind to analyze them. Her first introduction of the character of Lisbeth Bede in *Adam Bede*, for example, is not a physical description, but rather one of inner character: “she is an anxious, spare, yet vigorous old woman, clean as a snow-drop” (*Bede* 36). Eliot does go on to describe the Lisbeth physically, but by describing her as she did above *before* the physical description strongly suggests that Eliot is less interested in physical descriptions, for they are not as necessary to understanding the nuances of the character. Eliot’s initial description harkens back to Nichol’s assertion that “curiosity impels him to examine more closely”; here, Eliot herself has examined an elderly woman closely and her description is the result of that close viewing. When Eliot’s publisher John Blackwood read an early manuscript of *Adam Bede*, he remarked, “Lisbeth is a very perfect picture” (*Letters*, Vol. II, 445), suggesting that he too recognized Eliot’s powers of observation and description. Eliot’s keen observation, or her study of the character, of Lisbeth Bede is also an excellent example of the utilization of Nichol’s description of stellar observation with a telescope as showing the observer “the very minute irregularities of our firmament” (*Views* 17). By honing in on Lisbeth’s less physical qualities, with her own authorial lens, Eliot’s observations provide the reader of *Adam Bede* with view of Lisbeth as an individual noted for her own “minute irregularities.”

Mechanical Tact, the Essential and Non-Essential

The concept of distinguishing sometimes small characteristics which nonetheless imbue an object or character with a distinct personality or image is another element which may be found in both Nichol and Eliot. In his *Views*, Nichol puts it quite eloquently when he writes
of viewing an object through the depths of the night sky, honing in on one object in a great ocean of stars, allowing the observer to “separat[e] the individual bodies” (14). Nichol’s emphasis is on the necessity of not generalizing all stars and nebulae, but rather studying them individually in order to ascertain, understand and appreciate their unique features. When viewing the early works of Eliot through this lens, one develops a greater appreciation for the delicacy with which she has created and developed each character. Throughout her works, it is evident that Eliot possessed an almost Thackeray-like eye for small details, the kind that bring forward some fundamental essence of the character, whether the character is small and insignificant or large and of great value. As an example, in the opening pages of Eliot’s *Scenes of Clerical Life*, the narrator describes Mr. Pilgrim, a local physician, as at his most comfortable when in an “…excellent farmhouse where the mice are sleek and the mistress sickly.” We are not destined to know much more of Mr. Pilgrim, but in that brief moment when he introduced to us, Eliot chooses to provide a unique detail of his personality, rather than bland physical characteristics or even nothing at all. Here, she is narratively doing what Nichol described when he wrote of individual celestial bodies. In doing so provides the reader with a richer understanding of who the character is than any lengthy superficial description could achieve. The fact that Mr. Pilgrim is such a small character heightens, rather than lessens, the narrative impact, for his description serves to fill out the scene, once again presenting the reader with a view of a complete world, that every character has a place and a story.

This emphasis on detail, on the minutia that defines each individual character, is one of Eliot’s strongest points and it is found throughout *Adam Bede*. In addition, the details Eliot chooses to present to the reader are crafted through close narrative observation, as though the
narrator is long acquainted with the character or characters in question and is seeking to enlighten the reader in the best way possible. Again, the idea of the Wardian case arises: Eliot’s understanding of the motivations, hidden feelings and thoughts enable her to offer the reader such a deeply thought-out view. Early in *Adam Bede*, as the village gathers to hear Dinah Morris, a young Methodist, preach on the green, the landlord of the Donnithorne Arms, Mr. Casson, is at great pains to venture forth to hear the young woman, while not seeming outwardly interested. Eliot’s careful handling of Mr. Casson, and of her description of him as “…providing himself with an air of contemptuous indifference” bestows upon the reader a sharper view and understanding of the landlord’s attitude, as well as imbuing the character, a very minor one, with a feeling of being fully dimensional. The reader is unlikely to confuse Mr. Casson with any other minor character in *Adam Bede*, such as Wiry Ben, thanks to Eliot’s efforts to create a sense of individuality. Characters such as Mr. Casson exemplify the idea that Eliot has carefully observed and interpreted the character.

It is this carefully crafted sense of individuality, the use of details which separate each character from the others, that helps to make Eliot’s works so realistic. Yet Eliot is not overly effusive with her details, nor does she sprinkle them throughout the novel with no sense of reason. Rather, Eliot’s attention to detail is an example of what Nichol refers to as having the “…power to distinguish, as if by intuition, the essential from the non-essential—to light at once upon the important feature of an evanescent phenomenon, and to seize and appreciate it, which is among the higher attributes of thought” (*Phenomena* 90). Nichol was referring to the observation, through a telescope, of distant objects in the night sky and the need for the observer to possess a certain skill in making such observations. In looking at Eliot’s creations, those figures she observes, interprets and presents to the reader, the reader finds
that Eliot has done the same with her characters: in describing any character, she separates the essential elements from the non-essential, again giving the reader a richer comprehension of the character in question. It is this distillation that provides Eliot’s works with a depth not seen in many contemporary works.

An excellent example of this distillation of character may be seen in *Adam Bede*’s troubled anti-heroine, Hetty Sorrel. Although roundly pretty and of some charm to the male sex, Hetty is, as presented by Eliot’s observing narrator, shallow, self-centered and vain. Conscious of her appeal to Adam, Hetty enjoys his attentions despite her lack of reciprocal interest. Eliot’s provides the reader with the observation that Hetty “…liked to feel that this strong, skilful, keen-eyed man was in her power, and would have been indignant if he had shown the least sign of slipping from under the yoke of her coquettish tyranny…” (90). For all her physical charm and occasional performances of girlish charm, Hetty is less likable than she should be, and certainly less likable than others believe her to be. Driving the point home that Hetty’s nature is a selfish one, the narrator explains that Hetty “…felt nothing when his eyes rested on her, but the cold triumph of knowing that he loved her…” (90). This description of Hetty is damning, for by allowing such analytical insight into Hetty’s nature, Eliot prepares the reader for what to expect from Hetty: cold calculation and a want of empathy. With outward charm stripped away, Eliot presents the essential Hetty.

Throughout *Adam Bede*, Eliot goes to great pains to present the essential qualities of all her characters, implementing what Nichol calls “a delicacy…of tact” and a “fineness of perception” (89). Again, Nichol was referring to the need for skill in making successful observations of stars and nebulae, while extolling the virtues of history’s great astronomers, but the concept, as applied to Eliot, is quite fitting. Eliot’s perceptions, or those details and
qualities she chose to use in reference to her characters were indeed fine and carefully, delicately, crafted. Even her humorous depiction of Mr. Irwine’s dog, Pug, resonates with a strong sense of accurate perception, noting that the dog sat “with the air of a maiden lady who looked on…familiarities as animal weaknesses, which she made as little show as possible of observing” (152). Rare is the author who bothers to mention a dog, even more rare the author who finds in the image of their creation a strong sense of character, one that is noted and appreciated by the reader. Eliot’s narration of the world she created in *Adam Bede* is filled with astute observations and depictions of characters living complex, vibrant lives full of dimension.

**A Suitable and Accurate Sketch**

In his *Views of the Architecture of the Heavens*, Nichol writes of the astronomer William Herschel’s comprehensive and extensive observations of the night sky, noting that Herschel did so “with a view to determine the elements of a suitable and *accurate* sketch…” (18). In assessing her role as creator and narrator, perhaps Nichol would have aligned Eliot with Herschel, for her works are highly detailed, carefully crafted depictions that are firmly rooted in realism. Eliot’s scenes and characters are multi-dimensional; they experience joys and sorrows, make mistakes and amends. Their lives, as presented by Eliot, present to the reader a sense of honesty and truth, truth again being the vibrant, urgent quest of many in the nineteenth century. While some of Eliot’s characters may have been inspired by people she knew, they are nonetheless works of fiction, created by an author who sought out some sense of over-arching truth. This is manifested not just in her own personal life, but through the
written works she created. It can be said, then, if one accepts the vibrant realism of Eliot’s works, that what she created was indeed “a suitable and accurate sketch” (Views 18) of a small rural village and the lives of some of its inhabitants. Her characters were not “…superfluous existences; inartistic figures crowding the canvas of life without adequate effect” (Bede 61). Ultimately, we have Eliot’s own words to describe her narrative efforts as a form of observation, when she writes in *Adam Bede*:

Certainly I could, [have made Mr. Irwine give Arthur some truly spiritual advice] if I held it the highest vocation of the novelist to represent things as they never have been and never will be. Then, of course, I might refashion life and character entirely after my own liking…But it happens, on the contrary, that my strongest effort is to avoid any such arbitrary picture, and to give a faithful account of men and things as they have mirrored themselves in my mind (159).

While it is impossible to know all of what was in Eliot’s mind when she wrote *Adam Bede*, the resulting work, based on its thoughtful, rich observations, suggests that the author must have experienced some measure of success. Her initial attempts at fiction quickly found favor In a letter to the publisher John Blackwood dated 6 November, 1856, Eliot’s companion, George Henry Lewes, introduced the manuscript of the first part of Eliot’s *Scenes of Clerical Life* with the note that he found the writing to have “vivid presentation and nice observation” (*Letters*, Vol. II, 269), praise indeed from one of the period’s finer writers and a man who prefaced his own scientific works with extensive field work. Indeed, Lewes was Eliot’s fiercest supporter and rallied her spirits when she became subject to feelings of doubt. In her journal entry, entitled “How I Came to Write Fiction,” extracts of which were not published until after her death, Eliot noted that upon reading a short piece of tentative fiction to Lewes, “…he was struck with it as a bit of concrete description…” and that as her fictional output progressed, Lewes told Eliot that she had ‘wit, description and philosophy’
(Letters, Vol. II, 407). Thus, Eliot’s natural emphasis on realism had the early attention of and support from Lewes, providing her with the confidence to continue to hone her craft as she began writing *Adam Bede*.

From the beginning, *Adam Bede* was described by Eliot’s publisher as “altogether very novel and I cannot recollect anything at all like it. I find myself constantly thinking of the characters as real personages, which is a capital sign.” (Letters, Vol. II, 446). Eliot’s tone as an author of realism, then, was noticed early in her career, although Blackwood may not have yet made the connections between Eliot’s realism and her belief in and passion for the natural sciences. Had she not been so scientifically minded, had she not read deeply in works like Nichol’s, hers may have been a very different type of novel. Fortunately, Eliot not only absorbed important ideas on the power of observation and expressed them through her narrator, she also used them to great effect in the interactions between her characters.
In reading *Adam Bede*, of which Eliot noted early in its writing that her “…heart is in the story,” (*Letters*, Vol. II, 419), it is clear that the author and narrator are clear-headed, keenly observant forces. The level of observation and resulting analysis provide the reader with a finely detailed understanding of the novel’s characters. Yet curiously, there is another layer of observation in the novel: that of the observation among the characters themselves and it is this layer which provides fascinating passages for study. In focusing on observation among the characters in *Adam Bede* three areas will be explored: discovery, pre-conceived ideas and the failure to see accurately, and seeing beyond. Each will show how the tenets of careful observation and analysis—as presented by Nichol—are necessary to, but often lacking in, fruitful human relationships.

Failure to See

One of the most dynamic and engaging aspects of the works of John Pringle Nichol is his choice to write for the average reader, not his fellow scientists. Grand topics on astronomical history, the motion of the planets, and what we see when we look to the heavens are all presented in a manner that is direct, simple and fairly easy to understand. In the first chapter of *The Phenomena and Order of the Solar System*, in which Nichol orients the reader to the early history of astronomy, he tellingly—for our purposes—notes, “it is almost a universal
fact, that no observer in the first instance ever dreams that the appearances on which he is theorizing, are in their absolute shape and form precisely as he sees them,” (36). The emphasis, one must note, is Nichol’s, stressing the understanding that no observer of the night sky has ever imagined that what he sees when he looks up is not exactly as it appears. How true that is for human nature, as well, as we will see in *Adam Bede*, for Eliot too shows several of her characters to be unskilled at observation and liable to take situations and other people at face value. Eliot knows the inherent problems in such behavior, but her realism, and her attentiveness to works like Nichol’s, effectively prohibit her from writing her characters in any other way.

The failure to see, or failure to understand what is observed, is one of the central tragedies of *Adam Bede*, most significantly in the relationship between Adam and Hetty. The relationship with Hetty is, to Adam, one of romance, of a man to a woman whom he hopes to marry and with whom build a life. Adam’s perception of Hetty is that of a charming young woman; outwardly, Hetty is regarded as a beauty by all who know her, possessed of a rare beauty described by the narrator as a “spring-tide beauty; it was the beauty of young frisking things, round-limbed, gambolling…” (77). Physically, Hetty is imbued with sweetness and docility, and likened to youthful, energetic animals that have some physical weakness to them necessitating protection. Adam, like all others, is entranced and in doing so, is utterly at sea as to Hetty’s self-absorbed inner life. Adam, the narrator asserts, thinks of Hetty in a romantic haze, imbuing her with qualities she does not possess, simply because she appears childlike, bonny and sweet. He imagines her as an ideal wife and a charming mother and even when reality creeps in, as when “she behaved with cold vanity towards him,” he reassures himself it is simply because she does not love him enough yet (139). It does not
enter the mind of Adam to look closer, to look at Hetty in any other way in order to divine her meaning or her attitude towards him. Simply put, Adam does not believe that Hetty is anything other than what she appears; to paraphrase Nichol, she is in her absolute form in the eyes of her would-be suitor. As the narrator poetically notes with a touch of the scientific; “Nature, that great tragic dramatist, knits us together by bone and muscle, and divides us by the subtler web of our brains” (36). Sadly, Hetty’s attitude truly was cold vanity; poor Adam simply could not and did not see it, lacking also the fine delicacy and intuition that Nichol stated was required in successful observation. Adam could not get beyond his “preconceived…and unfounded notions,” (Phenomena 95) of Hetty’s nature, just as Nichol described the workings of early astronomers and their view of the heavens.

Almost cruelly, Hetty sees Adam, or rather Adam’s life, as he is and does not love him for it. Blind to his many good qualities, incapable of seeing them in him, she sees Adam through the lens of her own selfishness. She sees only his faults as they relate to her, only his inability to shower her with finery and the burden of elderly parents. While some of what she observes is clearly true, Hetty’s inability to see all of Adam upholds Nichol’s assertion that no one, in making an analytical visual observation, comprehends that what they see is not as it appears. This suggestion is further seen in Arthur Donnithorne’s view of Hetty; having embarked on an illicit relationship with the girl, Arthur views her much as Adam does, feeling “sure that she was a dear, affectionate, good little thing,” (139) when careful observation, as well as logical thought, ought to have told him that she was none of those things, most especially not good. Again, the human view is faulty and the subject poorly observed. These failures of observation are not merely narrative curiosities; rather, they inexorably lead to misunderstandings and irretrievable scenes of heartbreak, death, and
physical suffering.

As narrator, Eliot takes on a kindly role towards her characters excellently crafted and realistic flaws, seemingly understanding that their behavior is all too human in its imperfection and reliance on feeling rather than calculation. To that end, Eliot recognizes Adam’s inability to see Hetty, asking the reader not to “despise Adam as deficient in penetration” (139). Nichol uses the word penetration effectively as well, writing at length in his Views of the power of telescopes to see deeply into the heavens. Adam, according to Eliot, cannot see deeply into Hetty but the reader is asked not to think too badly of him for it, nor of Arthur, for the narrator notes that many persons have been “beguiled” (139) as they were. What is significant, in addition to the men’s failures as observers, is Eliot’s scientifically-oriented assertion that “Nature has her language...in a hasty reading we may happen to extract the very opposite of her real meaning” (139). Eliot goes on to write that Hetty was so attractive, “…you must have been a very acute personage indeed to suspect her of...hardness” (141). Essentially, the men fail to observe because they are human and in their humanity are not fully equipped or able to understand what nature has created in Hetty or how they should attempt to understand her, because she, like a distant nebula viewed through the telescope of William Herschel, has an outer appearance that is deceptive as to its inner fires.

Seeing Beyond

In describing the motion of the heavens and the historic work done to understand such motion, Nichol makes reference to the horizon: “…that apparently flat plain around us,
which is the bounding line of vision” (*Phenomena* 23). Just as the night sky has its limited range of view, so too do many of the characters in *Adam Bede*, whose failure to see beyond what is literally and figuratively directly in front of them often has sorrowful consequences. As noted above, the observational challenges and failures of Hetty, Adam and Arthur wreak havoc on their lives with dire consequence. Sadly, although narratively intriguing, their observational failures continue, to varying degrees, with their inability to see beyond their own limited horizons. This inability creates in each a false sense of the future, based on illusion, rather than a carefully planned future based on the reality of their everyday existence.

The tragedy of the life of Hetty Sorrel, destined to end in shame and transportation, is perhaps the most effected by an inability to see far beyond her own sphere. Hetty’s rapturous dreams of a life with Arthur, and the comforts Arthur’s wealth will provide her, obscure her vision and in doing so, prevent her from seeing outward at all. Her vision is only inward, as though training her own lens not on a distant star, but on her own heart. Eliot refers to Hetty’s observational blindness as “…dim ill-defined pictures that her narrow bit of an imagination can make of the future,” (140) suggesting that Hetty’s self-absorption, materialism and need for attention are to blame for her pronounced short-sightedness. Ultimately, Hetty utterly fails to see the harsh reality of her relationship with Arthur and that it, like so many other similar relationships in the time period, is not destined to end well. It is only when she is in the direst of straits that she finally beings to see clearly, as though the experience of a harsh reality has finally provided her youthful mind with a proper means of seeing, but by then it is much too late.

In contrast, Arthur knows too well that his secret relationship with Hetty is unwise and
has no future; under normal circumstances he is capable of seeing beyond his own horizon and understands that there is no place for a marriage to Hetty in his upper-class existence. What Arthur cannot see is a way out of the mire he has fallen into, nor does he fully appreciate the consequences of his actions. Thus, while his view is slightly better than Hetty’s, it too is compromised, although the effect on him differs from what Hetty experiences. Hetty, blinded to reality, lives in a dream-world that reality cannot shake until it is much too late; Arthur’s slightly broader view suggests his finer ability to see beyond, but what he sees and experiences torments him as he vacillates between what he chooses to see close by—Hetty in love—and what he refuses to see beyond him. Arthur goes so far as to deceive himself that Hetty is not nearly so attached to him as she truly is and that his actions are not as dishonorable as he once thought, proclaiming to himself that “it was not, after all, a thing to make a fuss about” (155). While Arthur may see farther, his observation is inaccurate, as though the lens through which he attempts to look beyond is distorted and cannot aid him.

Of the other significant characters in the novel, Mrs. Poyser, mother of the precocious Totty and aunt to both Dinah and Hetty, is one of the few imbued with a “…keenness and abundant opportunity for observation” (141). A practical woman of much common sense, her sight is far-reaching, whether it is in the direction of her niece’s potential marriages or the state of the market for her cheese. This practicality and clear sightedness is shared rather significantly by her niece Dinah, one of the only characters in the novel to see Hetty’s ruthlessness. Dinah recognizes that Hetty’s coldness is just that, rather than a girlish affectation brought on by coquetry. Fortunately for Hetty, Dinah’s goodness—the warm sun to Hetty’s cold moon—allows her to look at what Eliot describes as a “blank in Hetty’s
nature” (143) with kindness and pity, rather than disgust. Perhaps it is the practicality in both women that allows them to be clearer in their vision than many others, reflecting Eliot’s own outlook on life which was likely influenced by her understanding and appreciation of the orderliness of the natural sciences.

Discovery

As a man who once called the church his career, Nichol, as evidenced in his writing, was a thoughtful man and deeply philosophical in regards to new ideas and discoveries. Through his works, he celebrated the achievements of astronomers like Galileo and Tycho Brahe, sharing their often groundbreaking findings with his readership with reverence and joy. Yet Nichol knew that the advancement of knowledge, the acceptance of new ideas such as the motion of the Earth around the sun, were challenging to many. Philosophically, he wrote of this difficulty, “repose-loving man cares not to be disturbed by discoveries, he prefers old opinions…because they were easiest” (Phenomena 75). Nichol recounts the great struggles faced by Galileo and Copernicus, as they endeavored to share their discoveries and new concepts with a public that not only did not believe, but also in Nichol’s view did not want to. Galileo’s contemporaries, according to Nichol, would not even put their eyes to his telescope, refusing the astronomer his opportunity to prove his observations. In Adam Bede, several of Eliot’s characters face their own discoveries and, though they are less universally revolutionary than those described by Nichol, they are, for them, nonetheless earth shattering.

The revelation of Hetty’s pregnancy, coupled with the death of her child, is heart-breaking for not only her shamed family, but for Adam, as well. Long attached to Hetty, the
discovery of Hetty’s apparent lack of propriety, as well as her secretive nature, shakes
Adam’s calm. Adam has not had the opportunity to learn about Hetty’s true nature through
what Nichol describes as “…that gradual acquisition of knowledge…that slow and laborious
purification and enlargement of early and narrow ideas…” (Phenomena 19), but quickly,
almost violently, and when Hetty is imprisoned for the murder of her child, Adam grieves for
her and for his lost ideal, taking on blame for her predicament, despite the reassurances of his
teacher, Bartle Massey, who notes that Hetty’s true nature was invisible to Adam. Adam’s
discovery, which he has difficulty grasping and tries to reason away as being his
responsibility, is coupled with his inability to see deeper into Hetty’s behavior and
appearances. Adam’s life, though not an easy one, has not prepared him and his protective
feelings towards Hetty for this discovery. Adam does not possess the wisdom of his creator
and narrator, who notes, “ships, certainly, are liable to casualties, which sometimes make
terribly evident some flaw in their construction, that would never have been discoverable in
smooth water; and many a ‘good fellow,’ through a disastrous combination of circumstances,
has undergone a like betrayal” (114). Adam’s own betrayal is made worse by the realization
that Arthur, whom Adam admired and had friendly feeling towards, is in many ways
responsible for Hetty’s downfall. Unlike the accomplishments of Galileo, which were merely
a question of the role of God and the supremacy of Earth in the heavens, the betrayal of
Adam and Hetty, “the signal for all discord and passion” (Phenomena 73) is a deeply human
experience, and though it may concern only a few people, the resonance of the betrayal is felt
long after the event.

Ultimately, Adam accepts his discovery of the true nature of both Hetty and Adam,
forgiving both their sins and the hurt they have caused on so many. While Adam may not be
relieved, his soul is calmed and he finds love with the gentle and pious Dinah Morris and, although he experienced deep grief, he may ultimately have found peace in knowing the truth, his knowledge occupying a place in what Nichol rather hyperbolically refers to as “the temple of Truth” (*Phenomena* 77). Eliot’s treatment of Adam’s ordeal and his ultimate discovery and acceptance of the truth suggest a scientific and intellectual need to get at the truth of a situation, whether it be mathematical or profoundly human, no matter what the end result. Adam endures tragedy, but through inadvertent discovery and the eventual application of clearer observation, Adam emerges from his grief a wiser, more content person. Finally, he understands Hetty, realizing that, as Eliot writes: “…we must learn to accommodate ourselves to the discovery that some of those cunningly-fashioned instruments called human souls have only a very limited range of music, and will not vibrate in the least under a touch that fills others with tremulous rapture or quivering agony” (88).
While the works of Nichol are clearly rich in the necessity and nuances of observation in the field of astronomy, another large element of his work is that of celestial mechanics, an element which, surprisingly, may be comfortably used to view *Adam Bede* and the network of connections within the novel. In *The Phenomena and Order of the Solar System*, Nichol makes a simple but meaningful statement in regard to the motion of the planets in the solar system: “up to this point their orbits were individuals—without connection or unity” (210). Nichol explains that the connections between the planets themselves, and the influence of the sun on the planets, had long gone unexplained and misunderstood. Yet when the focus of astronomers was turned to this problem, they found extraordinary connections and strong, yet subtle interactions between these distant objects, “doubtless forming one stupendous system, bound together by fine relationships” (*Views* 9). The concept of invisible connections is strong throughout *Adam Bede*, as are concepts of harmony, perturbation and physical characteristics. Put simply, celestial objects have a range of influence on each other, just as characters in the novel impact each other in unseen ways and the characters in *Adam Bede* may be viewed as celestial objects with their own orbits, motion and interactions.

Connections play a significant role in *Adam Bede*, as seen in the small families and communities that Eliot created. Adam Bede, for example, is part of several spheres within his community: in his small family, among his friends, that of the village itself, and the school where he develops his knowledge. Each sphere operates on its own with connections
within — between Adam, his brother, and his mother, for example — but these spheres also have interactions with each other. Actions in one sphere may have impacts on another, in ways large and small. Looking closely, one may begin to see subtle interactions, demonstrating a social perspective on Nichol’s assertion that objects in the solar system were connected, not isolated, no matter their distance from each other or the smallness of their interactions.

That feature of the Heavens which first strikes the untutored Observer after he has ceased to wonder at their mere brilliancy, is the prevalence of motion and activity—in some cases general and uniform, in others special and intricate; and curiosity impels him to examine more closely, that so he may unravel the order and significance of the vast and remarkable changes which meet his view (Phenomena 19).

The village of Hayslope, home to the Bede and Poyser families, is an excellent example of the above quote from Nichol, for a village is nothing if not a hub of activity. Taking Nichol’s quote point by point, the village contains first, motion and activity that is of a general nature, uniformly occurring on a regular basis. One can see this in the activity of Adam and Seth Bede’s workplace, the shop of Mr. Burge. The men arrive for work at a prescribed time and depart at another. Their daily motion is uniform and if one were to trace a path between the Bede home and the village, a fairly regular path, or orbit, would likely be seen. Yet Hayslope also contains motion that is more complex: Adam’s visits to the Poyser farm are less regular and follow a different path, both literally and figuratively. The clandestine meetings between Arthur and Hetty are an intricate pattern of activity shielded from public view. If we do as Nichol suggests, and look more penetratingly at these motions, “in pursuit of these wandering bodies through their intricate mazes,” (Phenomena 90) we do indeed find the opportunity to unravel the significance of the motion of Eliot’s characters.

Early in The Phenomena and Order of the Solar System, Nichol writes of the
individual observer reaching into the night sky in an attempt to understand “...the profound laws expressive of the harmony of their arrangements” (20). Many of the spheres in Hayslope are harmonious, and interact with other spheres with harmony. For example, the Poyser family sphere interacts smoothly with the Bede family sphere. Adam, the central figure of the Bede family sphere, as well as a satellite of the larger sphere of Hayslope, moves largely in harmonious motion with all that he encounters. When the harmony is disturbed, however, it is due to actions and motion within a sphere, the perturbation rippling not through space but through human feelings. Nichol refers to perturbation as arising from “mutual action of the planets...” with the effect of disturbing the “...orbits, to alter and vary them” (Phenomena 230). The revelation of Hetty Sorrel’s relationship with Arthur Donnithorne is an excellent example of an action that disturbs and alters the orbits and movements of other objects. Viewed as a satellite of the Poyser sphere, Hetty’s action spreads outward from herself, impacting her immediate family by bringing shame, nearly causing the removal of the Poyser family from the Hayslope sphere, destroying other connections the family enjoyed with other spheres, and significantly impacting the sphere of the Bede family. Adam, long enamored of the idea of marrying Hetty, is shaken and his own orbit alters. The relation of his satellites, his mother and brother, are affected as well, through their concern and affection for him. The harmony that existed has been altered, perhaps irrevocably.

The harmoniousness of characters in Eliot’s novel is also represented by analogies to the settled nature of plants, most particularly through Dinah and Hetty. In refusing Seth Bede’s proposal of marriage, Dinah tells him that she is “not free to leave Snowfield, where I was first planted, and have grown deep into it, like the small grass on the hill-top” (Bede 81).
Dinah’s assertion that she is rooted in Snowfield may also be viewed as though she is in a fixed orbit, distant enough that the gravitation of his affection is not strong enough to move her. The energies and forces in the universe are, after all, of varying intensities. Conversely, Hetty is described by the narrator as being like “some plants that have hardly any roots: you may tear them from their native nook of rock or wall…and they blossom none the worse” (Bede 140). Continuing the astronomical analogy, Hetty then is a satellite of insignificant mass, easily captured by the forces of a more powerful force: the desire for Arthur.

In describing the observations of William Herschel and his attempt to understand the nature and makeup of the Milky Way (which was then thought to be the whole of the universe), Nichol informs his reader that Herschel came upon a surprising fact: there were gaps in the night sky, even when viewed with a telescope. Nichol refers to these gaps as “absolute vacuities…breaks in the regular progression of stars” (Views 21). What this suggests is a lack of uniformity in the distribution of stellar objects, an idea Eliot may have appreciated in a human nature centered realm, inspiring the realism of the sort that recognizes that character is not fixed. The growth and development of characters in Adam Bede suggests that Eliot was not immune to the idea and was in fact quite sophisticated in her understanding of human nature changing over time. While some scholars have seen this in her later works and in relation to Darwin, the lack of uniformity as presented by Nichol suggests that the concept was part of Eliot’s consciousness earlier in her career.

As an author, Eliot had an advantage that astronomers such as Herschel and Nichol did not. In Views of the Architecture of the Heavens, Nichol writes of the stars in the constellation Perseus: “…a group whose internal mechanism, although reason can ascertian its existence, imagination altogether fails to conceive” (115). As the imaginative creator of
her own system of beings and their relations to each other, Eliot had what Herschel did not:
control over those mechanisms and an innate understanding of the internal characteristics.
She did not need to use inference or reason to acknowledge the existence of the systems;
rather, her creation of them may be viewed an act of imaginative implementation of scientific
theory within the realm of human behavior and interaction, which scholars of Darwin’s
influence on Eliot are particularly familiar with.
Chapter VI.

Conclusion

As written by an author inspired by the natural world, beyond astronomical connections, George Eliot’s *Adam Bede* is bursting with natural metaphor, and rich, dramatic depictions of the natural world. To borrow a phrase from Thomas Rymer Jones, Eliot as an author of fiction may be viewed as a “cultivator of Natural History” (*Animal Kingdom* vii), an author who viewed her characters with a scientist’s interest in developing understanding through classification. By replacing the works of God with the near personification of Nature, Eliot creates something distinctly devoted to the natural world. One sees in Eliot’s works suggestions of geologic history — stratifications of life and personal history creating an individual’s nature — microscopic marine life plain and ugly, but beautiful in its own distinct way, and even the realm of plant biology. In brief yet powerful moments, the reader assumes Eliot’s distinct view of human life as being firmly a part of the natural world around it. In *Adam Bede* one sees a world of complex living systems that Eliot has created and which she seeks to explore — and guide the reader — through observation and analysis. The work examined in the thesis shows Eliot’s extraordinary use of the natural world as a force and presence, a stunning metaphor to connect the reader and characters to the world around them, while reinforcing the idea that Eliot was, in essence, a creator, cultivator, and observer of unique, contained worlds, her own vivariums of fictional life.

Throughout her adult life, George Eliot maintained an interest in astronomy; in a letter dated 27 May, 1854 - some twelve years after first reading Nichol — she noted “in this
world all things are approximations, and in the system of the Dog-star too, very probably, in spite of Dr. Whewell” (*Letters*, Vol. II, 158). The star to which Eliot refers is today more commonly known as Sirius, the brightest star in the night sky and part of the constellation Canis Major. As for Dr. Whewell, Eliot was almost certainly referring to William Whewell, whose works on astronomy addressed that science in combination with natural theology. By then a firm believer in truth, rather than religion, Eliot was not impressed. Eliot was clearly at home with astronomical metaphor, suggesting that her knowledge and interest had not waned since her reading of Nichol and lending support to the idea that astronomy played a role in her views of human life.

In Eliot’s time, the Milky Way was considered to be the entire known universe and it was not, in fact, until the early twentieth century that this was idea was disproven. Therefore, to study the sky in Eliot’s time was to study the entirety of the universe, of which the Earth was but a small fragment. For intellectuals such as Nichol and Eliot, who had broken free from traditional Christian beliefs and behaviors, the allure of studying something as grand and pure as the universe was likely quite strong and stirring. In taking on the role of author of fiction, Eliot became a creator and carefully fashioned her own miniature universe: that of the world of *Adam Bede*. While many readers may have liked to see and experience the hand of God, Eliot replaced God with science and brought Nichol’s extra-solar work to Earth. There, every hill, every milch cow, every breeze and every character was wrought by her and behaved as she intended. This world was an ideal landscape to stretch out with her imagination and combine the realism of the natural world as she intimately knew it with the vaster and more objective world of the heavens.

Today, a great deal of emphasis is placed on the influence of Charles Darwin’s work,
On the Origin of Species. As noted in the introduction to this thesis, many scholars have found ample correlations between Darwin’s work and Eliot’s 1871 novel, Middlemarch. Indeed, such study is captivating, with Middlemarch providing fertile ground with allusions to nature, woven webs, tangled lives and ideas, drops of water viewed under a lens, and so much more. There is so much allusion to the complexity of nature that it is clear why one would wish to make Middlemarch their primary focus in studying Eliot. The revolution of Darwin in relation to Eliot is significant, and many scholars touch upon Darwin’s writings on the topics of nurturing, the struggle for existence, and even variation under domestication when looking at Middlemarch, finding social correlations in Eliot’s creation. In his extensive work, Darwin and the Novelists, George Levine wrote that Darwin “…can be taken as the figure through whom the full implications of the developing authority of scientific thought began to be felt by nonscientific culture” (1). Darwin’s impact is not to be underestimated and it would be easy to lay all of Eliot’s scientific interest at Darwin’s feet. That, however, would be an overestimation, for it must be clear that Eliot was indeed a voracious reader — an aspect of Eliot’s intellectualism that Joan Bennett describes as “…a powerful intellect and a hunger of the mind…” — and that included works in the natural sciences (9).

When research for this thesis began, under a very general framework of scientific influence on Eliot’s works, early readings on Eliot’s life provided a path which somewhat surprisingly led away from Darwin and farther back into Eliot’s early life. The result was my assertion that there are other scientific works, beyond those of Darwin, which Eliot read and which are worthy of scholarly examination as having an influence on her writings. Reading what Eliot herself read, on topics like geology, anatomy, and plant life, have provided an essential lens with which to view Eliot’s works, particularly the early works before Darwin,
in a new way. While Eliot’s first published works of fiction, *Scenes of Clerical Life* feature allusions to nature, *Adam Bede* shows a growing confidence and the allusions to nature there are more pronounced. In looking at those allusions and by looking closely at Eliot’s interests, interesting correlations appear. In introducing Adam’s education at Bartle Massey’s school, for example, Eliot describes Adam as having “…long ago exhausted the resources of his imagination in trying to think how the bunch of leathery sea-weed had looked and grown in its native element…” (210). A detailed description, but one that is more interesting when one considers that Eliot took a great deal of interest in marine biology and had only recently read a work on British seaweeds, published in 1857. It is clear that her expansive scientific interests influenced her writing; some sciences, such as astronomy, were more fruitful and abundant than others, such as seaweeds, but they all played a role in her fictional worlds, in interrelated layers. In looking for some sense of the truth about Eliot’s influences, more than influence was revealed. Eliot’s works, viewed through the lens of science, show her search for the truth in the world around her: how to reconcile religious belief with rising knowledge, the absorption of the facts offered by science, and man’s place in a larger world, marking her works as uniquely her own and distinct from other contemporary works.

In this analysis, Eliot’s role as narrator plays a complex part. In reading *Adam Bede* within the context of Nichol’s work on astronomy, close attention has been paid to not confuse Eliot the author with the narrator. It cannot be said with certainty that Eliot the author is fully the narrator; regardless, the narrator of *Adam Bede* is an important aspect of the text, for it provides a great deal of observational information, as well as creates a relationship with the reader. Indeed, the narrator’s occasional direct engagement with the
reader creates a strong voice that seeks to impact the reader’s understanding and opinions of the novel’s characters. In creating a friendly, almost conspiratorial relationship with the reader, Eliot’s narrator takes on a role that is as significant as that of any character in the novel. In attempting to shape the reader’s conception of the characters, including those that may exhibit unpleasant behaviors, the narrator is doing more than tell a story: it is acting as spiritual counselor, attempting to lead the reader to see the moral which may be drawn from the novel. This complicates the relationship the narrator has with the reader, for it verges on the intrusive, rather than remaining instructive.

What then, does the reader make of Eliot’s role? As the creator of the world of *Adam Bede*, it is tempting to see much of Eliot herself in the narrator. It is clear from studying Eliot’s life that she was an autodidact with strongly developed and continually developing beliefs, guided by a pursuit of the truth. Truth weaves its way into *Adam Bede*, through deception, omission, and revelation, yet it may also be suggested that Eliot’s narrator becomes intrusive due to Eliot’s passion for the truth. In Eliot’s hands, the narrator becomes a truth-teller, in addition to storyteller, taking on a role of moral mediator, practically pleading with the reader not to think too harshly of the characters at times. By then living unmarried with G.H. Lewes and helping to financially support his wife and children, Eliot by this time knew something of the complexities of truth and the need for a mediator, someone to look at the vast complexities of a person or relationship and judge it for more than mere appearances. By managing the reader’s understanding of the complexities of the characters, the narrator and, by extension the author, may have been attempting to guide the reader’s conclusions about said characters. While this undeniably takes away some agency from the reader, the overall effect, regardless of unknown authorial intention, provides the reader with
as clear an understanding of the inner workings of each character as possible. Eliot’s own observation lens has looked deeply and the narrator is a tool to share those observations with the reader.

While the idea of comparing the worlds of George Eliot to astronomy may at first glance seem cold, perhaps even severe or suggesting a grand remoteness, it should be viewed as quite the opposite. Absorbing the great joys Nichol experienced in studying and teaching astronomy, combined with the evident affection and sympathy Eliot gave her complicated characters creates a deep web that, like the night sky, is bright: not with the cold light of a million suns, but with love, humor, friendship, jealousy, and sorrow. As Eliot writes in *Adam Bede*, “the human soul is a very complex thing” (157). Nichol understood the complexity of the heavens and in reading his works Eliot came to know some of that celestial complexity as well. By viewing her works through this lens, I affirm that Nichol should be considered an important influence on Eliot’s works as well as a symbol of her life-long passion for the natural sciences and a sign of caution to anyone who would attempt to show Eliot’s scientific interests in too narrow a light. Moreover, Eliot should be highly regarded not merely as an exceptional author, capable of great character description and development, but also as pioneer in combining the wonders of the natural world, of scientific research and history, with the state of the human soul.
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