

NON-EUCLIDEAN EYE PROBLEMS IN THE GEOMETRY LESSON OF *FINNEGANS*
WAKE

by

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ABSTRACT

I demonstrate the existence of a correlation between references to physicists and references to eye problems in the geometry lesson in Book II, Chapter 2 of James Joyce's *Finnegans Wake*. Specifically, the sequence of physicists proceeds from Newton to Einstein following a diagram of Euclid's first proposition, and parallels the conflict of the brothers Dolph and Kev as they struggle to understand the diagram and reconcile their duality. In light of the importance of Euclid and Einstein elsewhere in Joyce's work, and the significance of eye problems in Joyce's own life, I argue for a metatextual reading of the geometry lesson, in which Joyce uses eye problems as a metaphor for the difficulty of apprehending both non-Euclidean geometry and the linguistic texture of *Finnegans Wake* itself.

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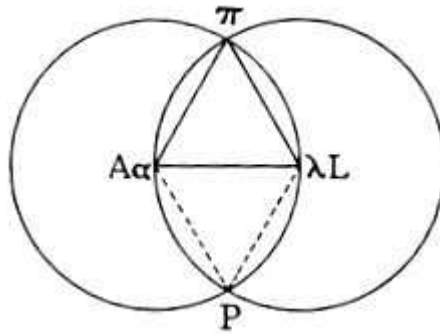


Figure 1 The Euclidean diagram on page 293 of *Finnegans Wake*

Towards the end of Book II, Chapter 2 of *Finnegans Wake*, Dolph teaches his less intellectual brother Kev geometry by constructing the above diagram of Euclid's first proposition, which appears in the text between lines 11 and 12 on page 293. The placement of the diagram is suspect: it interrupts a long and rambling parenthetical aside that signifies Kev's disinterested daydreaming. Rather than place the diagram at the moment when Dolph's explanation of the diagram resumes, or leave the diagram in the margins as in the earliest drafts (*Drafts* 47482a-67), Joyce juxtaposes it with the remark that Kev is gazing out the window "in the lazily eye of his lapis" (293.11). As a result, the phrase appears to introduce the diagram, as if Euclid's first proposition is this lazily eye. The diagram certainly resembles an eye in at least two ways: in the lens shape that the overlapping circles create between them, and in the symbolism of two circles as two eyes with slightly different perspectives. As ocular symbol, however, the geometry problem is also an eye problem: the phrase puns on "lazy eye" and "lapis lazuli," a stone whose blue colour recalls the blueness of Joyce's own perpetually afflicted eyes (McHugh, *Annotations* 293.11). The phrase immediately following the diagram, "Vieus Von DVbLIn," is a

distortion of “views of Dublin,” another sight-themed phrase, but it adds a further layer to the diagram’s symbolism: located between “lapis” and “Vieus,” the diagram becomes a symbol for the *lapis via* or philosopher’s stone (*Annotations* 293.12). That Joyce places these ocular lines behind an occult lens ties the diagram to a long history of geometrical mysticism, one that includes Pythagoras, Bruno, and Yeats (Baricz 236). There is, however, a more direct connection to Pythagoras and Euclid: the Latin *lapis* translates the German *stein* from the name Albert Einstein, a connection that Joyce emphasizes through the word “albut” earlier on the page and a reference to Einstein’s birthplace Ulm a few lines later (293.05, 293.14). The placement of the diagram immediately after the word “lapis” thus contributes at least three layers to the diagram’s meaning: Joyce’s eye problems, the mystical tradition around science, and the evolution of physics away from Euclidean geometry in Einstein’s general theory of relativity. It is typical of Joyce’s method in *Finnegans Wake* to introduce a series of themes or motifs in one densely layered cluster such as this, and then to elaborate the connections between these ideas in a series of puns and juxtapositions over the next several pages, and as I will demonstrate, the geometry lesson contains a series of references to major mathematicians and physicists interconnected with references to various eye problems. In order to interpret this surprising association, I will examine the symbolic places of Einstein, Euclid, and eyesight in *Finnegans Wake*, as well as their place in Joyce’s previous works. I will then provide a reading of the sequence of references to physicists that shows its role as a parallel to the transition of the brothers from a state of duality to one of unity, culminating in a discussion of Joyce’s self-incorporation into this sequence. Finally, I will connect my reading of eye problems and physicists to the theme of

sexual perversity and forbidden sight that dominates the lesson, since Dolph uses the diagram to covertly show his brother an image of their mother's genitals. Ultimately I will argue that the association of eye problems with physics and non-Euclidean geometry between the diagram and the end of the chapter illuminates the method and cosmological double vision of the *Wake*, since both physics and Joyce's text involve confronting a series of symbols whose meanings exceed and elude the abilities of the mind's eye.

CHAPTER 2: THE MOTIFS

Albert Einstein is one of the figures who looms largest in the verbal texture of *Finnegans Wake*, due to at least three factors: his revolutionary role in the history of science, his similarities to Joyce, and the extreme ease with which Joyce can pun on his name. This last point illuminates one of the methodological principles of the language of the *Wake*, which is that, since everything connects to everything else in Joyce's universe, Joyce is willing to follow whatever opportunities language presents him. David Hayman describes Joyce's method of composition as "like running after one's own language" and adds that Joyce's "effort was partly to make language obey *his* rules rather than its own, partly to exploit the givens of language" (148). Thus in any given passage, Joyce has certain motifs in mind and actively seeks to incorporate them into his language, but does not resist when a less relevant reference occurs to him. Since Einstein's name contains the German words for "one" and "stone," Joyce has ample opportunity to allude to him even when Einsteinian themes are not important to a passage. Indeed, the opportunities are so ubiquitous that Adaline Glasheen concludes that "Any 'stone' or 'one stone' or 'a stone' . . . in any language can name Einstein in FW" (83). Furthermore, since Einstein was born in Ulm, and *Ulme* is German for "elm tree," Joyce can turn almost any reference to a tree into a reference to Einstein as well. Inevitably, then, the book contains many references to Einstein that are more opportunistic than thematically relevant. Andrzej Duszenko's analysis of "The Relativity Theory in *Finnegans Wake*" discusses the deep level on which Joyce weaves Einstein into the fabric of his text: the elm and the stone represent the brothers Shem and Shaun, who themselves represent time and space, tying back to Einstein

and to Joyce's "theme of the unity of opposites" (62). As a result, Einstein appears in passages such as the closing paragraph of Book I, even though the emphasis in that passage is on not the relativity theory but the elm-stone geography of Shem and Shaun (215.31–216.05). Then, because the elm and the stone already imply Einstein and spacetime, it is convenient for Joyce to loosely associate the elm with time—"I feel as old as yonder elm"—and the stone with mass or extension in space—"I feel as heavy as yonder stone"—even though the parallel is imperfect. Because Joyce is so open to circumstance in his references to Einstein, the repetition of those references and the juxtaposition of related ones are necessary in order to mark passages wherein Einstein has special significance. For example, the geometry lesson begins with the albut-lapis-Ulm references around the diagram, and ends with the words "Eyeinstye!" and a reference to Einstein's "Noblett's surprize" marked by the substitution of the German "uns" for "us" (305.06, 306.04). In between these two clusters, Joyce references some related physicist or mathematician every few pages, including Newton (293.17), Hamilton (300.27–28), and Poincaré (304.05). These clues, along with Einstein's role in proving that the universe did not follow Euclidean geometry, establish that the references to Einstein in the geometry lesson are not the result of linguistic convenience: they are instead a framing device that establishes one of the passage's major thematic concerns.

As Duszenko shows, the major references to Einstein in the *Wake*—in chapters I.6 and III.1, as well as the geometry lesson in II.2—tend to tie into one of two major themes: the duality and unity of time and space, and the "fall and resurrection or constant renewal of the world" (62). Einstein ties into this latter theme due to his role in disproving Newtonian mechanics, since Joyce associates Newton's discovery of gravity upon seeing an

apple fall with the fall of Man upon eating an apple. This idea appears, for example, following the diagram: Joyce follows the mention of “old Sare Isaac” with the cyclical history of “Dawn gives rise. . . . Eve takes fall” (293.17, 293.20–21). Einstein’s theory of relativity thus marks, symbolically, the overturning of the world and the redemption of Mankind, which is also Tim Finnegan’s resurrection at his wake following his own more literal fall from a ladder. While the specific duality of time and space does not appear in the geometry lesson, the brothers Dolph and Kev are an incarnation of Shem and Shaun, respectively, who represent pairs and oppositions throughout *Finnegans Wake*, consistently embodying the duality of the cosmos, but who also come together to become Tristram, the unification of that duality. In the geometry lesson, their theme of duality and unity culminates when Kev punches Dolph at the climax of the passage. Indeed, I will show that the theme of duality and unity is the most crucial purpose of the references to eye problems, as two eyes struggle to reconcile their perspectives.

The other way in which critics explain Einstein’s relevance in *Finnegans Wake* is to more broadly associate Joyce’s method of writing with relativistic principles, although this approach almost always rests on the assumption that Joyce’s understanding of relativity was superficial. S. B. Purdy, for example, reaches the amusing conclusion that “if we took [*Finnegans Wake*] as the sum of its sources and the profundity of its description of scientific matters, we should be forced to conclude that it has been written by Leopold Bloom” (216). Given Joyce’s necessarily limited understanding of relativity, it would have been easy for him to confuse it with relativism and see Einstein’s work as a de-mechanization of the universe with an emphasis on perspective rather similar to Joyce’s own work. In fact,

Einstein's specific concern was to create a model of the universe that would allow the same laws of physics to apply in all frames of reference (Einstein 45). The theory of general relativity was, in a way, even more thoroughly preoccupied with universality and mechanical consistency than Newtonian mechanics, and therefore a bad fit for a postmodern reading of *Finnegans Wake* as a chaotic deconstruction of narrative.

Nevertheless, as Alan J. Friedman points out, Joyce and Einstein had a lot in common: they both revolutionized their fields in the late teens and early twenties, and they were both "concerned with manipulations of time and space, with the relations between subject and observer, and with the role of language in our understanding of the universe," albeit in virtually incommensurable ways (198). Furthermore, Joyce's understanding of Einstein's theory was irrelevant to his ability to effectively "incorporat[e] into his work those elements that he found useful because they reinforced his own ideas and themes" (Duszenko 62), and Joyce was able to capitalize on the zeitgeist's reaction to relativity by living in an intellectual centre, Paris, during the decade of the most public preoccupation with relativity. Sam Slote thus notes that Joyce's interest in relativity, as well as quantum physics, had "less to do with the specific content of these new theories and more to do with their estranging effects upon conventional wisdom" (176), and the otherwise patronizing Purdy still concludes that "*Finnegans Wake* remains our century's greatest artistic expression of the sense of a changed world science has given us" (216). Joyce's heavy use of Einstein in *Finnegans Wake* is thus primarily representative not of Einstein's specific ideas but of the historical event of their reception.

The aspect of the relativity theory's reception that would have carried the most

personal meaning to Joyce is the theory's demonstration that space is non-Euclidean, meaning that it does not hold to Euclid's fifth postulate and the consequent concept of parallel lines. Euclid's postulate is "That, if a straight line falling on two straight lines make the interior angles on the same side less than two right angles, the two straight lines, if produced indefinitely, meet on that side on which are the angles less than the two right angles" (Euclid 202). In other words, this postulate covertly presents the concept of parallel lines: lines that never meet when extended indefinitely. Though this postulate has always been controversial due to its lack of a strictly logical derivation, it was only in the nineteenth century that mathematicians constructed geometrical systems without the fifth postulate. Non-Euclidean geometry is important to Einstein's work for two reasons: first, he required it to describe space and time under the effects of a gravitational field; second, he showed that through non-Euclidean geometry one could conceive of the universe as both "finite" and "unbounded," allowing for a universe with an average density of mass other than zero or infinity (Einstein 110, 116). The former conclusion led Einstein to predict gravitational lensing, the alteration of the path of light around a sufficiently massive body such as a star, which a number of astronomical expeditions observed in 1919, making Einstein famous (Einstein 131). The latter conclusion enabled later discussions, in the late twenties and early thirties, of the possibility of an "expanding universe," a phrase Joyce uses at 263.26. Again, however, Joyce's actual depth of understanding of these phenomena is less important than what he could do with them as symbols. Specifically, the proof that the universe was non-Euclidean would have had tremendous significance to the Jesuit-educated Joyce, who learned Euclid in school and used Euclidean terms as symbols throughout his work. For example, David Weir argues for the importance of the Euclidean term "*gnomon*"

on the first page of *Dubliners* as, along with its neighbours “*paralysis*” and “*simony*,” one of the “thematic keys” of the work (343), and Joan Parisi Wilcox finds a reference to Euclid’s fifth axiom in the opening question and answer in the “Ithaca” episode of *Ulysses*, as well as references to non-Euclidean geometry in Joyce’s notes for the episode (645). For Joyce, Einstein’s contribution to overturning Newtonian mechanics could only have been of secondary importance compared to his contribution to overturning Euclidean geometry, a victory over tradition in keeping with Joyce’s own modernist aesthetics.

The other relevant motif for my argument, eyesight, has a far less rich critical history, in spite of Joyce’s own eye problems. Joyce suffered his first debilitating attack of Glaucoma in 1917 and, by the time he wrote the first draft of what would become chapter II.2, was recovering from his tenth eye operation in as many years (Ellmann 417, 579). As a result, eyesight as a symbol could have been as personally significant to Joyce as his preoccupation with Dublin and Catholicism. Furthermore, eyesight plays a central and extremely fruitful role in the symbolism of the “Cyclops” episode of *Ulysses*, and throughout his works Joyce habitually returned to and reinterpreted the themes of his earlier works. Nevertheless, the only major discussion of eyesight in *Finnegans Wake* is the eighth chapter of John Bishop’s book *Joyce’s Book of the Dark*, where his emphasis is on a general apprehension of vision in the *Wake* rather than on a reading of any particular passage. Bishop points out the connection between vision and one of *Finnegans Wake*’s most frustrating qualities, its “general referential opacity” due to the fact that, “since so much of the *Wake* is hard to visualize, it is difficult to see it referring to anything at all” (216). Perhaps the single greatest challenge of Joyce’s language is its lack of a unitary

referent for any given word or phrase. If the “lapis” of 293.11 is a lazy eye, Joyce’s blue eyes, the philosopher’s stone, and Einstein all in one, as well as Kev lazily looking out the window as he ignores his geometry lesson, the word cannot possibly conjure any specific visual image in the reader’s mind to capture all of these meanings. Sentences written in these languages are more like a series of polysemic hieroglyphs than a stimulant to the mind’s eye, more like mathematical equations than descriptions. Clive Hart observes that readers are “constantly impelled to shift our attention from the subject-matter seen through the words to the words themselves” such that “surface texture has become all-important” (167), but I would argue that the problem is not simply that the text obscures the subject matter: rather, the text gestures to more subject matter at once than the mind’s eye can apprehend. The language of *Finnegans Wake* thus sees, appropriately enough, a union of opposites: too much signification amounts to the impression of no signification at all. Insofar as eyesight functions as a metatextual symbol for the obscurity of the *Wake*, then, it cannot rely on obstruction. It must rely, instead, on a debilitating overabundance of light, perspective, or detail.

An alternate approach to eyesight in *Finnegans Wake*, and one that has special relevance to the geometry lesson, comes from a short article by John Gordon, who notes that the Euclidean diagram also calls to mind “the standard operation for glaucoma, using a trephine” (96). In such an operation, the surgeon cuts a “triangular flap” which is then “folded back” in order “to drain the viscous waters” from the eye (97). Gordon’s reading interprets the entire geometry lesson as a description of such an operation from the perspective of the patient, including his anesthetic-fuelled reverie, and thus adds a new

layer to the multiplicity of meanings of both the diagram and the following thirteen pages. Gordon traces the metaphor of the patient trying to bring his two eyes back into focus with one another following his surgery to “the efforts of the two eyes/brothers to reach some accommodation of their respective visions, to come to a focus and (300.20–300.28) cohere perceptions from the swarming reality before them” (97). Though Gordon’s description does not suggest a metatextual interpretation in which the experience of the brothers parallels the experience of the reader in encountering the language of the *Wake*, his choice of words is very similar to my claim about the role eyesight must play to function metatextually: to “cohere perceptions from the swarming reality” of the meanings in a sentence in the *Wake* is precisely the difficulty that the reader faces. Joyce is thus able to use the discord and attempted reconciliation of the brothers—the union and opposition they represent—to stand in for the struggle of the reader to apprehend a coherent meaning from the diverse significations of his language. The Euclidean diagram represents a singular circle—perhaps the circular history of Joyce’s universe, or the closed but unbounded space of a relativistic one—seen with a double vision, as two eyes or relativistic frames of reference struggle to coordinate their perceptions. Kev and Dolph look at the world with the double vision of a “lazily eye.”

CHAPTER 3: ANTECEDENTS TO THE MOTIFS

Since eyesight and geometry form, respectively, the central motifs of the “Cyclops” and “Ithaca” episodes of *Ulysses*, Joyce’s engagement with them in *Finnegans Wake* exists in a continuum with those earlier treatments. The contrast between Joyce’s literary innovation and his thematic preoccupation means that his body of work is one in which ideas recur constantly in vastly different forms, but always in conversation with their earlier incarnations, such as when Stephen’s epiphany upon seeing a beautiful girl on a beach in *A Portrait of the Artist as a Young Man* becomes Bloom’s voyeuristic orgasm in the “Nausicaa” episode and then a suspicious incident in HCE’s past that may or may not have occurred in Phoenix Park in *Finnegans Wake*. In the transition from Stephen to Bloom, the incident goes from romantic to comic, in part because of the sexualization of the scene and in part because of Bloom’s age relative to the girl. The transition to HCE leaves behind the beach—though the event remains in a public location—but retains the older man’s desire for a younger girl, this time perhaps his own daughter. In short, the use of a motif in *Ulysses* provides the basis for understanding its development in *Finnegans Wake*, even as the enormously different scopes of these works almost always ensure some mutation in the motif’s meaning.

“Cyclops” and “Ithaca,” along with “Nausicaa” and “Oxen of the Sun,” are the episodes of *Ulysses* most concerned with how linguistic style alters the perception of the episode’s subject matter. Though the effects of literary style are arguably Joyce’s largest preoccupation in that novel, “Cyclops” marks a drastic division between the first eleven episodes, written in a largely uniform style, and the diverse experimentation of the last

seven. Indeed, Michael Groden has shown that the stylistic deviation of the latter half of the novel was not Joyce's original plan and that he initially tried to write "Cyclops" in the novel's normal style (18), which lends the chapter a special place in the development of Joyce's stylistic concerns. The episode recounts every event twice, once in the first-person voice of the anonymous narrator and again in a series of interrupting parodic passages. Susan Bazargan notes that these passages tie into the episode's interest in a court of law, as "Justice depends largely on the maintenance of coherence between divergent viewpoints" (755), which is a very similar point to Gordon's claim about the efforts of Dolph and Kev to unify their perspectives. The "Cyclops" of the title is both the one-eyed Fenian in the episode who is incapable of considering any other perspective than his own and the one-eyed narrator limited to his own perspective on the events of the episode, and this latter and rather obvious pun on "I" ties together the episode's interest in style and perspective to the theme of identity. The formation of a coherent narrative can mean the exclusion of other viewpoints, but such an exclusion allows for a stronger identity; conversely, the inclusion of too many styles and viewpoints results in incoherence and plurality. Joyce illustrates this tension through the stylistic interruptions that provide a second, but equally distorted, perspective on the events of the episode. When Joyce revisits the motif of eyes in the geometry lesson, however, his focus has shifted from the one-eyed to the two-eyed, from the Fenian's lack of perspective to the brothers' irreconcilable double vision of the world. This shift works well with the stylistic differences between *Ulysses* and *Finnegans Wake*: whereas the former is concerned with how different styles distort the same subject matter, *Finnegans Wake* has a single style that presents multiple subject matters simultaneously. The

problem shifts from the limitations of language upon the human mind to the limitations of the human mind on the intelligibility of language.

“Ithaca,” unlike “Cyclops,” maintains a relatively consistent style throughout, one that uses parody to test the limitations of the so-called “objective” style of scientific and philosophical discourse. The episode draws heavily on geometrical and astronomical terms, making it the most explicit antecedent in Joyce’s work to the geometry lesson. Indeed, perspective is relevant to this chapter as well, especially in the way Stephen and Bloom’s observation of Molly in her bedroom window references late nineteenth-century expeditions to observe Venus from various distant points on the Earth (Fleishman 380). After all, much scientific language seeks to use technical vocabulary and passive voice constructions in order to eliminate the perception that it is written from any given perspective, even as it depends on correlating multiple observations. More important, however, is Joyce’s use of scientific language to engage with the theme of error. For example, Michael Livingston finds so many errors in “Ithaca” that he concludes that they cannot all be Joyce’s mistakes, that Joyce “has a purpose for introducing them into ‘Ithaca’” (447). This purpose, he argues, is to show the necessary accumulation of uncertainty in the most objective style, the style that attempts to eschew style’s necessary capacity for distortion. As a result of these errors, “no answer can fully satisfy the question, since no question or answer can adequately represent reality. Uncertainties are layered upon uncertainties, and even the barest, coldest of facts are subject to question” (450). As with the parodies in “Cyclops,” then, the emphasis of Joyce’s use of scientific language is on the inevitable manner in which language distorts the world it represents. In *Finnegans Wake*, however, Joyce has no singular world to represent, and so his language, as bizarre and

particular as its style might be, has no referent to misrepresent. Again, there is an inversion: no longer a world distorted by the contingencies of language, but a language distorted by the over-saturation of significance in the world. Science becomes a contributor to that over-saturation, a source of symbolism and vocabulary that enriches the already overwhelming interconnection of ideas and ties into mystical and literary traditions. That said, Joyce's use of a myriad of scientific and technical vocabulary in "Ithaca" shows a similar mindset, a celebration of the sheer diversity of language and the contribution of scientific ideas to the richness of experience. I don't want to suggest that *Finnegans Wake* represents a complete transformation of the concerns of *Ulysses*, but that the inversion of Joyce's concerns with the relationship between language and the world represents a logical next step following his experiments in his "usylesly unreadable Blue Book of Eccles" (FW 179.26-27).

CHAPTER 4: ACCRETION AND CORRELATION

So far I have discussed what roles the motifs of eyesight and non-Euclidean geometry play in Joyce's work more generally, but now I will analyze the results of their connection in the geometry lesson. Joyce shows the thematic correlation of the motifs of non-Euclidean geometry and eye problems through repeated and varied juxtaposition: a reference to a figure from the evolution of physics from Newton to Einstein almost always appears only a few lines away from a reference to some kind of eye problem, and vice versa. However, Joyce's manuscripts point to a gradual accretion of these connections. In his initial drafts from the summer of 1926, Joyce includes the diagram and many of the references to eye problems, adding "the lazily eye of his lapis" in September (*Drafts* 47478-10). However, in keeping with Joyce's accretive process, "lapis" may not yet indicate Einstein, since "Ulm" is still missing and since, even in the absence of this clue, "lapis" already has enough in the way of significance to justify its inclusion. In the second main stage of revision, when Joyce was preparing the majority of II.2 for publication in *transition* in January 1928, references to Newton and Hamilton appear, indicating that Joyce had decided to incorporate references to classical mechanics (*Drafts* 47478-28). Then, in 1934, Joyce added the last few pages of the chapter, from 304.5 to the end, which include references to the non-Euclidean Poincaré and Einstein (*Drafts* 47478-136, 47478-175). Finally, perhaps to tie the geometry lesson together, Joyce added the reference to Ulm at the beginning in 1937 (*Drafts* 47478-102). This process of addition, along with a number of other small changes that accompany them, suggest that Joyce initially associated the Euclidean diagram primarily with Euclid himself, then with Euclidean science, and only

finally with non-Euclidean physics. However, while eye problems were a prominent motif from the beginning, the development of the chapter shows a gradual interlacing of that motif with the physicists that increases as Joyce turns to the non-Euclidean: Einstein and Poincaré receive the most overt correlation with eye problems, with “Eyeinstye” the pun that most directly works the eye problem into the physicist’s name (305.06). The chapter’s composition shows Joyce discovering new meanings in his own words, such as when “lapis” becomes a sign for Einstein in conjunction with “Ulm,” and this discovery of new meanings demonstrates the way in which Joyce let language lead him to its own plurality of meaning. As much as *Finnegans Wake* is an overdetermined demonstration of Joyce’s mastery of language, it is also an exposé of the largely hidden amount of meaning already there: Joyce perverts language in order to reveal what is under its skirts.

In the final text of the book, the first in the series of allusions to physicists following the diagram is “old Sare Isaac” Newton with his “universal of specious arismystic” (293.17–18). Though the spelling of “Sare” recalls Sarah, the mother of the Biblical Isaac, it also allows for a typically Wakean distortion of “sore eye” along with the first syllable of “Isaac.” Indeed, the following “s” allows for either “eye” or “eyes,” or alternatively “I” or “I’s,” indicating that the eye motif signifies the ambiguous duality of the brothers and their unstable identities as separate but seeking to unite. The phrase “universal of specious arismystic” refers to Newton’s term for algebra, the “universal arithmetic” (*Annotations* 293.17–18), but also according to Federico Sabatini gestures to “Aristotle (and so philosophy), art, mysticism” (4). Newton’s preoccupation with alchemy and other mystical traditions was intertwined with his scientific pursuits, which fits with Joyce’s use of the

Euclidean diagram to reference geometrical mysticism: the history of science is intertwined with the history of mysticism and philosophy, since they are all attempts to know the universe. Furthermore, the plurality of meanings that a symbol can acquire through science and mysticism exemplifies Joyce's interest in the way language comes to contain too many meanings for the mind to apprehend. The reference to Newton has Dolph in the midst of explaining his diagram, and he says that they will be "heaving" Newton "unsaid"—leaving him aside (293.16, 293.18; *Annotations* 293.16–18). The reference to leaving Newton aside is ambiguous, since it could entail moving beyond his ideas, but the context suggests the opposite: a return to the oldest and most traditional geometrical ideas. The other meanings of "Isaac" here both gesture to traditions: the brothers Jacob and Esau competing to be Isaac's heir in Genesis and the reference to Isaac Todhunter's edition of Euclid in the footnote (*Annotations* 293.L, 293.F2). To leave Isaac aside is both to conquer the father, Isaac, and to return to the source, Euclid.

The next reference to Newton, a few pages later, has the word "lippia"—a Latin term for watery eyes (*Annotations* 297.25)—followed a few lines later by a mention of "the constant of fluxion" (297.25, 297.29). This latter phrase references Newtonian calculus, the "Doctrine of Fluxions," as well as implying that eye problems are a "constant affliction" (*Annotations* 297.29). It also creates a typically Joycean opposition between "constant" and "flux." Watery eyes are another potential cause of blurred or even double vision, in keeping with the doubled nature of the circles in the diagram and the brothers it represents, and the duality of constancy and flux reinforces this idea. Joyce's other reference to fluxions, two pages later, continues the theme of duality in the word "refluction," suggesting the

unity and opposition of a reflected image (299.18). This pun comes in the middle of Dolph admonishing Kev for failing to see the hidden sexual meaning in the diagram: “But you're holy mooxed and gaping up the wrong palce as if you was seeheeing the gheist that stays forenenst. . . . You must lap wandret down the bluishing refluction below” (299.13–18). Though “gaping up the wrong palce” does not refer to an eye problem, it does refer to a failure of visual interpretation, this time a failure to see an alternative perspective in reflection. Both “refluction” and “forenenst,” which is an Anglo-Irish term for “opposite” (*Annotations* 299.15), suggest that Kev cannot see Dolph’s opposite perspective, which is the lower triangle reflected “wandret”—Danish *vandret*, “horizontally” (*Annotations* 299.17), but also a pun on “wandering eye,” another term for lazy eye—in the horizontal line in the diagram. The word “bluishing” further involves the duality of the brothers through the blue of Joyce’s eyes, and thus a symbol of the artistic brother Dolph, and the red of blood, a symbol of the more combative brother Kev. In fact, this blue-blood fusion appears again during the brother’s reconciliation at the end of the chapter, where a footnote mentions “A bluedye sacrifice” (305.F1), both blue-eyed and bloody. Thus both of Joyce’s references to Newton’s fluxions accompany references to distorted vision, opposites, and the brothers’ duality. In both cases, their inability to see the same perspective is described in terms of affliction or error.

Between the two references to fluxion, Joyce includes a passage more densely layered with mathematical vocabulary than any other in the *Wake*. It begins with “Quef!” and ends with “Qued?” (298.05, 299.03), which as Q.E.F. and Q.E.D. are the terms that follow, respectively, problems and theorems in Latin editions of Euclid (*Annotations* 298.05,

299.03). Between these typical framing words, which are complete with exclamation and question mark inversion, Joyce presents something resembling a mathematical theorem which includes the phrase, “hence shall the vectorious readyeyes of evertwo circumflicksrent searchers never film in the elipsities of their gyribouts those fickers which are returnally reproductive of themselves” (298.14–18). Though this passage is dense, it refers to ready eyes as a radius and circles as searchers (*Annotations* 298.14–15), and their inability to “film” or see the Viconian eternal return or the Yeatsian gyres of history, two models of circular history in keeping with the *Wake*’s own structure. The failure of these eyes is because they are “evertwo,” like the brothers who search for the meaning of the diagram. This proposition is the alternative to a previous proposition that “thence must any whatyoulike in the power of empthood be either greater **THAN** or less **THAN** the uniteate we have in one” (298.11–14), or that any number to the power of zero must be more or less than one (*Annotations* 298.11–14). Joyce here contradicts actual mathematics, in which any number to the power of zero is always exactly one: in the mathematics of the *Wake*, however, unity is almost impossible to achieve, and the result of any operation that would equal one instead gives opposites such as the typographical reflection of the two “than”s.

Once Dolph succeeds in revealing the diagram’s sexual meaning to Kev, the denser brother becomes morally outraged. In his rant defaming Dolph’s character, he accuses his brother of “ownconsciously grafficking with his sinister cyclopes after trigamies and spirals’ wobbles pursuing their rovinghamilton selves” (300.25–28). This passage names William Rowan Hamilton as a roving eye, and while roving eye is a moral problem rather than a medical one, the Cyclopes gesture to optical limitations. Specifically, Kev accuses Dolph of

being limited to his own perspective, just as Dolph earlier accused Kev: the words “ownconsciously” and “selves” suggest solipsism, and the “sinister cyclopes”—left-handed one-eyed monsters—suggest a one-sided viewpoint. This passage also returns to the theme of the mystical traditions intertwined with geometry. McHugh points out that “ownconsciously grafficking”—unconscious graffiti—is a reference to automatic writing, the source of Yeats’s gyre-shaped revelations in *A Vision* (*Sigla* 72). Such gyres are conical, circles or spirals from one angle and “trigamies” or triangles from another, invoking the Euclidean diagram’s two shapes as well as the sense that ideas appear differently from different perspectives. Between them, Dolph and Kev have both perspectives, but as the tension mounts between the brothers they are too divided to bring those perspectives together. Dolph’s sinister left eye and Kev’s morally right eye are still out of focus with one another.

Kev punches Dolph. The standard interpretation is that he punches him in the jaw, but Joseph Campbell and Henry Morton Robinson take the marginal note “WITH EBONISER” to mean that Dolph “now has a beautiful black eye” (304.R, Campbell 190). In any case, Dolph’s reaction suggests optical consequences to the assault: “Thanks eversore much, Pointcarried! I can’t say if it’s the weight you strike me to the quick or that red mass I was looking at but at the present momentum, potential as I am, I’m seeing rayingbogeys rings round me” (304.05–09). Once again, Joyce juxtaposes a figure in the history of physics from Euclidean to non-Euclidean space, Henri Poincaré, with a reference to eye trouble, in this case the unusually visual pun “eversore.” The resemblance between a v and a y allows this word to read “eyesore.” Indeed, the use of the resemblance between letters as a method of adding meaning has its roots in Joyce’s own eye troubles: Roy K. Gottfried

argues that even when working on *Ulysses* Joyce began to employ the way that “letters, when stared at, have deceptively similar shapes, with only the smallest variations in form creating large differences in identity” as a result of his experiences with eye charts (27). Just as any word or symbol always has more meanings than the mind can take in at once, words and symbols always closely resemble and call to mind other words and symbols, creating a potentially infinite series of variations on and connections between ideas. Dolph’s sore black eye begins to see the rainbow of these variations, as he accepts his brother’s rather violent perspective for the first time. Since Poincaré is the first figure in this sequence to have worked with non-Euclidean geometry, the allusion to him signifies a breakthrough in the brother’s perspectives.

Dolph’s apology and reconciliatory speech proceeds to the climactic ocular-physicist juxtaposition: “Sheepshopp. Bleating Goad, it is the least of things, Eyeinstye! Imagine it, my deep dartry dullard!” (305.05–07). Everything is now shipshape, as the Biblically blessed sheep and damned goats come together: opposites unite. More importantly, Einstein has a stye in his eye. As eye problems go, a stye has the least in common with the sore eyes and double vision of the previous twelve pages, but it works both as an example of the convenience of linguistic association and as a signifier that the questions of duality and perspective tied up with the previous references to eye problems have found resolution in the final figure in the tradition of Euclidean geometry, the one who abandons it in order to start the world-cycle anew. Indeed, given Joyce’s accretive process of composition, it is quite possible that the convenient “eye-in-stye” pun suggested the value of tying physics and eye problems together, and that Joyce then retroactively worked this theme into earlier sections of the text. In any case, Einstein plays a crucial role

in Dolph and Kev's reconciliation, as they conspire "For auld lang salvy steyne" to get their father to buy them a treat from Noblett's sweet shop (305.29, *Annotations* 306.04):

"Heavysciusgardaddy, parent who offers sweetmeats, will gift uns his Noblett's surprize.

With this laudable purpose in loud ability let us be singulfied" (306.03-06). As Gordon notes, "singulfied" finally unites Dolph and Kev into one figure, joining their perspectives as the eye-operation patient gets his two eyes realigned (98). However, because for Joyce no unification is ever without inherent opposition, the word "gulf" appears in the middle of the word to remind the reader that while two eyes may align their perspectives, they are still on opposite sides of the face perceiving slightly different angles. As a marginal note comments, the twins have achieved "*The Twofold Truth and the Conjunctive Appetites of Oppositional Orexes*," a more complete and unified perspective possibly only because of its inherent duality (305.L). This opposition-within-unification inverts the unification-within-opposition of the brother as reflections of one another from throughout the geometry lesson.

The progression from Euclid to Einstein thus represents the progression of the brothers from duality to unity, but it remains unclear in what sense Einstein's overturning of Newtonian mechanics and Euclidean geometry corresponds to unity. McHugh argues that the narrative is of Dolph moving from Euclid and Newton to Poincaré and Einstein by means of Kev's punch, that Kev's violence represents the overturning of Dolph's traditional ideas and that when Dolph sees rainbows he is "enlightened" (74-75). However, given Kev's role as a physically oriented dullard, it rings false that he would stand in for the highly intellectual achievements of Einstein and Poincaré. If Dolph and Kev parallel Jacob

and Esau, the sons of the Biblical Isaac, however, then their reconciliation begins to make sense. I have yet to delve into the sexual significance of the Euclidean diagram, but it represents the womb of the brothers' mother, and the marginal note that accompanies it refers to "*the Interplay of Bones in the Womb*" (293.L). Given that page's other references to the Biblical Isaac, McHugh glosses this note as a reference to Jacob and Esau's struggle in their mother's womb in Genesis 25:22 (*Annotations* 293.L). Dolph, then, is the tricky Jacob who stole his father's blessing, and Kev is the angry and more physical brother. This means that Dolph's connection to Euclid and Newton is the birthright, the connection to a tradition that forms a necessary element of a revolutionary idea such as Einstein's. After all, non-Euclidean geometry still follows four of Euclid's five postulates, and relativity still maintains Newtonian mechanics as a special case. Indeed, Joyce's own radical literary experiments were rooted heavily in ancient myth and history. Thus, while Kev provides the violent breakthrough, Dolph provides the traditional basis upon which to construct a new idea. Their unification brings together the necessary conditions for innovation.

Joyce's awareness of the importance of tradition manifests itself in the only pun that concerns eyes and geometry but does not concern the brothers. A parenthetical aside in Kev's rant at Dolph includes the phrase, "peel your eyes, my gins, and brush your saton hat, me elementator joyclid, son of a Butt!" (302.11-13). The peeling of eyes is both an injunctive to pay attention and a potential reference to the glaucoma operation, and appropriately to such a personal reference, Joyce puns on his own name. Indeed, "joyclid" is a dual pun, since with a hard c it becomes a pun on Euclid and with a soft c the phrase "Joyce's lids." Appropriately, the pun depends on which sound the reader chooses to "c."

The intimacy of this pun also comes from the distortion of “my” to “me:” the elementator is Joyce in both the first and third person. As eyelid, Joyce identifies himself with his eye problems: the difficulties of reconciling multiple perspectives reflects Joyce’s own difficulty managing the sprawling polysemy of his work. As Euclid, Joyce identifies himself with the very tradition whose overturning he celebrates. Both of these identifications suggest that Joyce views *Finnegans Wake* as a sort of self-overcoming, the creation of something beyond his own capacity to understand or control. Sabatini reads the word “elementator” as a combination of Euclid, as author of the *Elements*, with “‘elementary’ (and so unreliable)” as well as “‘emendator’” (9). Joyce’s identification with Euclid is then an identification with a master whose work is nevertheless flawed and out of date; it is also an identification with the capacity to correct those flaws, perhaps as an Einstein providing a more sophisticated vision. Sabatini’s overall reading of “joyclid” is that it “advocates a symbolic combination of literature and science, a combination that is enacted in the very style of *Finnegans Wake*, raising issues of imagination and literature in accord with scientific analysis” (8). However, I have shown that the symbolic combination of literature and science is not an argument in the geometry lesson but a presupposition that allows for its interconnecting layers of meaning. If there is an argument, it is that the classical works and traditional ideas are necessarily in need of emendation by new thinkers, who will themselves become elementary and in need of revision. Sabatini also reaches this conclusion, writing that Joyce “reveals that the new scientific outcome still preserves the nucleus of the theories that generated it” (8). Innovation becomes another incarnation of cyclical history, where perhaps one day writers will speak of non-Joycean wordplay in the same celebratory tones

in which physicists speak of non-Euclidean geometry. As “elementator joyclid,” Joyce gestures to the water in Euclid’s eye without ignoring the stye in his own.

CHAPTER 5: VOYEURISM AND THE COSMOS

Now that I have demonstrated the connection between eyesight and non-Euclidean geometry, I will analyze its role in relation to the other themes of the geometry lesson, especially the sexual and cosmological significance of the diagram. Dolph intends Euclid's first proposition to reveal to his brother the secrets of human reproduction in the form of their mother's womb and genitals. The circles are her hips, the upper triangle is her womb, and the lower triangle is her red pubic hair; point π is her navel and point P her genitals. Joyce conveys this simply at first, by naming the points of the triangles ALP—the mother's initials—and their Greek equivalents, $\alpha\lambda\pi$, but he fills the ensuing pages with a large number of puns to convey Dolph's hidden meanings as he constructs the triangles. For example, he refers to the diagram as "Fig., the forest" (294.03), which combines "Figure, the first" with "fig," which McHugh annotates as slang for "cunt," and a reference to the forest of pubic hair (*Annotations* 294.03). Dolph goes on to explain the points of intersection between the two circles in terms of urination, as "tew tricklesome poinds" that Kev recognizes as "The doubleviewed seeds," W.C. or water-closet (295.30, 296.01; *Annotations* 296.1). This latter term also recalls the theme of double vision, positioning Dolph and Kev as the reflected points in addition to their roles as the out-of-focus circles. When the diagram is complete, Dolph proclaims, "I'll make you to see figuratleavely the whome of your eternal geomater" (296.30–297.01), lifting back Eve's fig leaves to reveal their eternal earth-mother, as well as "the *whole* of your 'eternal' geometry" (Solomon 112). Joyce makes the mystery of geometry synonymous with the mystery of sexuality, which is appropriate given that the earth-mother is the origin of the cosmos. Furthermore, Joyce

associates the mystery of sex with two mythical symbols for wisdom by means of the shape of his diagram when he writes that “if you flung her headdress on her from under her highlows you’d wheeze whyse Salmonson set his seel on a hexengown” (297.01-04). This associates “the wisdom of Solomon” and “that conferred upon Finn when he ate the Salmon of Wisdom, for which the anglers (geometricians) seem to be fishing” (*Sigla* 69-71). This association works because, should the two equilateral triangles overlap and the two circles become one, they will form the star-shaped Seal of Solomon, and because the lens-shape formed by the two circles is the *Vesica Piscis* or “fish’s bladder,” a mystical symbol associated, in medieval architecture, with the womb and the evil eye (*Sigla* 68). In other words, Joyce connects the simple geometrical figure of Euclid’s first proposition with two other geometrical symbols, and finds that they both signify wisdom. Joyce also draws on the importance of sight in the apprehension of geometry’s secret wisdom, since Dolph promises to make Kev “see” the womb and to “wheeze whyse,” or “see why,” Solomon set his seal on a hexagon. The brothers are playing peeping Toms insofar as they are seeing a forbidden sexual image, and this peeping is the same act as that in which mystical geometers see the secrets of the universe. At the same time, the reader knows that these geometrical revelations are only Euclidean, and so the peeping Toms have yet to see the reality behind the crude diagram.

In addition to their mother’s genitals, Dolph uses his diagram to reveal the world in a more literal sense. Since the mother, Anna Livia Plurabelle, is also the river Liffey that flows out into Dublin Bay, the diagram that reveals her triangular sexuality also describes the river’s delta, becoming a map of the bay and its various islands, such as Lambay and

Mud Island (*Annotations* 294.04)—“Lambday” and “Modder ilond” in the text (294.04). The brothers thus fulfill the literal meaning of *geometry*, measuring the Earth, and see their city from a cosmic perspective. The diagram forms another map, a “vertical” one in contrast to the “horizontal” geographical one, in which the upper triangle is heaven and the lower hell, with the Earth on the line of reflection (*Sigla* 69). This cosmic map, which serves as yet another mystical geometrical diagram for the operations of the universe, also divides “the double nature of the woman: mother and temptress,” with the womb associated with heaven and the genitals with hell, “a dark, shadowy reminder of Eve’s fall” (Solomon 106). Indeed, reminders of the fall of Eve pepper the text, ranging from the direct—“Eve takes fall” (293.21)—to the extremely subtle: in the phrase “lens your dappled yeye here, mine’s presbyoperian,” Eve’s apple, which is also Newton’s apple, rests between the two d’s that represent the upper and lower deltas of the diagram, signifying the moment of transition between paradise and original sin (293.23–294.01). This phrase also puns on the lens shape of the *Vesica Piscis* and on double vision, as well as presbyopia or long-sightedness, which connects the passage to the general motif of eye problems (*Annotations* 294.01). Indeed, insofar as the apple is both Eve’s and Newton’s, it moves in two directions: the apple that caused Eve to fall from grace, and the apple that, in falling, connected Newton’s thoughts about the earth and the heavens. The diagram, then, represents Anna Livia Plurabelle symbolically on two levels, in addition to being a literal drawing of her lower abdomen: as map of Dublin Bay, it represents Anna Livia’s place in the world, and as map of the cosmos, it represents the role of woman in history. Since Anna Livia is the everywoman of *Finnegans Wake*, the diagram is a double revelation of the woman as cosmos and the cosmos

as woman. Finally, as Solomon observes, Dolph assigns himself and Kev opposite places in this cosmos: Kev takes the upper point and becomes “the heavenly Mick (the militant archangel, Michael)” while Dolph claims the lower point for himself, “the devilish Nick” (107). In doing so, Dolph tricks Kev into being Isaac’s second-born after all, since Dolph is closer to the birth canal.

Because of the illicit sexual nature of the diagram’s most straightforward manifestation of woman, Joyce associates all attempts at knowing the cosmos through mystical symbols with forbidden acts of sight such as peeping. Since science is simply a much more successful form of mysticism in these terms, efforts from Newton’s laws to Einstein’s relativity all fall under the category of illicit knowledge, sights of the universe’s hidden secrets snatched through a keyhole. In fact, the object best suited for both peeping and observing the cosmos is the telescope, which Joyce references a few times in II.2. For instance, earlier in the chapter, a marginal note quips, “*Two makes a wing at the macroscope telluspeep*” (275.L). This pun inverts the microscope—micro to macro—and the telescope—the Latin *tellus*, meaning “Earth” (*Annotations* 275), suggests a telescope that looks in the wrong direction. It also directly ties observing the cosmos to peeping. Michael H. Begnal suggests that this marginal note also prefigures the dual perspectives of the brothers: “the twins are trying to see from near and from afar at the same time. The essential statement is that if we or they will only look in a new way, ‘peep,’ something important will be revealed, something will ‘tellus’ what we want to know” (22). In other words, for the brothers to understand the world, they need to join their opposite perspectives into a new way of seeing, one that has something of an illicit nature. The other reference to telescopes in the

chapter comes in a brief parody of a passage of Yeats's *A Vision*: "When I'm dreaming back like that I begins to see we're only all telescopes" (295.10-12). Critics tend to interpret this passage as a reference to the telescoping nature of Joyce's work, wherein any character "is liable to be seen at any given moments as small as a grain of sand or as enormous as the universe—increasing and decreasing in either spatial or sound volume according to the point of observation determined by a whimsical creator" (Solomon 111). Anna Livia Plurabelle can be a mother, Eve, the river Liffey, or the boundary between heaven and hell, as suits Joyce; similarly, Dolph and Kev can be two boys, the duality of mankind, the dimensions of time and space, or a pair of eyeballs after an operation. The language and symbolism of *Finnegans Wake*, Solomon argues, has no sense of scale, no boundary between the cosmos and Dublin, all of world history and an evening spent on homework. Just as telescopes and astronomical calculations make distant stars seem close and manageable, the over-determination of meaning in Joyce's writing allows its readers access to grand cosmic principles by means of quotidian squabbles. By describing such violations of scale in terms of peeping, Joyce acknowledges the inherent perversity of trying to see the cosmos.

The telescopes with which scientists peep at the universe are a particularly apt choice of symbol in light of the chapter's interest in Newton and Einstein: Newtonian mechanics and relativity both predicted the movement of astronomical bodies, and had their predictions confirmed through the use of telescopes. However, the telescope is not the most powerful connection between their theories and eyesight. Euclid and Newton each wrote foundational works in the field of optics, and Einstein showed that space was non-Euclidean in part because gravity alters the path of light, causing it to travel in a

“strayedline” (294.02–03). All three major figures in the geometry lesson’s history of physics are thus major figures in the scientific understanding of light itself. Indeed, Newton’s discovery that white light is in fact composed of a spectrum of colours puts a curious spin on Dolph’s vision of rainbows after being punched: just as Joyce references non-Euclidean geometry by means of Poincaré, he also references a specifically Newtonian breakthrough. Then again, it is a breakthrough that Einstein’s work does nothing to undermine, and Joyce may even reference Einstein’s prediction of the redshift that occurs with light in a gravitational field when he has Dolph refer to “that red mass I was looking at” and the dominance of the colour red in the geometry lesson as the colour of Anna Livia’s pubic hair (304.07). Furthermore, the rainbow appears as a symbol throughout *Finnegans Wake*, and Bishop suggests that it too connects to Joyce’s eye troubles: the eye’s iris is named for the Greek *iris*, rainbow, and “as the iritically afflicted Joyce would well have known and as passages everywhere in the *Wake* suggest, these ‘iritic colors’ largely appear beneath the ‘iris’ of vision-capable eyes” (230). That the rainbow as a Newtonian discovery is slightly out of step with the non-Euclidean moment in the text is not as important as its strong thematic resonance with Joyce’s own eye problems. Furthermore, white light being composed of many colours suits Joyce’s preoccupation with the multiplicity of meanings in any given word or symbol: in seeing rainbows, Dolph manages for a moment to see all of the possible meanings at once.

CHAPTER 6: CONCLUSION

This breakthrough—the apprehension of an expanding series of meanings in a single word—is crucial to the very language of *Finnegans Wake*. Joyce’s interest in mystical systems that utilize geometrical symbols stems from his interest in the numerous meanings inherent in any symbol: a few circles and triangles are meant to convey the complexity of the cosmos in their simplistic structure, but because of the simplicity the various mystical diagrams begin to recall one another, proliferating their meanings limitlessly. Joyce’s distorted language capitalizes on the limitless series of connections and resemblances possible between words, bringing to the forefront a polysemy already present in language, and as a result of this experiment no word or phrase in *Finnegans Wake* can conjure a stable, singular image in the mind’s eye. The experience of reading the *Wake* is one of a confrontation with an overwhelming wealth of signification that the reader knows is there but cannot hold onto, and so most *Wake* scholarship, including this very paper, functions by enumerating and parse out in sequence what the mind cannot apprehend all at once. Indeed, it is in this that Joyce’s project most resembles Einstein’s relativity: one of the difficulties of a four-dimensional, non-Euclidean spacetime geometry is that it is impossible to imagine or visualize in any meaningful way, and so it must be described using complex symbols. Scientists can thus understand, describe, and make predictions according to this geometry, but they cannot hold it in their minds. Thus Einstein’s universe and Joyce’s both show the limitations of the mind’s eye. In the geometry lesson, then, Joyce associates eye problems with the history of physics not because everyone before Einstein saw the world imperfectly, but because physics has progressed to be more and more difficult to see.

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