Geometry and Topography in James Joyce's *Ulysses* and *Finnegans Wake*

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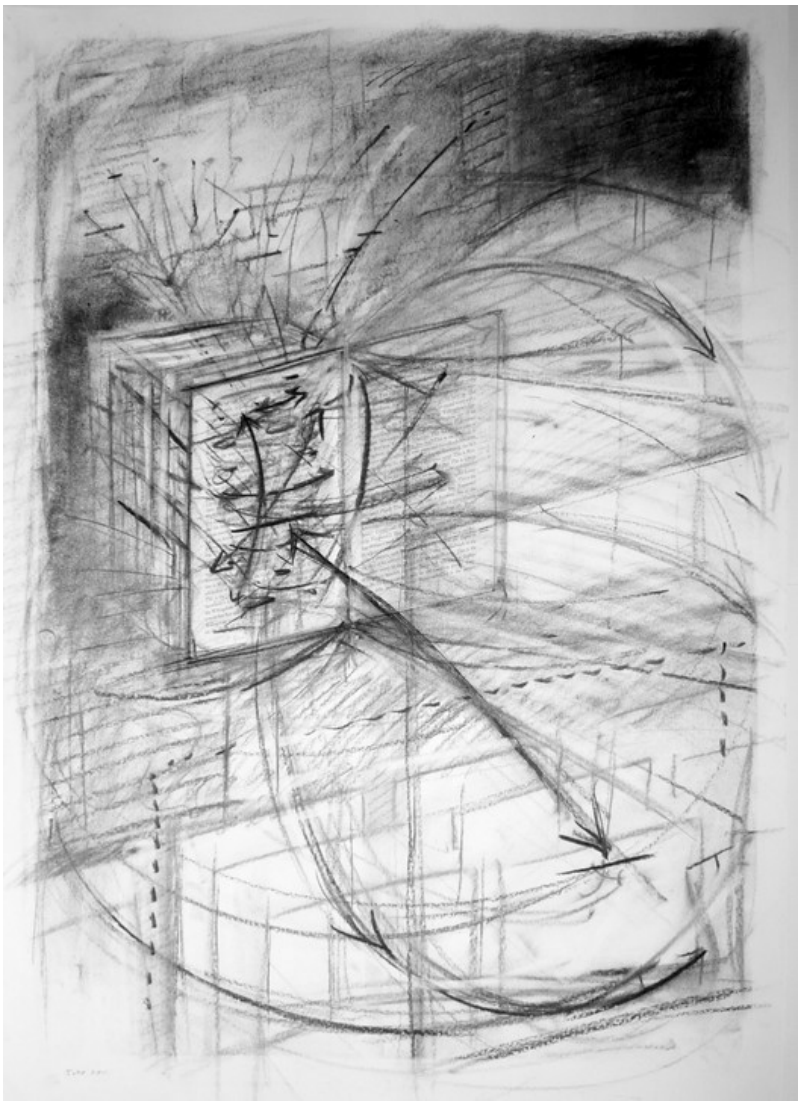

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Abstract

Following the development of non-Euclidean geometries from the mid-nineteenth century onwards, Euclid's system had come to be re-conceived as a language for describing reality rather than a set of transcendental laws. As Henri Poincaré famously put it, '[i]f several geometries are possible, is it certain that our geometry [...] is true?'. By examining Joyce's linguistic play and conceptual engagement with ground-breaking geometric constructs in *Ulysses* and *Finnegans Wake*, this thesis explores how his topographical writing of place encapsulates a common crisis between geometric and linguistic modes of representation within the context of modernity. More specifically, it investigates how Joyce presents Euclidean geometry and its topographical applications as languages, rather than ideally objective systems, for describing visual reality; and how, conversely, he employs language figuratively to emulate the systems by which the world is commonly visualised. With reference to his early readings of Giordano Bruno, Henri Poincaré and other critics of the Euclidean tradition, it investigates how Joyce's obsession with measuring and mapping space throughout his works enters into his more developed reflections on the codification of visual signs in *Finnegans Wake.* In particular, this thesis sheds new light on Joyce's developing fascination with the 'geometry of language' practised by Bruno, whose massive influence on Joyce is often assumed to exist in Joyce studies yet is rarely explored in any great detail.

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Declaration

I declare that, except where explicit reference is made to the contribution of others, this thesis is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.

Signature:.....

Date: ….....

Abbreviations

D James Joyce, *Dubliners* (1914) (Oxford: Oxford University Press, 2000)

P James Joyce, *A Portrait of the Artist as a Young Man* (1916) (Oxford: Oxford University Press, 2008)

U James Joyce, *Ulysses* (1922), ed. by Hans Walter Gabler (London: The Bodley Head, 1986)

FW James Joyce, *Finnegans Wake* (1939), ed. by Robbert-Jan Henkes, Erik Bindervoet & Finn Fordham (Oxford: Oxford University Press, 2012)

Introduction

> *Geometry is the means, created by ourselves, whereby we perceive the external world and express the world within us. […] It is also the material basis on which we build those symbols which represent to us perfection and the divine.*
>
> — Le Corbusier, *The City of Tomorrow and its Planning*[1]

Geometries shape the way we read, represent and describe the visual world. Galileo went so far as to argue that the universe is a 'grand book […] composed in the language of mathematics, and its characters are triangles, circles, and other geometrical figures'.[2] '[T]he mathematical language' to which Galileo refers is, of course, Euclidean geometry, whose laws were widely considered to constitute the original 'language' of the universe within Enlightenment thought. By applying the ideal objects, or 'symbols', of Euclid's *Elements*—points, lines, planes, solids—we are able to measure (*meter*) the Earth (*geo*), *graph* (write of or represent) its *topoi* and map the contents of the wider visual universe in ideally objective terms. But if the universe is 'a great book' then it is one which allows multiple possible readings. Assertions of Euclidean geometry as a transcendental and pre-historic system such as Galileo's proved to be fallacious following the development of universally coherent non-Euclidean geometries by János Bolyai, Bernhard Riemann, Nikolai Lobachevsky and Henri Poincaré in the nineteenth and twentieth centuries. As Poincaré puts it in *Science and Hypothesis*, '[i]f several geometries are possible, […] is it certain that our geometry is the one that is true?'.[3] What is certain is that Euclid's system has become so ingrained within traditional conceptions of objective visual reality that this very ideal may as well exist in a 'book' which Euclid and his disciples have 'written'. Like the elements of language, the signs of Euclid's *Elements* formalise how we think and communicate, and they have become entrenched within our understanding of abstract as well as concrete spaces. As we shall see, Euclidean (and, more recently, non-Euclidean) geometric objects have come to inform a range of critical understandings of narrative form

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1 Le Corbusier, *The City of Tomorrow and its Planning* (1929), trans. by Frederick Etchells (Mineola, NY: Dover, 1987), xxi.

2 Galileo Galilei, 'The Assayer' (1623), trans. by Stillman Drake, *Discoveries and Opinions of Galileo*, ed. by Stillman Drake (New York, NY: Anchor Books, 1957), 229-280, 237-8.

3 Henri Poincaré, *Science and Hypothesis*, trans. by W. J. Greenstreet (Mineola, NY: Dover, 1952), 48.

and textual space in modernist literature; which is reflective of a perceived geometrisation within modernist art and discourse itself. Le Corbusier explores this notion in *The City of Tomorrow and its Planning*, arguing that:

> Machinery is the result of geometry. The age in which we live is therefore essentially a geometrical one; all its ideas are orientated in the direction of geometry. Modern art and thought—after a century of analysis—are now seeking beyond what is merely accidental; geometry leads them to mathematical forms, a more and more generalized attitude.[4]

Like modernist art, recent literary criticism has also tended 'in the direction of geometry'. Narratives can be linear, circular or multi-directional; revisit common points and envisage them from different angles; diverge, overlap or run parallel with other narrative strands; operate on different semantic planes or dimensions intertextually; and—on the level of language itself—be elliptic, chiastic, hyperbolic or circumlocutory. In *The Aesthetics of Chaos: Nonlinear Thinking and Contemporary Literary Criticism*, Michael Patrick Gillespie explores critical and aesthetic re-appropriations of the linear specifically. He argues that non-linearity is not only an essential facet of modernist literature but it has also come to define the way we describe it: '[t]he New Physics, which has already had an impact upon the way we think in general, also has specific application to literary criticism, as the procedures of non-linearity can be employed for a better accommodation of our needs as readers'.[5]

In *Ulysses* and *Finnegans Wake*, Joyce explores and encourages these ways of thinking about language and narrative form geometrically. He also demonstrates how geometric ideal objects—like the Euclidean notion of the infinitely straight line, for instance—are traditionally acquired symbols, like linguistic signs; and how these geometric ideals of 'perfection and the divine' (as le Corbusier puts it) become sedimented within the linguistic, textual and topographical systems which we use to measure, represent and make sense of the world.[6] In particular, Joyce evokes an overarching concern with the linear, both formally (in terms of the Euclidean ideal of rectilinearity) and conceptually (in terms

[4] Le Corbusier, xxi-xxii.
[5] Michael Patrick Gillespie, *The Aesthetics of Chaos: Nonlinear Thinking and Contemporary Literary Criticism* (Gainesville, FL: University Press of Florida, 2003), 15.
[6] Le Corbusier, xxi.

of linear narratives, histories, arguments, modes of thought, etc.). In *Chaosmos: Literature, Science, and Theory*, Philip Kuberski identifies Joyce's disruption of linearity in this latter sense as a key feature which characterises 'the formal changes in Joyce's prose from *Dubliners* to *Finnegans Wake*', arguing that 'Joyce's technical achievements are directed against the progressive, linear, and instrumental values of the enlightenment which sought to disguise the rhetoric of language within the discourse of realism and rationalism'.[7] In *Ulysses* and *Finnegans Wake*, Joyce undermines these values—along with the Euclidean ideal of the straight line itself—through the use of divergent narrative devices: the texts' circular narrative structures formalise the looping topographical and metaphysical journeys of their protagonists; both narratives operate within different narrative spaces or dimensions (*Ulysses* refers both to Joyce's Dublin and Homer's Greece while *Finnegans Wake* operates simultaneously on different levels of HCE's consciousness); they contain micro-narratives—along with motifs, cross-references, intertextual allusions and other narrative tangents—which diverge, coincide and refer to one another at various points; and they follow their characters' journeys as they separate and interconnect in different spaces and times. The multifaceted non-linearity of *Ulysses* and *Finnegans Wake* extends beyond their circulating and labyrinthine narrative forms, and it is also apparent within the polysemic nature of their narrative voices. Joyce frustrates attempted linear readings of the narratives' projected worlds by rupturing the semiotic stability of their associated words, which often refer to multiple contexts or, as is especially the case with *Finnegans Wake*, are mediated by overlapping voices.

Generally speaking, the non-linearity of *Ulysses* and *Finnegans Wake* responds and contributes to the violence practised by his contemporaries on traditional representations of time in literature, along with the related Bergsonian and Einsteinian conceptions of time as relative and non-linear which were being explored by his contemporaries within the visual as well as the literary arts. As Roger Friedland and Deirdre Boden argue in *NowHere: Space, Time, and Modernity*, '[m]odernity changed the representation of space and time and hence the way we experience and understand them. Specifically, it entailed a rise and fall of fixed-point perspective in the visual arts and the linear narrative in fiction'.[8] The re-

[7] Philip Kuberski, *Chaosmos: Literature, Science, and Theory* (Albany, NY: State University of New York Press, 1994), 57.

[8] Roger Friedland & Deirdre Boden, *NowHere: Space, Time, and Modernity* (Berkeley, CA: University of California Press, 1994), 2.

imagining of 'fixed-point perspective in the visual arts' is evident in Cubism, for instance, which entails the apprehension of a multitude of coincident and disparate perspectives simultaneously. Joyce, in a similar fashion, obliterates a fixed-point perspective temporally by evoking a variety of common perspectives as they are perceived along different points in time. Joseph Frank explores these complementary developments in the plastic and literary arts in his seminal essay on 'Spatial Form in Modern Literature'. He argues that '[i]n a non-naturalistic style, […] the inherent spatiality of the plastic arts is accentuated by the effort to remove all traces of time-value; and since modern art is non-naturalistic, we can say that it is moving in the direction of increased spatiality'.[9] With reference to the works of Proust, Joyce and Eliot, Frank expands on this relationship between the removal of 'time-value' and 'increased spatiality' to explore what he calls the 'spatialization' of form in the modern novel, according to which—as Luke Gibbons puts it—'the unfolding of time through narrative is "flattened out" by, and converted into, the co-ordinates of the spatial imagination'.[10] Within a purely temporal context, Joyce's incorporation of non-linear and circular narrative structures also reflects Giambattista Vico's cyclical vision of history; and, more generally, it provides a basis for exploring the typically High Modernist artistic process of re-cycling linguistic, artistic and other forms of cultural debris from the past.[11] As Joseph Mali argues with regard to Vico's perceived 'myth of "history"' in *The Legacy of Vico in Modern Cultural History*, 'for Vico and Joyce, history is, much like life itself, a recurrent and immanent process of life and death, moving in circular rather than linear patterns'.[12]

Several critics have explored how the treatment of linear perspectives and forms in modernist visual art impacted the development of non-linear temporal concepts in modernist literature. In *Joyce's Visible Art: The Work of Joyce and the Visual Arts*, for example, Archie Loss explores how Joyce '[employs] diverse temporal elements congruent with Cubist conceptions of time and space' in *Ulysses.* He argues that the intertextual narratives of 'Cyclops' and 'Aeolus', in particular, provide a form of visual representation

[9] Joseph Frank, 'Spatial Form in Modern Literature': Part 3, *The Sewanee Review*, Vol. 53, No. 4 (Autumn, 1945), 643-653, 650-1.

[10] Luke Gibbons, 'Spaces of Time through Times of Space: Joyce, Ireland and Colonial Modernity', *Field Day Review*, Vol. 1 (2005), 71-86, 71.

[11] Michael Patrick Gillespie (ed.), *James Joyce's Trieste Library: A Catalogue of Materials at the Harry Ransom Humanities Research Center* (Austin, TX: The University of Texas Press, 1986), 15.

[12] Joseph Mali, *The Legacy of Vico in Modern Cultural History* (Cambridge: Cambridge University Press, 2012), 121.

analogous to montage.[13] In *The Culture of Time and Space*, Stephen Kern examines how a range of early twentieth-century spatial theorists including Henri Poincaré, Ernst Mach and Albert Einstein impacted the development of modernist art, particularly in terms of the Cubist re-imagining of fixed-point perspective. Kern further examines how these theories and artistic developments impacted the works of modernist writers including Proust and Joyce who, he argues, 'transformed the stage of modern literature from a series of fixed settings in a homogeneous space into a multitude of qualitatively different spaces that varied with the shifting moods and perspectives of human consciousness', and thus formed part of a larger attack on 'traditional notions that there is one and only one space and that a single point of view is sufficient to understand anything'.[14]

One of the main concerns of this thesis, however, will be how Joyce's treatment of the linear—and geometric ideal objectivities in general—are informed by the critiques of geometric and conceptual rectitude which were developed by the sixteenth-century heretic Giordano Bruno of Nola, one of Joyce's earliest and longest-lasting influences. Bruno's mocking portrayals of his characters' unbending belief in the rectitude (i.e.: correctness) of their own lines of reasoning in his Italian plays and dialogues forms part of his larger critique of the ideally straight line—and the narrow-minded, corrective thought processes of his Euclidean contemporaries who believed in its existence—in his scientific works (which were mostly written in Latin). In *De Triplici Minimo et Mensura*, Bruno argues that there is nothing sensibly evident in nature to prove the existence of the infinitely straight line, or indeed the existence of any Euclidean ideal object; and that, as James Lewis McIntyre puts it in *Giordano Bruno*, 'any appearance of similarity' and 'exactness' in the visual world is merely an 'illusion of the senses'.[15] In his pioneering monograph, McIntyre explores how the Nolan sought to 'liberate both himself and others from so many vain inquiries, and fix their contemplation on things abiding and sure' by developing his own reductive geometry in which 'there is no difference between the infinite circle and the straight line'.[16] In his plays and dialogues including 'The Ash Wednesday Supper', 'The Candlebearer' and 'The Heroic Frenzies' (the latter appearing in Joyce's Trieste Library),

[13] Archie K. Loss, *Joyce's Visible Art: The Work of Joyce and the Visual Arts, 1904-1922* (Ann Arbor, MI: UMI Research Press, 1984), 56.
[14] Stephen Kern, *The Culture of Time and Space 1880 – 1918* (Cambridge, MA: Harvard University Press, 1983), 149-150.
[15] James Lewis McIntyre, *Giordano Bruno* (London: MacMillan & Co., 1903), 173-5.
[16] McIntyre, 119-175.

Bruno expands his critique of narrow-minded thinking beyond the context of Euclidean geometry by incorporating non-linear narrative devices which frustrate the unbending, narrow and uni-directional thought processes of his protagonists.[17] Bruno's circumlocutory rhetorical tactics are syntactical as well as structural. Lists, in particular, abound in his plays, as well as a range of other diverting tropes including ellipsis and hyperbaton. In *Giordano Bruno and the Geometry of Language*, Arielle Saiber extrapolates on the significance of these disruptive narrative and linguistic techniques, arguing that 'Bruno's incorporation of language rich with lists, repetitions, diversions and threads of words reflects the literal- and narrow-mindedness of his characters'.[18] In light of his larger critique of the Euclidean tradition, Saiber further argues that the divergent nature of his narratives 'serves as a vehicle for Bruno to critique a certain kind of conceptual and behavioural "rectilinearity"'.[19] Within a scientific context, Bruno's satire of 'conceptual and behavioural rectilinearity' in his plays—a notable aspect of this being the inability to perceive reality from outside one's own perspective—highlights the unbending nature of the geometric tradition and its assumptions, including the Euclidean ideal of infinite rectilinearity which the Nolan held to question.

In Joyce studies, Brunonian influences in *Ulysses* and *Finnegans Wake* are often assumed to exist yet they are rarely explored in any depth, and this is especially the case with *Finnegans Wake*. Gino Moliterno addresses this issue in his essay 'The Candlebearer at the *Wake*', arguing that many of the *Wake*'s critics tend to accept Samuel Beckett's assertion of the text's underlying Brunonian influences in 'Dante... Bruno. Vico.. Joyce' without question and avow 'an overwhelming general influence without supplying too many details'.[20] To illustrate his claim, Moliterno cites several critics including James Atherton who, he argues, 'doesn't hesitate to include Bruno among the "structural books" of the *Wake* but at the same time suggests that Joyce "is not likely to have read his works very thoroughly"'; and Boldereff's *Hermes to his Son Thoth*, 'the only book-length study devoted to Bruno and Joyce', which 'only throws the matter into more confusion'.[21] When seeking Brunonian lines of influence, moreover, critics tend to look no further than Bruno's

[17] Gillespie (ed.), *James Joyce's Trieste Library*, 59.
[18] Arielle Saiber, *Giordano Bruno and the Geometry of Language* (Hampshire: Ashgate, 2005), 71.
[19] Saiber, 71
[20] Gino Moliterno, 'The Candlebearer at the *Wake*: Bruno's *Candelaio* in Joyce's Book of the Dark', *Comparative Literature Studies*, Vol. 30, No. 3 (1993), 269-294, 269.
[21] Moliterno, 269-270.

doctrine of the coincidence of contraries (*coincidentia oppositorum*). Bruno's vision of a cosmic union between opposites is certainly a prominent concept in *Finnegans Wake* on a number of levels, particularly with regard to the Shem/Shaun and other symbolic dualities. As Ronald J. Koch argues in 'Giordano Bruno and *Finnegans Wake*: A New Look at Shaun's Objection to the "Nolanus Theory"', '*Wake* criticism has tended to accept this doctrine as an explanation of the numerous pairs of opposites in *Finnegans Wake*—usually read as attributes of the opposite and feuding sons Shem and Shaun'.[22] Several critics have traced Brunonian lines of influence in Joyce's other works. In 'Gnomon is an Island', David Weir examines how Bruno's theory of coincident contraries informs Joyce's incorporation of the gnomon in 'Dubliners'. In light of Bruno's understanding of the gnomon as 'that which, added or subtracted, enlarges or diminishes a figure without changing its form', Weir illustrates how the gnomon evokes Bruno's law of contraries as it relates to maximum and minimum.[23] In '"Indifferent *Weib*": Giordano Bruno and the Heretical Mode of Vision in "Penelope"', Gareth Downes explores how Bruno's theory is evoked at the end of *Ulysses.* Downes argues that 'Joyce wove the ontological immanentism of Giordano Bruno's thought into the text of *Ulysses*, specifically from Bruno's *Cause, Principle and Unity*', and he explores how Joyce's engagement with the Brunonian doctrine of the coincidence of contraries 'influenced the composition of "Penelope" as a text in which the scholastic principles of form and matter are destabilised'.[24] Within a geometric context, Bruno's theory of coincident contraries is also an important component of Bruno's larger cosmology, which assumes the coincident circularity of infinite and infinitesimal lines. As Saiber argues, for Bruno the monad is both 'circularlystraight and straightlycircular'.[25]

But Joyce's interest in Bruno extended much further than the *coincidentia oppositorum*, and he was familiar with the Nolan's fictional plays and dialogues as well as his philosophical, scientific and mathematical works. Joyce had read and reviewed James Lewis McIntyre's pioneering monograph on the Nolan, *Giordano Bruno*, by 1903.

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22 Ronald J. Koch, 'Giordano Bruno and *Finnegans Wake*: A New Look at Shaun's Objection to the "Nolanus Theory"', *James Joyce Quarterly*, Vol. 9, No. 2 (Winter, 1972), 237-249, 237.

23 David Weir, 'Gnomon Is an Island: Euclid and Bruno in Joyce's Narrative Practice', *James Joyce Quarterly*, Vol. 28, No. 2 (Winter, 1991), 343-360, 356.

24 Gareth Joseph Downes, '"Indifferent *Weib*": Giordano Bruno and the Heretical Mode of Vision in "Penelope"', *European Joyce Studies 17*, ed. by Richard Brown (Amsterdam: Rodopi, 2006), 145-156, 145.

25 Saiber, 134.

McIntyre's work was the first of its kind: as Joyce points out in his 1903 review for the *Daily Express*, 'no considerable volume has appeared in England to give an account of the life and philosophy of the heresiarch martyr of Nola', and he goes on to highlight the significance of the Nolan's theories within a modern scientific context, claiming him to be 'the father of […] modern philosophy' .[26] In *Giordano Bruno*, the University of Aberdeen scholar provides an extended discussion of the Dominican monk's critique of Euclidean geometry as an illusory system, as well as his attempt to create an alternative, reductive geometry based on sensible evidence. Joyce also studied Bruno's Italian works while he was enrolled at University College Dublin between 1898 and 1902. Father Ghezzi, Joyce's Italian tutor at UCD, would probably have had access to all three Italian language plays and dialogues—'The Heroic Frenzies', 'The Ash Wednesday Supper' and 'The Candlebearer'—given that they were widely available by the late nineteenth century as cheap individual editions, and also within compendiums such as Paul de Lagarde's 1830 edition of Bruno's complete works and Adolf Wagner's 1888 edition. Aside from the various direct and indirect allusions to Bruno's works throughout *Finnegans Wake*, Joyce's Brunonian influences are clear, generally speaking, on a stylistic level. His own 'incorporation of language rich with lists, repetitions, diversions and threads of words' in *Ulysses* and *Finnegans Wake*, as in Bruno's plays and dialogues, frustrates a linear reading of the text and disrupts wider manifestations (political, religious, cultural) of 'conceptual and behavioural "rectilinearity"'.[27]

Bruno's linguistic and rhetorical engagement with geometric concepts and traditions also provides a crucial (and highly overlooked) reference point from which to discuss non-Euclidean geometry and literature, especially with regard to Joyce. By taking widely accepted mathematical conventions to be 'an illusion of sense' and distancing himself from the 'vain enquiries' of his Euclidean contemporaries, Bruno developed his own philosophy of nature which only sought for 'physical (i.e. real or "immanent") causes or principles'.[28] His related assumption that 'there is no difference between the infinite circle and the straight line' implies a non-Euclidean continuum and the total curvature of space.[29] Many

[26] James Joyce, 'The Bruno Philosophy', *Occasional, Critical, and Political Writing*, ed. by Kevin Barry (Oxford: Oxford University Press, 2000), 93-96, 93.
[27] Saiber, 71.
[28] McIntyre, 175; 119-121.
[29] McIntyre, 135.

of the reasons why Joyce understood Bruno to be 'the father of what is called modern philosophy' become clear in light of Bruno's fundamentally non-Euclidean re-imagining of the cosmos.[30] Bruno's notion that seemingly rectilinear forms are in actual fact infinitesimally curvilinear, and his refutation of Euclid's parallel postulate, bear striking parallels with the elliptic geometric postulates which were systematised by Bernhard Riemann almost three hundred years later, whose geometry assumes that it is impossible to draw a parallel line through a given point to a given line.[31] Whether or not Bruno was correct in assuming the total positive curvature of infinite space (Einstein's Lobachevskian model of space-time, by contrast, assumes the total negative curvature of four-dimensional space)—or that his geometric diagrams in such texts as *Articuli Adversus Mathematicos* (1588) and *De Triplici Minimo et Mensura* (1591) were anything more than 'mathematical fantasies', as Augusto Guzzo suggests—his continued belief in the mythical status of Euclid's parallel postulate and the infinitely straight line proved to be viable following the publication of Riemann's, Bolyai's and Lobachevsky's distinct and universally coherent non-Euclidean geometries in the nineteenth century, which all imply some form of total curvature.[32]

Non-Euclidean geometry and literature

The growing popularisation of non-Euclidean geometries within scientific discourse from the mid-nineteenth century onwards influenced a range of writers who, reflecting Bruno's combined literary and scientific innovations, employed these ground-breaking geometric ideas rhetorically in order to explore a common conceptual ground between the perceptible limitations of the literary and the scientific subject. Before they gained recognition in the scientific community and before Einstein assumed his hyperbolic model of space-time in 1917, Lobachevsky, Bolyai and Riemann, like Bruno, were largely considered to be the hermetic perpetrators of fictitious geometries. This inspired a series of writers who, in a similar vein, set out to produce geometrically inspired fictions. As Thomas Jackson Rice argues, '[i]n spite of [a] strong conservative resistance within and without the mathematical community, or because of it, toward the end of the nineteenth century there was already a thriving subgenre of popular fiction based on the multiple dimensions of non-Euclidean

[30] Joyce, 'The Bruno Philosophy', 93.
[31] Poincaré, 39.
[32] Augusto Guzzo, *Giordano Bruno* (1960), quoted in Saiber, 48.

geometry'.[33] Rice cites Abbott's *Flatland: A Romance of Many Dimensions* (1884) as an early example, which Linda Henderson refers to as 'the first example of popular fiction about the fourth dimension'.[34] *Flatland* is a satirical novella featuring a hierarchical society of two-dimensional shapes ranging from acute-angled triangles to many-sided polygons who can perceive only seemingly straight lines. By ridiculing the Square's initial refusal to accept the possibility that Flatland exists within a realm of three dimensions—or, as it is named by the ineffable Sphere, Spaceland—Abbott derides his contemporaries' general refusal to accept the possibility of a fourth dimension and possibly higher dimensions on the basis that such conceptual configurations of reality are imperceptible within their own. As Lila Harper points out in '*Flatland* in Popular Culture', Charles Howard Hinton's 1904 book *The Fourth Dimension* (in which the term 'tesseract' was coined) 'contains a color [*sic*] plate showing twelve colored [*sic*] cubes intended to help readers visualize how a tesseract might appear as it rotates in four dimensions, and the cover of the Oxford edition of *Flatland* is illustrated with Hinton's models'.[35] Abbott's *Flatland* was thus published within the context of a wider popular and scientific interest in non-Euclidean geometry and modern physics, as well as a more general questioning of accepted Euclidean principles.

Lewis Carroll's *Euclid and his Modern Rivals* (1885), which involves a dialogue between Minos and Professor Niemand (i.e.: nobody), humorously presents contemporary critiques of Euclidean geometry in a similar way. Although Carroll's unbending defence of Euclid's system in this dialogue sets his intentions at odds with Abbott's in *Flatland*, his playful style reflects the freedom with which fundamental geometric constructs were questioned within mainstream scientific and literary discourse. Carroll's reflection on ground-breaking mathematical concepts in *Euclid and his Modern Rivals* is developed in his novels *Alice's Adventures in Wonderland* (1865) and *Through the Looking-Glass* (1871), in which he evokes a number of popular nineteenth century mathematical theories including the scientific limit, parallel universes and non-Euclidean geometries. Although Carroll would always consider the phantasmagoria of Wonderland and the Looking-glass world to be

[33] Thomas Jackson Rice, *Joyce, Chaos, and Complexity* (Chicago, IL: University of Illinois Press, 1997), 56-7.

[34] Linda Henderson, *The Fourth Dimension and Non-Euclidean Geometry in Modern Art* (Cambridge, MA: MIT Press, 2013), 17.

[35] Lila Marz Harper, '*Flatland* in Popular Culture', *Mathematics in Popular Culture: Essays on Appearances in Film, Fiction, Games, Television and Other Media*, ed. by Jessica K. Sklar & Elizabeth S. Sklar (Jefferson: McFarland, 2012), 288-304, 302.

imaginative creations with little bearing on reality, the *Alice* stories nevertheless epitomise the growing prevalence of these topics in mainstream art and popular discourse in the latter half of the nineteenth century. Jeremy Gray highlights the scale of '[t]he impact of the discovery of non-Euclidean geometries' in *Ideas of Space* by referring to Ivan's speech to Alyosha in V.iii of Dostoevsky's *The Brothers Karamazov* (1880), in which Ivan states his refusal to accept the existence of a non-Euclidean geometry in which 'parallel lines […] may [converge] somewhere in infinity': 'I do not accept it and do not want to accept it! Even if the parallel lines converge and I actually witness it, I shall witness it and say they have converged, but all the same I shall not accept it'.[36] Although Ivan stubbornly retains a conviction in the classical notion that 'God […] created [the world] according to Euclidean Geometry', he cannot ignore the '[possibility] to think of new worlds': once this becomes possible, Gray argues, 'the certainty we [have] in the old ones [begins] to evaporate'.[37]

The revitalisation of geometric discourse in science and popular culture also impacted the works of W. B. Yeats, one of Joyce's earliest influences. Yeats's interest in geometric figures was primarily stimulated by his fascination in the occult, which in turn was nurtured by a number of esoteric societies which were gaining popularity in Dublin at the turn of the twentieth century including the Theosophical Society and the Hermetic Order of the Golden Dawn, of which Yeats was a member. Approaching mathematics from an esoteric context, Yeats appropriates geometric objects as symbols which signify transcendental notions rather than purely empirical realities. Yeats's geometric notions are most directly addressed in his extensive prose work *A Vision* (1925), in which he adopts the symbol of the gyre to represent recurrent historical cycles in a similar way to Joyce's Viconian portrayal of history in the *Wake.* The gyre as a symbol of history's repetitive structure is further incorporated in several of Yeats's poems including 'The Second Coming' (1920) and 'The Gyres' (1939), which both explore notions such as fatality and rebirth through figurative tropes which invoke spiralling patterns.

More generally, the growing dissemination of non-Euclidean concepts within popular discourse towards the end of the nineteenth century, and the consequent exploration of

[36] Jeremy Gray, *Ideas of Space: Euclidean, Non-Euclidean, and Relativistic*, 2nd ed. (Oxford: Oxford University Press, 1989), 175; Fyodor Dostoevsky, *The Brothers Karamazov* (1880), trans. by David McDuff (London: Penguin, 2003), 307-308.

[37] Dostoevsky, 307; Gray, *Ideas of Space*, 175.

non-Euclidean concepts in literature, were complicit in the birth of what would become known as science fiction. H. G. Wells, for instance, could be said to have pre-empted Einstein's incorporation of non-Euclidean geometry as a means of describing higher-dimensional spaces and times in *The Time Machine* (1895). Discussing a 'geometry of Four Dimensions', the Time Traveller boldly informs Filby that 'the geometry […] they taught you at school is founded on a misconception'.[38] Wells's incorporation of four-dimensional geometry as a plot device in *The Time Machine* forms part of a more encompassing re-imagining of established mathematical and scientific principles throughout his *œuvre*, which exemplifies a scientific turn within modernist literature and beyond. More specifically, Wells's works responded to an increased interest in the works of certain French spatialists. As German Duarte argues in *Fractal Narrative*, his popularity in France coincided with the country's fascination with the theories of Henri Poincaré.[39] Wanda Strauven, moreover, explores how Wells's presentation of time in *The Time Machine* responds to the growing popularisation of Henri Bergson's theory of *durée* and the related Einsteinian notion of relative time in her essay 'A Fourth Dimension in Marinetti's Writing'.[40] Critical works regarding non-Euclidean geometry and literature such as these, however, rarely provide concrete examples of how non-Euclidean constructs are technically re-appropriated by writers like Wells or Joyce, and they usually contribute more to the construction of a critical vocabulary than to the discovery of clear lines of influence.

With regard to literary modernism more generally, it is significant that so many of Joyce's contemporaries 'experimented with alternative temporal and spatial constructions of reality' in their works, as Astradur Eysteinsson and Vivian Liska argue, following the dissemination of mathematical proofs which called into question even the most ideally objective accounts for describing space.[41] The growing awareness of non-Euclidean geometries within popular scientific discourse impacted a range of modernist literary works, partly because their very existence proved Euclid's system to be a set of signs

[38] H. G. Wells, *The Time Machine* (1895; repr. London: Penguin, 2005), 3-4.
[39] German A. Duarte, *Fractal Narrative: About the Relationship Between Geometries and Technology and its Impact on Narrative Spaces* (Bielefeld: Transcript Verlag, 2014), 168.
[40] Wanda Strauven, 'A Fourth Dimension in Marinetti's Writing', *On Verbal / Visual Representation*, ed. by Martin Huesser et al. (Amsterdam: Rodopi, 2005), 207-218, 209-10.
[41] Astradur Eysteinsson & Vivian Liska, 'Time and Space', *Modernism* (Philadelphia, PA: John Benjamins, 2007), 251-252, 251.

'created by ourselves', as le Corbusier puts it, rather than a categorisation of natural truths.[42] In this sense, Euclidean geometry had come to be perceived as a language for describing the universe rather than a *de facto* representation of 'that great book' itself.[43] As Bruno argues, 'mathematical exactness […] is never found in the material world': 'nothing is perfectly straight, nothing is perfectly circular among composites, nothing absolutely solid but the atoms, nothing absolutely void but the spaces between them'.[44] Like the universalising connotations to which linguistic signs refer, geometric ideal objects of perfection are presented as ultimately imagined constructs. Edmund Husserl explores this parallel between the ideal objectivities of geometry and language in his essay 'The Origin of Geometry', in which he argues that language, 'in all its particularizations (words, sentences, speeches), is […] thoroughly made up of ideal objects'.[45] Husserl also implies, as Jacques Derrida explores further in *Edmund Husserl's 'Origin of Geometry': An Introduction*, that the traditional means by which we acquire geometric ideal objects bear ontological parallels with the processes through which we learn language.[46] Although Husserl's essay on the 'Origin of Geometry' was not first published until 1936, Henri Poincaré began pursuing many similar ideas regarding geometric conventionalism in *Science and Hypothesis*, in which he argues that:

> The geometrical axioms are therefore neither synthetic a priori intuitions nor experimental facts. They are conventions. […] Is Euclidean geometry true? It has no meaning. We might as well ask if the metric system is true, and if the old weights and measures are false […]. One geometry cannot be more true than another it can only be more convenient.[47]

While Joyce and other modernists sought to 'create anew the appropriate conventions for representing reality as [they] experienced it', Poincaré and other practitioners of modern science were employing new geometric conventions which were more 'appropriate' or

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42 Le Corbusier, xxi
43 Galileo, 75.
44 McIntyre, 159; 175.
45 Edmund Husserl, 'The Origin of Geometry' (1936), repr. in Jacques Derrida, *Edmund Husserl's 'Origin of Geometry': An Introduction*, ed. & trans. by John P. Leavey (Lincoln, NE: University of Nebraska Press, 1989), 155-180, 161.
46 Jacques Derrida, *Edmund Husserl's 'Origin of Geometry': An Introduction*, ed. & trans. by John P. Leavey (Lincoln, NE: University of Nebraska Press, 1989).
47 Poincaré, 50.

'convenient' than Euclid's for describing the universe.[48] Euclidean geometry's emergent status as a subjectively imposed sign system rather than a transcendental set of laws (as Kant believed) formed part of Modernism's larger 'crisis of representation', which Pericles Lewis describes as 'a crisis in both the content and the form of artistic representation'.[49] More generally, this crisis encompassed geometric as well as artistic forms of representation. Michael Patrick Gillespie explores this notion further in *The Aesthetics of Chaos: Nonlinear Thinking and Contemporary Literary Criticism* by comparing Joyce to Einstein:

> Joyce and Einstein, because of their monumental achievements in their respective fields in art and science, offer prime examples of what can be accomplished by individuals capable of adopting logical systems that develop beyond traditional Newtonian or Cartesian thinking. As we come to an understanding of how these men, and others using similar methods, formulate and then articulate their views of the world, we approach a clearer sense of how to overcome the limitations imposed by traditional habits of thought and expression.[50]

In this light, Joyce's early interest in non-Euclidean geometries and his treatment of geometric concepts in his works exemplifies a crucial juncture within modernity: between, on the one hand, the exploration of subjectivity within modernist literature, along with its violence on traditional representations of time and space, and, on the other, the modern scientific awareness of the subjectivities inherent in Euclidean geometry and its new, non-Euclidean reformulations of geometric norms. Bruno, 'the father of [...] modern philosophy', was an important influence for Joyce in both regards.[51] Bruno's critique of the Euclidean tradition, his satire of 'rectilinear' modes of thought and his exploration of heterodox geometric concepts in his works not only informed Joyce's own rhetorical and stylistic engagement with geometry, but also provided him with a basis from which to explore the origin and acquisition of both geometric and linguistic traditions. The overlaps between geometry and language which Bruno evokes throughout his works provide a unique insight into the visual and scientific turn within modernist literature more generally, particularly in light of the Nolan's playful rhetorical and figurative engagement with

[48] Pericles Lewis, *The Cambridge Introduction to Modernism* (Cambridge: Cambridge University Press, 2007), 5.
[49] Pericles Lewis, 2.
[50] Gillespie, *The Aesthetics of Chaos*, 15.
[51] Joyce, 'The Bruno Philosophy', 93.

geometric constructs in his plays and dialogues.

Although Joyce encountered Bruno's heterodox geometric theories—and his linguistic play with geometric ideas—towards the beginning of his writing career, his interest in how Brunonian and other geometric postulates could be applied topographically (in terms of both visual and written articulations of place) developed as he was writing *Ulysses*. In part, Joyce was influenced by the publication and popularisation of Einstein's general theory of relativity following the publication of its final form in 1916, which assumes a hyperbolic (Lobachevskian) and four-dimensional model of space-time. As Jeff Drouin argues in 'Early Sources for Joyce and the New Physics: the "Wandering Rocks" Manuscript, Dora Marsden, and Magazine Culture':

> Joyce began writing *Ulysses* in 1914, nearly ten years after Einstein published the special theory of relativity in 1905, and continued working on it well after the general theory was published in 1916. Though Einstein's theories were revolutionary within the field of physics, they did not become widely known outside that specialized arena until the end of 1919.[52]

Once Einstein's theories were more 'widely known', Poincaré's notion that Euclidean geometry was a form of language rather than a set of 'synthetic a priori intuitions' or 'experimental facts' became more widely accepted; a notion which was presaged by Giordano Bruno, who critiqued the understanding of Euclidean geometry as such.[53] As Michael Friedman puts it:

> The reason non-Euclidean geometry is preferable in the case of Einstein's general theory of relativity is not that rigid bodies have empirically been found to behave in this way, but rather that our total system of geometry plus physics (including our theories of the forces affecting the internal constitution of what we take to be rigid bodies) thereby becomes mathematically simpler – just as Poincaré had previously argued in the case of (Euclidean) geometry alone.[54]

While Joyce was composing 'Ithaca' in 1921, he also consulted Poincaré's discussion of

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[52] Jeff Drouin, 'Early Sources for Joyce and the New Physics: the "Wandering Rocks" Manuscript, Dora Marsden, and Magazine Culture', *Genetic Joyce Studies*, Issue 9 (Spring 2009), <http://www.geneticjoycestudies.org/GJS9/GJS9_jdrouin.htm> [date accessed: 04/01/16]

[53] Poincaré, 50.

[54] Michael Friedman, 'Space, Time and Geometry', *The Cambridge Companion to Einstein*, ed. by Friedman & Cristoph Lehner (Cambridge: Cambridge University Press, 2014), 398-420, 404.

non-Euclidean geometries in *Science and Hypothesis.* This is indicated in Joyce's notebooks for 'Ithaca', in which he takes notes on the negative and positive curvature implied by non-Euclidean geometries as set out in Poincaré's chapter on 'Non-Euclidean geometries':

> Eucl. space no total curvature of spine (Milly)
> Lobatchewsky const. tot. curv. neg
> Riemann " " " pos.[55]

It is also worth noting that Joyce adopts the Romanic version of Lobachevsky's name as it appears in the 1905 Walter Scott translation of *Science and Hypothesis*, which suggests that Joyce had access to a translated copy rather than the French original. Poincaré's discussion of positive and negative curvature further enters into a number of passages in the completed version of 'Ithaca'. Joyce evokes Riemann's elliptic version of the parallel postulate in the seemingly paradoxical opening, for instance, in which Bloom and Stephen take 'parallel courses' through Dublin despite 'starting united' (*U* 17.1-2). Poincaré is further invoked through the use of a punctuative *point carré* at the end of the episode:

> [56]
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Judging from the nature of Joyce's mathematical note-taking and 'geometric doodling' in his notebooks for 'Ithaca', it is therefore likely that he was well aware of non-Euclidean geometries by the early 1920's (which would have stemmed largely from his reading of Poincaré).[57] In *Science and Hypothesis*, Poincaré applies the geometries developed by Bolyai, Riemann, Lobachevsky and himself to give concrete examples in which they would be more useful than the geometry of Euclid, illustrating his claim that '[o]ne geometry cannot be more true than another it can only be more convenient'.[58] While

[55] James Joyce, 'Ithaca 13', *Joyce's Ulysses Notesheets in the British Museum*, ed. by Phillip F. Herring (Charlottesville, VA: The University Press of Virginia, 1972) 13.86-88, 474.

[56] James Joyce, *Ulysses: The 1922 Text*, ed. by Jeri Johnson (Oxford: Oxford University Press, 2008), 689. The Gabler edition of *Ulysses* erroneously prints the square point at the end of 'Ithaca' as a circular dot (*U* 17.2332). As Katarzyna Bazarnik points out in *Joyce & Liberature*, Joyce instructed 'the printers to make the dot conspicuously enlargened' yet, '[i]ronically, it has been frequently mistaken for a blemish of paper, the graphic removed altogether in later editions he did not personally supervise' (Katarzyna Bazarnik, *Joyce & Liberature* (Prague: Literraria Pragensia, 2011), 75.

[57] Phillip F. Herring, 'Descriptive Essay of "Ithaca"', *Joyce's Ulysses Notesheets in the British Museum*, ed. by Herring (Charlottesville, VA: The University Press of Virginia, 1972), 58-60, 59.

[58] Poincaré, 50.

writing *Ulysses*, Joyce would therefore not only have been aware of Bruno's heterodox geometric imaginings and his critique of the Euclidean tradition: he would also have been aware of the various ways in which heterodox geometric concepts such as the Nolan's could be applied within modern scientific methods of mapping space. Prior to the popularity of Poincaré's and Einstein's (and the renewed intrigue in many of Bruno's) non-Euclidean assumptions within modern scientific discourse, non-Euclidean geometries were widely considered to describe pure, abstract forms which described the phenomena of impossible realities. As Robert Tubbs argues in *Mathematics in Twentieth-Century Literature and Art*: *Content, Form, Meaning*:

> Although Lobachevsky and Bolyai did not find any contradictions when they assumed their version of the parallel postulate, the lack of contradictions did not mean that their geometry had any geometric meaning: they might have been exploring an interesting area of pure mathematics but one with no connection with anything anyone would usually think of as being a geometric object.[59]

Both Einstein and Poincaré demonstrated how non-Euclidean geometry could be applied, rather than merely theorised; and in their wake, the non-Euclidean imaginings of Giordano Bruno had begun to gain further credence within modern scientific thought. More generally, Einstein's theories of relativity indicate a 'movement away from the modern assumption that nature could and ought to be representable in a single code or register', as Kuberski argues in *Chaosmos*.[60] By focusing on Joyce's developing awareness of different geometric codes and registers in *Ulysses* and *Finnegans Wake*, this thesis explores how Joyce begins to explore the application, rather than the pure theorisation, of ground-breaking geometric concepts within his topographical writing of place in *Ulysses*; and how Joyce develops his linguistic and figurative application of these concepts in *Finnegans Wake.*

More specifically, this thesis examines how Bruno and Poincaré inform Joyce's presentation of geometries—and their topographical applications (within map projection, triangulation and parallax in particular)—as languages or tools, rather than ideally

[59] Robert Tubbs, *Mathematics in Twentieth-Century Literature and Art: Content, Form, Meaning* (Baltimore, MD: Johns Hopkins University Press, 2014), 13.
[60] Kuberski, 21.

objective systems, for describing reality; and how, conversely, he employs language to emulate the systems by which the world is commonly visualised. Joyce's writing (-*graphia*) of place (*topo*-) in *Ulysses* and *Finnegans Wake* involves the reconstruction of bodies, cities, planets and space itself as their phenomena are envisaged and imagined from different viewpoints. While Joyce's textual snapshots of these *topoi* are focalised through the subjectivising viewpoints of his protagonists, they also refer to the objectifying mathematical ideals which his characters have acquired. By exploring how visual and conceptual distortions arise when particular geometric doctrines and ideals are conflated with reality, or when the map is equated with the territory, Joyce follows Bruno in questioning rectilinearity in both the Euclidean sense (by demonstrating how Euclidean ideal objects become distorted when they are projected onto curved, irregular forms such as the Earth and the human body) and in terms of what Saiber calls 'conceptual […] "rectilinearity"' (by illustrating how an unwavering belief in the rectitude of particular geometric traditions can result in a visually and conceptually skewed impression of the world).[61] Although this thesis is concerned with Joyce's representations of the visual (and his engagement with geometric and topographical representations of the visual), it also considers the rich musicality and dense polyphony of *Ulysses* and *Finnegans Wake* in its examination of how their irregular visual and geometric landscapes are evoked verbally. The third and fourth chapters, in particular, explore how Joyce re-conceives the fundamental geometric laws and topographical concepts by manipulating the temporal structures associated with narrative, language and sound.

'Fashionable nonsense'

Before proceeding any further, it is important to stress an overarching concern which this thesis addresses in its examination of Joyce's response to the development of non-Euclidean geometries and their impact on previous traditions for measuring and mapping the visual world. Parallels between works of literature and non-Euclidean concepts are often vaguely expressed in contemporary literary criticism, and comparisons of tropes, styles and narrative structures to non-Euclidean geometries usually provide little more than loose analogies rather than definite lines of influence. Ironically, the readiness of many critics to apply non-Euclidean concepts to literary works without fully understanding them

[61] Saiber, 71.

reflects in itself the critiques inveighed by Bruno and Husserl against those geometers who, as they saw it, incorporated cardinal mathematical axioms in their deductions with little regard for their original meanings. Like those geometers who, Husserl argued, practised within 'a tradition emptied of sense' and played with geometry as if it were a 'skill' or a 'game'—or Bruno's contemporaries who, the Nolan argued, 'played with geometry' as if it were an 'abstract intellectual exercise'—a striking number of literary critics incorporate vague geometric notions within their textual analyses without fully understanding these empirical concepts or questioning the validity of their concomitant readings.[62] A more recent critique of contemporary critical thought's often misinformed use of mathematical principles is expounded by Alan Sokal and Jean Bricmont in *Fashionable Nonsense: Postmodern Intellectuals' Abuse of Science*, in which they interrogate postmodern criticism's 'repeated abuse of concepts and terminology coming from mathematics and physics'.[63] Their aim, as was the objective of Sokal's infamous hoax in 1996, was to demonstrate that '[n]o one [would] cry out that the king is naked' in cases where apparently scientifically and mathematically informed theses were disseminated by established philosophers and respected scholarly journals.[64] *Fashionable Nonsense* covers the use of geometry: it contains one chapter which analyses Jean Baudrillard's largely meaningless statement that 'the space of war has become definitely non-Euclidean', as well as a chapter debunking Lacan's many contestable applications of mathematical and geometric terms within 'psychoanalytic topology' (and his use of deliberately confounding phrases such as '[the Möbius strip] can be considered the basis of a sort of essential inscription at the origin, in the knot which constitutes the subject'; or '[i]n [the] space of *jouissance*, to take something that is bound, closed constitutes a locus, and to speak of it constitutes a topology') as pure nonsense.[65] Although it is often tempting to cast off some of Derrida's more technical phraseology as such, Derrida's 'Introduction' to Husserl's *Origin of Geometry* provides an encompassing critique of the senseless application of mathematical language, putting him firmly in the camp of Sokal and Bricmont.

Although the application of non-Euclidean concepts within non-scientific discourse is

[62] Derrida, 98; Husserl, 'The Origin of Geometry', 171; Giordano Bruno, quoted in Saiber, 46.
[63] Alan Sokal & Jean Bricmont, *Fashionable Nonsense: Postmodern Intellectuals' Abuse of Science* (New York, NY: Picador, 1998), 4.
[64] Sokal & Bricmont, 5.
[65] Jean Baudrillard, *The Gulf War Did Not Take Place* (1995), quoted in Sokal & Bricmont, 147; Jacques Lacan (1972 seminar), quoted in Sokal & Bricmont, 19-20.

particularly popular within postmodern criticism, non-Euclidean terminology and a similar degree of 'fashionable nonsense' had begun to appear in the critical works of artists and critics since the high modernist period. Non-Euclidean geometry captured the imagination of T. S. Eliot, for example, who uses Lobachevsky's hyperbolic system as a means of expressing the aesthetics of Ben Jonson. As he writes in his essay 'Ben Jonson' (1921):

> Jonson's characters conform to the logic of the emotions of their world. It is a world like Lobachevsky's; the worlds created by artists like Jonson are like systems of non-Euclidean geometry. They are not fancy, because they have a logic of their own; and this logic illuminates the actual world, because it gives us a new point of view from which to inspect it.[66]

For Eliot, Jonson achieves an analogous effect in art as Lobachevsky had within the domain of mathematics: both offer an alternative 'point of view' for inspecting 'the actual world' by creating logically coherent and alternative worlds of their own. The same could be said of Bolyai, who famously asserted that 'out of nothing I have created a strange new world'.[67] Eliot's reading of Jonson's non-Euclidean world building is compelling, but wholly inferential. At no point in his essay does Eliot elucidate this remarkable claim with investigations into the possible mathematical or scientific sources of this non-Euclidean dynamic in Jonson's works other than those of Lobachevsky, which were published two centuries after the Renaissance poet's death. Given that Lobachevsky and Bolyai were the first geometers to develop hyperbolic geometric system whose axiomatic elements were as coherent as Euclid's it is unlikely that Jonson would have been aware of any non-Euclidean geometric inquiries other than the largely unknown polemics of certain heretics, which were widely considered to be works of 'fancy' rather than illuminations of 'the actual world'.

Eliot's reading is so equivocal that it could be applied to any work of literature featuring a logically feasible system or world in which *tout se tient*, including Joyce's *Ulysses* and *Finnegans Wake*. Indeed, these works have been described in non-Euclidean terms by several critics. As is the case with Eliot's reading of Jonson, however, potential insights

[66] T. S. Eliot, 'Ben Jonson', *The Sacred Wood: Essays on Poetry and Criticism* (New York, NY: Alfred A. Knopf, 1921), 116-117.

[67] János Bolyai, quoted in Steve Adams, *Relativity: An Introduction to Time-Space Physics* (London: Taylor & Francis, 1997), 221.

into Joyce's non-Euclidean influences are often obfuscated through the use of loosely founded generalisations. This is certainly eminent in Joyce's obituary in the *New Republic*, for example, in which Joyce is referred to as a 'scientist of letters':

> Literature as a pure art approaches the nature of a pure science. And Joyce was also the great research scientist of letters, handling words with the same freedom and originality that Einstein handles mathematical symbols. The sounds, patterns, roots and connotations of words interested him much more than their definite meanings. One might say that he invented a non-Euclidean geometry of language; and that he worked over it with doggedness and devotion, as if in a laboratory far removed from the noises of the street.[68]

The anonymous obituarist's assertion that 'Joyce invented a non-Euclidean geometry of language' is completely unfounded, as is the contentious notion that Einstein handled mathematical symbols as freely as Joyce. Handling the complexities of non-Euclidean geometry and Einstein's general theory of relativity with a worryingly similar degree of 'freedom and originality', the obituarist unthinkingly conflates a conceptual crossover between science and art with a methodological affinity between scientific and artistic practice.

Joyce's *New Republic* obituary encapsulates a trend which continues to exist within modernist (and postmodern) studies to this day, whereby mathematical and scientific theory is applied in literary criticism with little consideration of the complexities elaborated by these theories or the extent of the writer's awareness of them. This is the case in Kevin Dettmar's reading of Joyce and postmodernism in *The Illicit Joyce of Postmodernism: Reading Against the Grain*, for instance, in which Dettmar likens modernist literature to Euclidean geometry:

> Modernist literature, like Euclidean geometry, is to some extent a creation of the structures through which it has been scrutinized; and the gradual augmentation of Euclidean by non-Euclidean geometry may serve as an example of the kind of paradigm shift that often results when the basic premises of such a system are called into question.[69]

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[68] Anon., 'Unsigned Notice', *New Republic* 20 January 1941; repr. in *James Joyce: The Critical Heritage, Vol. 2 of 2, 1928-41*, ed. by Robert Deming (London: Routledge, 1970), 747.

[69] Kevin Dettmar, *The Illicit Joyce of Postmodernism: Reading Against the Grain* (Madison, WI: University of Wisconsin Press, 1996), 138.

Dettmar goes on to argue that *Ulysses* falls into a category of 'nonmodernist poetics' which violates 'the central tenets of modernist poetics' much in the same way as non-Euclidean geometry violated the fundamental axioms of Euclid's previously canonical system.[70] Dettmar's reading is not unfounded: non-Euclidean geometry did result in a 'paradigm shift' in science and art, and postmodernist literature could be said to have resulted from one. However, it hangs upon the contestable notion that modernist literature can be equated with Euclidean geometry. Non-Euclidean geometries were, as we have seen, being explored by a range of writers including Lewis Carroll, Edwin A. Abbott and H. G. Wells before the advent of self-consciously postmodernist art and discourse, and one could quite as easily argue that Joyce's early contemporaries called into question the basic premises of the Euclidean system in a similar way. The binary opposition between Euclidean modernism and non-Euclidean postmodernism is a neat analogy, but the connection between a shift in poetics and a deviation in mathematical thinking is supported by nothing except a deduction featuring no geometrically informed premises.

Several critics have attempted to identify non-Euclidean influences in Joyce's works in more detail. In *Eternal Geomater: The Sexual Universe of Finnegans Wake*, Margaret Solomon draws a number of interesting parallels between non-Euclidean geometries and the visual landscape of *Finnegans Wake*. Her eleventh chapter, which examines the scene with 'The Coach with the Sex Insides', focusses more specifically on Joyce's direct allusions to the tesseract and four-dimensional space-time in III.iii. However, Solomon's remark that 'the four-dimensional "mamalujo" opens up a hypercube so that our three-dimensional eyes might be able to see that the boundaries of our universe are merely the limitations of our day-world perceptions'—similar to Dettmar's distinction between Euclidean and non-Euclidean geometry in relation to modernist and postmodernist literature—merely exploits the radicalism of non-Euclidean geometry to create an unrelated binary distinction: between the Euclidean geometry of the day-world and the night-world's non-Euclidean projections.[71] As is evident from Joyce's representation of parallel lines in the opening of 'Ithaca', Joyce invokes several examples of non-Euclidean geometry within the 'day-world' of *Ulysses*, which are explored in the second chapter of this thesis. Although Solomon identifies a number of important references and parallels to

[70] Dettmar, 139.

[71] Margaret C. Solomon, *Eternal Geomater: The Sexual Universe of Finnegans Wake* (Carbondale, IL: Southern Illinois University Press, 1969), 127.

non-Euclidean geometries in *Finnegans Wake*, she rarely sheds light on their potential sources (and, as is often the case in the *Wake*, there are at least several).

Thomas Jackson Rice's *Joyce, Chaos and Complexity*, by contrast, examines the historical background, wider artistic context and possible textual sources which informed Joyce's interest in Euclidean and other geometries in great detail, but fails to provide enough valid examples to sufficiently consolidate his claims regarding the apparently huge impact which geometric traditions and innovations had upon his works. The second chapter of *Joyce, Chaos and Complexity*, entitled 'The Aliments of Jumeantry in *A Portrait of the Artist as a Young Man*', consists of an extensive inquiry into Joyce's background reading in didactic and other texts regarding non-Euclidean geometry. However, Rice's search for non-Euclidean lines of influence in Joyce's works converges upon an abstract claim that '[t]he parallel relationship between the readers and Stephen Dedalus in *A Portrait* is […] Riemannian'.[72] Rice argues that, '[s]ince Riemannian parallels invariably meet, […] this geometrical analogy gives a new meaning to the open-endedness of *A Portrait*' (in the sense that Stephen becomes progressively alienated from the reader).[73] By using Riemannian geometry to describe a vague conceptual framework in his close reading, Rice is unable to illustrate how Joyce's apparently high level of interest in Riemannian geometry actually informed their composition.

While many arguments regarding the impact of geometries in Joyce's works are underdeveloped or completely abstract, this is not to say that a connection between Joyce and geometry is in itself invalid. What these critical inquiries fail to fully clarify is either how Joyce would have been familiar with emergent geometries in the first place; or how they are actually invoked in his works, beyond their provision of analogies for describing them. This thesis endeavours to do both.

Outline

By tracing Joyce's early readings of Bruno, Poincaré and other pioneering non-Euclidean geometers to his notebooks and manuscript drafts, this thesis illustrates how his self-

[72] Rice, 68.
[73] Rice, 68.

reflexive obsession with measuring and mapping space textually (through a figurative application of language and narrative form) in *Ulysses* forms part of his more developed reflection upon the abstract and coded nature of geometric and topographical means of representation in *Finnegans Wake.* It is divided into four chapters:

Chapter 1. 'Writings of paraboles': Geometric Traditionalism and Corporeal Topography in the *Wake*'s 'Night Lessons'

Chapter 2. Squaring the Circle: Geometry, Topography and Map Projection in "Ithaca"

Chapter 3. "Shut your eyes and see": Textual Topography and Verbal Geometry in *Ulysses*

Chapter 4. "Putting Allspace in a Notshall": Charting *Wake*an Territory

Given that Joyce's conception of geometry as a form of language is much more explicit and developed in *Finnegans Wake* than in *Ulysses*, this thesis begins with a detailed examination of the traditional geometric axioms which are applied by Dolph, Kev and the *Wake*'s other cartographers in their attempts at mapping corporeal and terrestrial bodies in chapter one. With reference to the *Wake*'s combined geometric and linguistic ambiguities, chapter two explores how Joyce begins to explore many similar practical issues regarding the ritualistic acquisition and application of mathematical traditions in *Ulysses*. Chapters three and four focus on Joyce's linguistic appropriation of applied geometric concepts. By commencing with *Ulysses*, the latter half of this thesis charts a developing complexification within Joyce's verbal mapping of place, and his textual emulation of topographical practice.

Each chapter, to a greater or a lesser degree, is concerned with three ways (listed below) in which Joyce employs geometric and topographical concepts in *Ulysses* and *Finnegans Wake* to explore the emergent twentieth-century understanding of geometry as a form of language; and, conversely, to explore the ideally objective limits of language itself:

(i) *Geometric traditionalism and myth*

This is principally the focus of chapters one and two, which discuss how Joyce explores the origin of geometric symbols, systems, beliefs and myths in II.ii and 'Ithaca'

respectively. In both II.ii and 'Ithaca', Joyce responds to a history of doubt regarding the validity of Euclid's parallel postulate, and by extension the sense of Euclid's entire system, by highlighting the traditional and senseless manner in which its laws are acquired. By drawing from Husserl's *The Origin of Geometry* and Derrida's *Introduction to the Origin of Geometry*, chapters one and two explore how Joyce presents Euclidean geometry as a tradition 'emptied of meaning' in *Ulysses* and *Finnegans Wake*; and how his incorporation of non-Euclidean concepts (as discussed by James Lewis McIntyre in *Giordano Bruno* and Henri Poincaré in *Science and Hypothesis*) within the visual landscapes of both texts highlights the Euclidean tradition's sensible limitations.[74] By illustrating how mythical conceptions and skewed imaginings of the visual world can arise from the *a priori* application of traditionally acquired axioms, Joyce inveighs a Brunonian critique of rectilinear modes of thought through his characters' unbending belief in the rectitude of particular mathematical traditions. More specifically, the first chapter examines the apparently confounding visual phenomena which Dolph and Kev encounter when they apply their rote-learned geometric axioms for the first time in order to create a topography of ALP's bodily and planetary hemispheres in II.ii. Neither the twins nor their schoolbook can account for the shocking phenomena which stem from the projection of ideal Euclidean objects onto irregularly curved surfaces or within totally curved spaces, and they consequently 'correct' what they see both conceptually (in the sense that they amend what cannot be accounted for dogmatically) and geometrically (i.e.: through the idealising process of straightening irregularly curved lines). Echoing Stephen's call for an awakening from the 'nightmare' of '[h]istory', and Bruno's desire to 'liberate himself and others' from the 'vain enquiries' of his contemporaries, Joyce stages a struggle to awake from a history of geometric preconceptions rooted in Euclid's *Elements* throughout the twins' attempts at objectively measuring the visual world (*U* 2.377).[75] The second chapter investigates how Joyce begins to explore similar ideas regarding geometric traditionalism by focusing on the visual distortions and errors which are committed by the narrative in 'Ithaca', an episode which takes the form of a 'mathematical catechism'.[76] The narrative's idealising eye in 'Ithaca' geometrises the visible universe, translating its irregular features into the 'mathematical language' of Euclid; and, as in II.ii, mythical constructs consequently arise

[74] Husserl, 'The Origin of Geometry', 171.
[75] McIntyre, 119.
[76] James Joyce, 'Letter of February, 1921', *Letters of James Joyce*, Vol. I of III, ed. by Stuart Gilbert (New York, NY: Viking, 1966), 164.

whenever it rectifies the visual world's curves and irregularities.[77] By presenting 'Ithaca' 'in the form of a mathematical catechism' and II.ii in the form of a schoolbook on trivium and quadrivium including lessons on history, language and religion as well as geometry, Joyce highlights the traditionalistic and rote-learned means by which geometric systems—like grammatical laws and religious dogmas—are learned.

In *Joyce, Chaos and Complexity*, Thomas Jackson Rice expands on the common ground which Joyce evokes between the acquisition of geometric and religious doctrines, relating this to a combined shift in mathematical and religious thought within modernity more generally. At the end of his chapter on 'Euclid and *Dubliners*', Rice refers to the opening of 'The Sisters' (cited below) to illustrate his notion that Joyce draws parallels between loss of 'the certainties that Euclidean geometry seemed to offer' and the loss of 'the certitudes of religious belief' within a modern scientific context:[78]

> Every night as I gazed up at the window I said softly to myself the word paralysis. It had always sounded strangely in my ears, like the word gnomon in the Euclid and the word simony in the Catechism. But now it sounded to me like the name of some maleficent and sinful being. It filled me with fear, and yet I longed to be nearer to it and to look upon its deadly work. (*D* 3)

Rice argues that 'Joyce's association of the catechism and Euclid in the opening paragraph of *Dubliners* […] reflects an unquestioned, *conventional* contemporary association between the textbook of religious doctrine and the book that had served as a "catechism" for Western mathematics and science for over two thousand years'.[79] He points out that this '*conventional* contemporary association' between Euclid's *Elements* and the catechism is explored further in *Ulysses*; especially with regard to the 'mathematical catechism' and its rote-like application of apparent facts, assumed measurements and other axioms in 'Ithaca' (as is examined more closely in chapter two). Joyce draws out further parallels between the acquisition of religious and mathematical certainties in 'Lestrygonians', in which Bloom considers the concept of parallax: '[p]arallax. I never exactly understood. There's a priest. Could ask him. Par it's Greek: parallel, parallax' (*U* 8.110-112). Bloom does not fully understand this applied mathematical concept ('I never exactly understood'), and his first

[77] Galileo, 237-8.
[78] Rice, 37.
[79] Rice, 36.

instinct to ask a passing priest reflects the coincident certainties offered by 'Euclidean geometry' and 'religious beliefs'. This overlap, as well as the subjective desire to become acquainted with the apparent certainties offered by Euclid's *Elements* and the catechism, is certainly prevalent in the opening of 'The Sisters', in which the narrator compares 'the word gnomon in the Euclid and the word simony in the Catechism'. However, Rice does not identify the vital role which the narrator's fascination with linguistic signs plays in his construction of doubts, fears and reflections upon the unknown. It is not the figure or the concept of the gnomon in itself which the narrator considers, but rather its signifying sounds: like the word 'paralysis', '[i]t had always *sounded* strangely in my ears, […] But now it *sounded* to me like the name of some maleficent and sinful being' (my emphasis). As is the case with Bloom and his thoughts on parallax in 'Lestrygonians', in which he considers the word's etymology ('[p]ar it's Greek: parallel, parallax'), it seems unlikely that the narrator has (or had) more than a vague knowledge of what a gnomon actually is, given his consideration of its verbal signifier rather than its signified concept; of the gnomon's fearful 'sound' rather than its fearful connotations of a larger, enclosed space. The narrator's childhood understanding of the gnomon is itself gnomonic, in the sense that he is aware of the gnomon's import and signified parallels but not its significance. By using the past perfect tense, the narrator further suggests that a knowledge of those larger unknown expanses implied by the figure of the gnomon would have granted him access to larger, unknown meanings beyond those described by the language of Euclid; much like an understanding of the implications underlying the priest's and his sisters' ellipses would have granted his childhood self access to the world of adults and their private language. In this sense, Joyce explores how the origin of geometry mirrors the acquisition of language: both entail applying signs, and interacting with a world of signs, without fully understanding their connotations. John Bishop pursues this notion further in 'Space in *Finnegans Wake*', suggesting that 'orientation in the world, and vision, arise through the hearing of language' (which Joyce illustrates through 'the elision of "ear" and "east"' in the phrase "in the far ear").[80] Bishop refers to the opening of *A Portrait of the Artist as a Young Man*, which also explores the primal acquisition of language, to illustrate his point that:

[80] John Bishop, 'Space in *Finnegans Wake*: An Archeology', *Making Space in the Works of James Joyce*, ed. by Valérie Bénéjam & John Bishop (London: Routledge, 2011), 20-37, 25.

> [l]anguage acquisition in turn has the triple effect of instilling in the child the laws of culture; of eliciting vision and making indexically apparent the extended space that will be explored in the child's engagement with his environment; and also, crucially—as in Vico and Freud—of drawing the spatiality of the human body out of its unconscious amorphousness.[81]

In *Finnegans Wake*, Joyce explores how 'language acquisition' has the effect of 'eliciting vision'; and how, in turn, the acquisition of geometric symbols bears ontological parallels with the learning of linguistic signs. The *Wake*'s verbal polyphony and plurivocalism is used to evoke a visual polysemy and geometric uncertainty within HCE's dreamscape. By referring to a range of complementary and dissident geometries to describe its unstable *topoi*, Joyce demonstrates how geometric signs, like linguistic signs, can be reconfigured or translated by using alternative forms of representation.

(ii) *Map projection and the body*

Chapters two and four consider how Joyce invokes the concept of map projection in both a literal and a figurative sense. Chapter two explores how the narrative's delusive topographies, cosmographies and other measures of the visual universe in 'Ithaca' reveal the distortions which Euclidean objects must necessarily undergo when they are projected onto a variably curved plane such as the Earth (as implied in Mercator's projection) or the human body (such as Molly Bloom's, which is re-imagined as a gigantic heavenly body towards the end of the episode). Chapter two also examines how Joyce responds to the perceived futility of attempting to square the circle, as discussed by Bruno and his forebears, in 'Ithaca', and relates Joyce's invocation of this geometric ideal to the practical issues which are faced by the narrator in its attempted reformulations of the Earth's curved surface within the rectilinear boundaries of the Cartesian grid. Chapter four focusses on how the visual distortions associated with map projection are reflected within the polysemic language of *Finnegans Wake.* It illustrates how the processes of expansion, contraction and mutation which many of the *Wake*'s spaces, places and bodies undergo are accompanied by related semiotic distortions, as well as aural mutations within the text's soundscape. It discusses how Joyce distorts certain sounds and significations through time to evoke the movement and transformation of particular bodies in space. This chapter also

[81] Bishop, 'Space in *Finnegans Wake*: An Archeology', 25.

considers how the maps and the books which the *Wake*'s characters use to record, objectify and 'rede […] its world' are presented as mediums which can be re-shaped in order to signify alternative accounts of visual reality (such as the text, for instance, which is mapped onto the surface of Shem's 'soulskin' in I.vii; or maps themselves, which are drawn onto the moving, breathing bodies of HCE and ALP) (*FW* 018.18-19; 377.28).

Joyce's multifaceted exploration and emulation of these concepts associated with map projection are combined in 'Eumaeus', in which Murphy attempts to validate his hyperbolic narratives by deforming the appearance of tangible signs relating to his outlandish exploits (thereby stretching the truth figuratively):

> Seeing they were all looking at his chest he accommodatingly dragged his shirt more open so that on top of the timehonoured symbol of the mariner's hope and rest they had a full view of the figure 16 and a young man's sideface looking frowningly rather.
>
> —Tattoo, the exhibitor explained. That was done when we were lying becalmed off Odessa in the Black Sea under Captain Dalton. Fellow, the name of Antonio, done that. There he is himself, a Greek.
>
> —Did it hurt much doing it? one asked the sailor.
>
> That worthy, however, was busily engaged in collecting round the. Someway in his. Squeezing or.
>
> —See here, he said, showing Antonio. There he is cursing the mate. And there he is now, he added, the same fellow, pulling the skin with his fingers, some special knack evidently, and he laughing at a yarn.
>
> And in point of fact the young man named Antonio's livid face did actually look like forced smiling and the curious effect excited the unreserved admiration of everybody including Skin-the-Goat, who this time stretched over.
>
> —Ay, ay, sighed the sailor, looking down on his manly chest. He's gone too. Ate by sharks after. Ay, ay.
>
> He let go of the skin so that the profile resumed the normal expression of before.
>
> —Neat bit of work, one longshoreman said.
>
> —And what's the number for? loafer number two queried.
>
> —Eaten alive? a third asked the sailor.
>
> —Ay, ay, sighed again the latter personage, more cheerily this time with some sort of a half smile for a brief duration only in the direction of the questioner about the number. Ate. A Greek he was. (*U* 16.673-699)

By ‘squeezing’ his tattoo to evoke Antonio’s ‘livid face’ and then ‘pulling the skin with his fingers’ to turn the expression into one of ‘forced smiling’, Murphy characterises his subject in more depth and gives further credence to his whole story about how the man was ‘[a]te by sharks after’. This also serves as an amusing distraction which facilitates the elliptical nature of Murphy’s dialogue, which entails circumnavigating certain facts and avoiding certain questions (such as the query regarding the significance of ‘the figure 16’, for instance). Murphy’s contortion of his tattoo in this passage (as well as the ‘[stretching] over’ of Skin-the-Goat, whose name implies the projection of an epidermal surface) encapsulates the way in which he bends the truth by altering the appearance of other symbolic objects and graphic media in an attempt to establish historical relationships between them and his stories. These include his discharge papers and his name (‘[t]here’s my discharge. See? W. B. Murphy, A. B. S.’), which Murphy uses to prove his identity; and the postcard of Peruvian natives, which he relates to his lurid recollections of ‘maneaters in Peru that eats corpses and the livers of horses’ (*U* 16.452-471). Many of these dubious relationships are mythical, in the sense that the signs to which Murphy refers are removed from their original signified contexts, and their purported relationship entails a stretching of the imagination. Consulting the ‘card with the natives’, for example, Bloom’s suspicions concerning Murphy’s story about his experience with ‘maneaters in Peru’ are aroused ‘having detected a discrepancy between his name [...] and the fictitious addressee of the missive’ (*U* 16.494-498). Throughout *Ulysses* and *Finnegans Wake*, Joyce explores this notion that myths can be generated from the figurative stretching of the relationship between narratives and their graphic (written and pictorial) means of representation. By highlighting the materiality and morphability of these graphic media, Joyce also illustrates how apparently objective representations of reality can become distorted when projected onto the irregular surfaces of the Earth, the human body, the map and the page.

The physically and semiotically distortive natures of the page and the body are explored further in ‘Eumaeus’, in which Bloom contemplates Molly and ‘her symmetry of heaving embonpoint’ as they are depicted in ‘the slightly soiled’ and ‘creased’ photo which he shows to Stephen:

> As for the face it was a speaking likeness in expression but it did not do justice to her figure which came in for a lot of notice usually and which did not come out to the best advantage in that getup. She could without difficulty, he said,

> have posed for the ensemble, not to dwell on certain opulent curves of the. He dwelt, being a bit of an artist in his spare time, on the female form in general developmentally because, as it so happened, no later than that afternoon he had seen those Grecian statues, perfectly developed as works of art, in the National Museum. Marble could give the original, shoulders, back, all the symmetry, all the rest. Yes, puritanisme, it does though Saint Joseph's sovereign thievery alors (Bandez!) Figne toi trop. Whereas no photo could because it simply wasn't art in a word. (*U* 16.1444-1455)

Thinking that 'no photo' could replicate 'the symmetry' of 'the female form', Bloom 'reproduces the traditional nineteenth-century assessment of the relationship between art and photography', as Jules Law argues in 'Simulation, Pluralism, and the Politics of Everyday Life'.[82] Law further argues that Bloom's 'assumptions about aesthetic value are undermined by the larger tendency of *Ulysses* to juxtapose the mythic and the mechanical […]. The same logic which leads J. J. O'Molloy to pronounce "a postcard" as "publication" is also at work in *Ulysses* preparing for photography to become "art"'.[83] Law argues that this juxtaposition 'evokes a "culture" of everyday life', whereby photographs and other products of this culture 'achieve the status of an historical and aesthetic object'.[84] Bloom's preference of plastic over photographic means of representation is also undermined in a more concrete, visual sense. Syntactically, it is uncertain whether the 'certain opulent curves' refer to Molly's womanly form or the curves of the creased photograph upon which it is represented. The 'certain opulent curves' could belong to Molly or her photographic representation simultaneously; or imply that both sets of curves (represented and representational) are co-related. Alternatively, the apparently unfinished sentence ('[...] certain opulent curves of the.') could imply a final noun within the point formalised by the full-stop itself, highlighting the photograph's pointed form. By creating these grammatical ambiguities, Joyce suggests that the womanly curves of Molly's 'embonpoint' are visually indistinguishable from the curves and the points of the creased photographic paper onto which they are projected (as well as the paper upon which the text itself is printed). This thesis explores how Joyce exploits a variety of related linguistic ambiguities in *Ulysses* and *Finnegans Wake* to explore how language and the text can be de-formed, like the crumpled photograph, to emulate the formal properties of its subject.

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[82] Jules David Law, 'Simulation, Pluralism, and the Politics of Everyday Life', *Coping With Joyce: essays from the Copenhagen Symposium*, ed. by Morris Beja & Shari Benstock (Columbus, OH: Ohio State University Press, 1989), 195-205, 197.

[83] Law, 197.

[84] Law, 197.

(iii) *Geometry, topography and sound*

Chapters three and four explore how Joyce emulates fundamental geometric constructs and related topographical concepts both aurally and structurally. The possibility of this notion is explored throughout *Ulysses*, in which both Stephen and Bloom repeatedly wonder how space can be envisioned non-visually. Stephen attempts to 'shut [his] eyes and see' as he walks down Sandymount Strand with his eyes closed in 'Proteus', which echoes his construction of 'a skeleton map of the city in his mind' in *A Portrait of the Artist as a Young Man* (*U* 3.9; *P* 55). Bloom also has recurring thoughts about perceiving the world blindly, many of which are provoked by the blind stripling's reappearance at different points in Dublin. Considering how the stripling might imagine 'shapely' women, for instance, Bloom thinks: '[m]ust be strange not to see her. Kind of a form in his mind's eye. The voice, temperatures: when he touches her with his fingers must almost see the lines, the curves' (*U* 8.1127-1129). With reference to Henri Poincaré's discussion of continuity and visual space in *Science and Hypothesis*, chapters three and four illustrate how Joyce's construction of interlocking narrative tangents and sounds enables the reader, like the blind stripling, to construct a '[k]ind of form in the mind's eye' by which the text's urban, bodily and other places can be envisaged. In particular, these chapters expand on Katherine O'Callaghan's notion that:

> Concurrent with the linear trajectory of [Joyce's] texts, instances of repetition attain the capacity to transport the reader between distant and dislocated junctures, provoking a spatial as well as a temporal reading process fuelled by the reader's memory. […] The interpreting reader makes connections across hundreds of pages resulting in a performance "space" beyond and beside linear narrative.[85]

With reference to the topographical contexts, points of view and lines of sight which are evoked by the repetition of leitmotifs of *Ulysses* and *Finnegans Wake*, chapters three and four explore how the visual world is embodied by the mutation of particular sounds and related concepts as they reappear in different forms across time.

[85] Katherine O'Callaghan, 'Mapping the "Call from Afar": The Echo of Leitmotifs in James Joyce's Literary Landscapes', *Making Space in the Works of James Joyce*, ed. by Valérie Bénéjam & John Bishop (London: Routledge, 2011), 173-190, 173.

Numerous critics have suggested that Joyce's treatment of the visual (and blindness) in his works is underpinned by his personal experience with eye disease. In 'Geodesic Joyce', for instance, Eric Bulson asserts that '[Joyce's] exile and eye troubles made the darkness of the blind stripling immediate enough', using this notion as a basis from which to explore the non-visual elements through which Joyce maps Dublin textually in *Ulysses*.[86] Reflecting on similar claims in 'Joyce, Myth and Memory "On His Blindness"', Lorraine Weir argues that 'Joyce's supposed blindness has long served as a crutch for readers disinclined to cope with the unfamiliar':

> We are expected to see when reading the words of an author known to have normal vision but to hear when reading the work of a blind man. Which leads one inevitably to the Pater/Schelling cliché that the architectonic structure of *Finnegans Wake* is the relentlessly ingenious frozen music of a visually undernourished mind! One could as well maintain that Picasso's "Three Musicians" demonstrates a pronounced decline in visual acuity from the works of the blue and rose periods.[87]

The visual and spatial characteristics of Joyce's works have been elucidated further in more recent criticism, and Joyce's partial blindness continues to serve as a useful analogy. Several critical discussions of Joyce's impaired eyesight have since tended to support the idea that, as John Bishop puts it in 'Space in *Finnegans Wake*: An Archaeology', 'he was acutely aware of the nonvisual components of space, particularly kinaesthetic, auditory dimensions and even olfactory components'.[88] Valérie Bénéjam also explores this notion in her introduction to *Making Space in the Works of James Joyce*, in which Bishop's essay appears. She argues that '[i]t was in part Joyce's deteriorating vision—and his consequent exile from the conventional worlds of visual and Cartesian space—that enabled him so productively to map out aspects of space that lie beyond or outside the visual'.[89] As Bénéjam discusses, several critics have '[drawn] analogies between [Joyce's] books and city space' in an attempt to elucidate how Joyce emulates spatial constructs textually.[90]

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86 Eric Bulson, 'Joyce's Geodesy', *Journal of Modern Literature*, Vol. 25, No. 2, Winter 2001/2002, 80-96, 80.

87 Lorraine Weir, 'Joyce, Myth and Memory "On His Blindness"', *Irish University Review*, Vol. 2, No. 2 (Autumn, 1972), 172-188, 172.

88 Bishop, 'Space in *Finnegans Wake*: An Archeology', 26.

89 Valérie Bénéjam, 'Introduction', *Making Space in the Works of James Joyce*, ed. by Bénéjam & John Bishop (London: Routledge, 2011), 11.

90 Valérie Bénéjam, 'Introduction', *Making Space in the Works of James Joyce*, 12.

These include Jean-Michel Rabaté (who compares 'one's progress through *Ulysses* to one's first visit to a large metropolis'), Richard Brown (who explores the idea of 'reading the city as a kind of text and the text as a kind of city') and Eric Bulson (who investigates how Joyce evokes a combined sense of textual and urban disorientation in 'Disorientating Dublin'), whose essays appear in Bénéjam and Bishop's collection.[91] Chapters three and four of this thesis provides a more encompassing background of related critical engagements with the labyrinthine dimension of *Ulysses* and *Finnegans Wake* respectively. They explore how the figure of the manneristic maze provides much more than a useful analogy for describing the disorientating nature of Joyce's works, and how Joyce's construction of branching lines of enunciation in both texts gives rise to labyrinthine narrative structures which embody the urban networks to which they refer.

More specifically, chapter three investigates how Henri Poincaré's discussion of continuity and visual space in *Science and Hypothesis* informs Joyce's spatial re-imagining of narrative form and sound in *Ulysses*. Focusing on 'Wandering Rocks' and 'Sirens', it explores how Joyce mirrors the geometric laws governing how images appear to succeed one another in visual space by manipulating the temporal logic governing when particular aural and linguistic patterns appear to unfold in narrative time. It further demonstrates how geometric constructs and related topographical concepts which entail a meeting of lines—including parallax, triangulation and the chiasmus—are evoked through conceptual and aural repetitions, in which particular objects are revisited from different viewpoints. The final chapter, '"Putting Allspace in a Notshall": Charting *Wake*an Territory', explores how Joyce's construction of an unstable word-world in *Finnegans Wake* builds on similar techniques which are used to construct the disorienting textual labyrinths of *Ulysses*. With reference to the exponential expansion of Shaun throughout Book III, it illustrates how the expanding and contracting dimensions of the *Wake*'s visual spaces are encapsulated by aural variances and figurative distortions within its 'soundscript' (*FW* 219.17). By focusing on the four bedposts' coincident viewpoints of Mr and Mrs Porter's sexual positions in

[91] Valérie Bénéjam, 'Introduction', *Making Space in the Works of James Joyce*, 12. In his earlier essay, 'Joyce's Geodesy', Bulson argues that '[Joyce's] exile and eye troubles made the darkness of the blind stripling immediate enough' (Eric Bulson, 'Joyce's Geodesy', *Journal of Modern Literature*, Vol. 25, No. 2, Winter 2001/2002, 80-96, 90). In this essay, Bulson focuses on the 'non-visual' elements by which Dublin is mapped textually in *Ulysses* and explores how one reads *Ulysses* like a map, in the sense that 'the act of reading is concomitant with tracing the movement of the various characters in each episode from one site to another' (Bulson, 83).

III.iv and referring to Pythagorean musical and cosmological theory, chapter four further examines how particular sounds function as landmarks for charting the overlapping spaces of the *Wake*'s aural and visual worlds. More generally, chapters three and four explore how Joyce's inter-medial play with aural and visual signs facilitates his non-visual articulation of mapped and lived spaces, whereby local significations become obscured by the babbling of different voices and geometric languages.

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By exploring these three inter-related textual applications of geometric and topographical concepts, this thesis explores how Joyce's writing of place in *Ulysses* and *Finnegans Wake* works within and beyond visual media in its cacophonous embodiment of various languages for measuring and describing the spaces in which we live.

Chapter 1. 'Writings of paraboles': Geometric Traditionalism and Corporeal Topography in the *Wake*'s 'Night Lessons'

> *It is […] reported that Ptolemy once asked Euclid if there was not a shorter road to geometry than through the Elements, and Euclid replied that there was no royal road to geometry.*
>
> — Proclus, *A Commentary on the First Book of Euclid's Elements*[1]

This chapter examines the practical and metaphysical issues which Joyce associates with the application of Euclidean geometry as a *geo-meter*, that is, a measure of the Earth. It focusses on the geometry section of the schoolbook in II.ii, in which Dolph and Kev (who are aspects of Shem (⊏) and Shaun (⋀)) apply Euclid's first proposition in order to navigate the Liffey, map the two hemispheres and envisage the corporeal form of their 'eternal geomater', Anna Livia Plurabelle (△) (*FW* 296.31-297.01). The shocking discoveries which the twins experience throughout their attempts at geometrising and mapping the world around them often stem from their inability or unwillingness to think beyond the ideal objectivities which are implied by the language of Euclid's *Elements*. Seeing in nature only straight lines, equilateral triangles, perfect circles and other representations of 'perfection and the divine' (as le Corbusier puts it) they struggle to apprehend the irregular forms which appear on ALP's variably curved bodily and terrestrial surfaces.[2] By alluding to the non-Euclidean geometries of Giordano Bruno, Henri Poincaré and Bernhard Riemann throughout the children's geometry lesson, Joyce interrogates the presumption that Euclidean geometry is the only straight and narrow path to an objective conception of the visual universe. John Bishop addresses this notion in *Joyce's Book of the Night*, arguing that '[t]he night dismantles orthodox geometries and geographies, as we learn in one of the *Wake*'s extended "Night Lessons" (II.ii)'.[3] As we shall see, Joyce's

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1 Proclus, *A Commentary on the First Book of Euclid's Elements*, trans. by Glenn R. Morrow (Princeton, NJ: Princeton University Press, 1970), 57.

2 Le Corbusier, *The City of Tomorrow and its Planning*, trans. by Frederick Etchells (1929), (Mineola, NY: Dover, 1987), xxi.

3 John Bishop, *Joyce's Book of the Dark* (Madison, WI: University of Wisconsin Press, 1986), 157.

allusions to unorthodox geometries in *Finnegans Wake* often appear within references to Euclid’s *Elements*. Throughout the teachings and parables of the schoolbook in II.ii, parabolic (i.e.: Euclidean) representations of the visual universe perversely play host to non-Euclidean alternatives including Riemannian geometry, which accounts for elliptic paraboloids and other variably curved bodies. By bastardising the original connotations of Euclidean signs and causing them to accommodate other possible significations, as he does with linguistic signs and their original languages throughout the *Wake*, Joyce treats geometry as a rhetorical device which, like language, can be used to provide alternative translations of a common reality. The disintegration of geometric ideal objects in *Finnegans Wake* not only epitomises Joyce’s post-Cartesian awareness of his own subjectivity (a strand which can be traced to his earliest works) but it also reflects wider concerns regarding the abstraction of Euclidean geometry which arose following the dissemination of universally coherent non-Euclidean geometries in the early to mid-nineteenth century, as well as the application of non-Euclidean geometry within modern scientific practice following the development of Einstein’s general theory of relativity. Joyce’s critique of the infinitely straight line in *Finnegans Wake* also bears critical implications within the context of geometry’s topographical applications. By presenting the axioms which underpin applied geometric practices such as triangulation, parallax and the Cartesian coordinate system as being open to interpretation, Joyce calls into question the most basic predicates which formalise any conception of space and place.

Before examining Joyce’s response to the perceived traditionalism of Euclid’s *Elements* and his invocation of alternative geometric languages within the geometric babbling of II.ii, this chapter begins by providing a brief summary of Euclid’s critics in the following section, ‘The Euclidean tradition: 300 BC—present’. By discussing the history of uncertainty regarding the numerous abortive defences and attempted reformulations of Euclid’s parallel postulate from around 300 B.C. onwards, this section provides a theoretical and a critical context from which to consider the polysemic nature of the *Wake*’s geometric world. The second section of this chapter, ‘Joyce and geometric traditionalism’, investigates how Joyce became familiar with this history of uncertainty, particularly in light of his readings of Giordano Bruno and Henri Poincaré, and it investigates his initial encounters with non-Euclidean geometries. The remainder of this chapter, from the third section entitled ‘Geometric traditionalism in II.ii’ onwards, considers how Joyce reflects

contemporary concerns regarding the senseless, *a priori* application of geometric ideal objectivities within the pedagogical context of the schoolbook in II.ii, in which Dolph and Kev are instructed to rote-learn and senselessly apply both geometric and linguistic symbols by their four masters. By exploring the practical issues which the twins face when they attempt to apply their dogmas and map ALP's bodily surface, this section illustrates how the ideal objects of Euclid's *Elements*, such as the straight line and the equilateral triangle, are bent out of shape when they are projected onto the variably curved surfaces of the human body and the Earth. More generally, this chapter discusses how Joyce responds to Bruno and Poincaré in demonstrating how geometric signs, like linguistic signs, are 'created by ourselves', as le Corbusier puts it, and how the potentially mythical ideals which they imply have nevertheless become ingrained within the proliferating *a priori* systems which we rely on when attempting to understand and describe the visual world.[4] It also explores how the classical belief in there being only one true geometry—like 'history' according to Stephen—is presented as 'a nightmare' from which we have '[struggled] to awake' for over two thousand years (*U* 2.377).

The Euclidean tradition: 300 BC—present

Joyce's treatment of the ideally straight line in his representations of the 'corpus entis and it scurves' in *Finnegans Wake* reflects a history of doubt over Euclid's fifth postulate (or twelfth axiom), which is also known as the parallel postulate (*FW* 376.15). Euclid's fifth postulate essentially defines parallels as 'straight lines in the plane which never meet even if produced indefinitely', as Jeremy Gray phrases it in *Ideas of Space*, yet in the *Elements* this simple notion is unnecessarily complicated.[5] The ambiguities concealed by the parallel postulate's pedantic phrasing propelled a search for simpler as well as completely different, non-Euclidean formulations. However, it was Euclid himself who exhibited the first signs of uncertainty over the truths which it implied, and for his entire life he and his disciples remained unable to prove the fifth postulate using the other four. As it appears in Joyce's copy of H. S. Hall and F. H. Stephens' text-book edition of Euclid's *Elements*, which features in Joyce's Trieste library, the parallel postulate states that:[6]

4 Le Corbusier, xxi.

5 Jeremy Gray, *Ideas of Space: Euclidean, Non-Euclidean and Relativistic*, 2nd ed. (Oxford: Oxford University Press, 1989), 28-29.

> If a straight line cut two straight lines so as to make the two interior angles on the same side of it together less than two right angles, these straight lines being continually produced, will at length meet on that side on which are the angles which are together less than two right angles.[7]

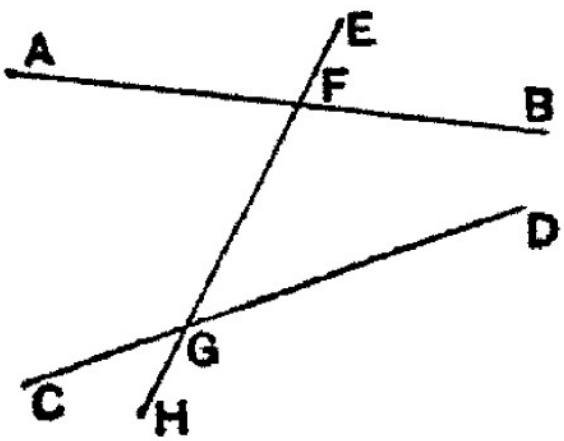

Fig. 1: H. S. Hall and F. H. Stephens, *A Text-book of Euclid's Elements for the Use of Schools, Books I–VI and XI* (London: MacMillan, 1898), 8. Original caption reads: '[…] if the two straight angles AB and CD are met by the straight line EH at F and G, in such a way that the angles BFG, DGF are together less than two right angles, it is asserted that AB and CD will meet if continually produced in the direction of B and D.'

As well as being approximately twice the length of every other, Euclid's fifth postulate is not self-evident. The incorporation of a premise and a logical conclusion suggests that, rather than being a postulate or an axiom at all, it is a deduction: a postulate assumes the existence of a fact as a basis for reasoning, yet Euclid proves the existence of one using an internal logic. As Gray argues:

> the problem of parallels puzzled Greek geometers a great deal. For a start, the postulate is non-intuitive and asserts things about lines meeting lines indefinitely far in the distance. […] Having to settle for a Gordian solution to the problem is rather unsatisfactory and possibly even misleading. Perhaps the postulate could even give trouble.[8]

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6 Michael Patrick Gillespie (ed.), *James Joyce's Trieste Library: A Catalogue of Materials at the Harry Ransom Humanities Research Center* (Austin, TX: University of Texas Press, 1986), 111.

7 H. S. Hall & F. H. Stephens, *A Text-book of Euclid's Elements for the Use of Schools, Books I–VI and XI* (London: MacMillan, 1898), 8.

8 Gray, *Ideas of Space: Euclidean, Non-Euclidean and Relativistic*, 2nd ed., 32.

The postulate's periphrastic formulation also betrays a sense of indeterminacy in that it avoids directly implicating the notion of infinity. Euclid could have greatly simplified its meaning by merely stating that two infinitely extended parallel lines cannot intersect; a relatively lucid concept which is implied in the fifth postulate's accompanying diagram (fig. 1). For Euclid, however, the incorporation of a wholly abstract concept such as infinity was to be avoided for it could not be directly related to sense-experience. These issues are raised by Hall and Stephens in their footnote to Euclid's parallel postulate, in which they state that '[a]xiom 12 has been objected to on the double ground that it cannot be considered self-evident, and that its truth may be deduced from simpler principles'.[9] They further call into question the axiom's role in the *Elements* by highlighting the fact that '[i]t is employed for the first time in the 29th Proposition of Book I […]'.[10] While the geometry of Euclid, as Hall and Stephens suggest, can be used without directly referring to the parallel postulate, Euclid's fifth postulate nevertheless plays a fundamental role in its assumption that a straight line would remain straight at any length. Without postulate five, the very definition of a straight line (and by extension every other rectilinear object in Euclidean geometry) becomes further shrouded in obscurity.

For over two thousand years geometers have attempted to prove Euclid's fifth postulate using the elements of his geometric system and none have yet succeeded. As Stefan Mykytiuk and Abe Shenitzer put it in *Mathematical Evolutions*, '[a]ttempts to deduce the parallel postulate from the remaining postulates and the axioms were undertaken by various mathematicians for over 2000 years. All of them ended in failure'.[11] In the fifth century Proclus responded to germinal concerns regarding Euclid's fifth postulate and addressed many of its underlying ambiguities in his *Commentary on the First Book of Euclid's* Elements (410-485). In this pioneering work Proclus not only 'shot down down the notion advanced by some that the fifth postulate was self-evident', as Jason Bardi remarks in *The Fifth Postulate*, but even 'refused to [...] consider the fifth as one of the postulates'.[12] By providing an account of various attempts at proving the fifth postulate, all of which (including his own, as it would later turn out) are false, Proclus foreshadowed a

[9] Hall & Stephens, 8.
[10] Hall & Stephens, 8.
[11] Stefan Mykytiuk & Abe Shenitzer, 'Four Significant Axiomatic Systems and Some of the Issues Associated with Them', *Mathematical Evolutions*, ed. by Abe Shenitzer & John Stillwell (D.C., WA: Mathematical Association of America Press, 2002), 219-224, 219.
[12] Jason Socrates Bardi, *The Fifth Postulate: How Unravelling a Two-Thousand-Year-Old Mystery Unravelled the Universe* (Hoboken, NJ: John Wiley & Sons, 2009), 61.

tradition of equally abortive attempts which would persist until well after the decline of the ancient Greek mathematical tradition.

The issues which Proclus raised gained renewed popularity within medieval Islamic thought, during a period of mathematical and scientific advancement heralded by Caliph Harun al-Rashid's establishment of the House of Wisdom in the ninth century. As Uta Merzbach and Carl Boyer discuss in *A History of Mathematics*:

> Islamic mathematicians were clearly more attracted to algebra and trigonometry than to geometry, but one aspect of geometry held a special fascination for them—the proof of Euclid's fifth postulate. Even among the Greeks, the attempt to prove the postulate had become virtually a "fourth famous problem of geometry," and several Muslim mathematicians continued the effort.[13]

Perhaps one of the most unique efforts during this period was the astronomer-poet Omar Khayyám's, who was dissatisfied with Ibn al-Haytham's attempted proof for Euclid's parallel postulate on the basis that it incorporates motion, which 'Aristotle condemned the use of […] in geometry'.[14] Khayyám endeavoured to elucidate the postulate's meaning by producing an equally logical, more axiomatically worded equivalent. In *Explanations of the Difficulties in the Postulates of Euclid* (1077), Khayyám's axiom asserts that '[t]wo converging lines intersect and it is impossible for the converging straight lines to diverge in the direction of convergence'.[15] Formulations of Euclid's fifth postulate have since drawn from the basic sense of Khayyám's definition which, unlike Euclid's, introduces the notion of infinity by focusing on the concept of converging lines rather than angles of intersection: if two converging lines must intersect, then two non-convergent, or parallel, lines cannot intersect and would never cease to run parallel.

Perhaps the most coherent reiteration of the parallel postulate was produced in the eighteenth century by John Playfair who, in his 1795 edition of Euclid's *Elements*, translates it as such: '[p]arallel straight lines, are such as are in the same plane, and which,

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[13] Uta C. Merzbach & Carl B. Boyer, *A History of Mathematics*, 3rd ed. (Hoboken, NJ: John Wiley & Sons, 2011), 220.

[14] Merzbach & Boyer, 220.

[15] Omar Kahyyám, *Explanations of the Difficulties in the Postulates of Euclid* (1077), quoted in Boris Abramovich Rozenfel'd, *A History of Non-Euclidean Geometry: Evolution of the Concept of a Geometric Space* (New York, NY: Springer, 1988), 38.

being produced ever so far both ways, do not meet'.[16] In Hall and Stephens's edition Euclid's *Elements*, the Playfair axiom is incorporated in definition twenty-five at the beginning of Book I: '[p]arallel straight lines are such as, being in the same plane, do not meet, however far they are produced in either direction'.[17] Again, by bringing into play the concept of parallel lines Playfair's version of Euclid's fifth postulate hangs on the notion of infinity in its suggestion that it would be impossible for two parallel lines to ever diverge or converge. Playfair's definition of the parallel postulate, which has come to be known as the 'Playfair axiom', is generally used in geometric textbooks to this day due to its relatively simple and self-evident nature. Jeremy Gray argues that 'it is the clearest summary of the postulate to modern eyes' and that, as we shall see, '[i]ts great attraction is that it can readily be reformulated to suggest non-Euclidean geometries by denying either the existence or uniqueness of parallels'.[18] Although a number of geometers including Khayyám and Playfair were able to clarify the essential meaning of Euclid's obscurely pedantic postulate, they remained unable to prove that parallel lines meet at infinity, and indeed whether the universe was infinite at all. Khayyám was well aware of the possibility that Euclid's fifth postulate could not be proved using Euclidean geometry, and was one of the first geometers to seriously consider non-Euclidean alternatives. It remained to be proved whether two lines can in fact be parallel at all, and whether the abstract notion of infinity actually exists beyond the mathematical imagination, within a possibly bounded material universe. If anything, by elucidating Euclid's postulate such re-definitions merely made the conceptual ambiguities which Euclid tried to avoid more explicit.

Furthering the inquiries of Khayyám and his disciples, a series of geometers emerged who, rather than attempting to produce a logical equivalent for Euclid's parallel postulate, set out to replace postulate five with another axiom signifying an altogether different meaning. By giving rise to parallel postulates whose proofs escaped the laws of Euclidean geometry, many of these experiments bore shocking implications regarding the nature of the straight line and by extension the fundamental constitution of space. Giordano Bruno was a pioneer in this regard. His heterodox geometric concepts are discussed in several of his scientific

[16] John Playfair (ed.), *Elements of geometry; containing the first six books of Euclid, with two books on the geometry of solids. To which are added, elements of plane and spherical trigonometry* (Edinburgh: Bell & Bradfute, 1795), 6.
[17] Hall & Stephens, 5.
[18] Gray, *Ideas of Space: Euclidean, Non-Euclidean and Relativistic*, 2nd ed., 34.

works including *De la causa, principio, et Uno* (1584), *Articuli centum et sexaginta adversus huius tempestatis mathematicos atque Philosophos* (1588), *De triplici minimo et mensura* (1591) and *De innumerabilibus, immenso, et infigurabili* (1591). As mentioned in the Introduction of this thesis, Bruno's geometric imaginings are also discussed at length in James Lewis McIntyre's *Giordano Bruno. Giordano Bruno* was the first in-depth monograph on Bruno ever to be published in English, and it was reviewed in the year of its publication by James Joyce for the *Daily Express*, in which Joyce refers to Bruno as the 'father of […] modern philosophy'.[19] Throughout McIntyre's account of Bruno's geometric theories in part two of *Giordano Bruno* is an emphasis on Bruno's notion that '[m]athematical exactness [...] is never found in the material world'.[20] As McIntyre explains, Bruno distanced himself from the Euclidean geometric tradition as well as the predominating Aristotelian tradition of logical reasoning in an attempt to simplify the elements of Euclidean geometry on the basis of experiential evidence. His reductive geometric system accounts for the formal properties of *minima*, or atomic particles, which he used to support his argument that any appearance of geometric perfection or exactness in the material world is merely an 'illusion of sense'.[21] Bruno's critique of the Euclidean tradition and its ideal objectivities plays into his denunciation of the infinitely straight line and the perfect circle in *De la Causa*. Discussing Bruno's Cusanic notion that the infinite finds its corollary in the infinitesimal, McIntyre expands upon this re-conception of the straight line:

> in the maximum there is no difference between the infinite circle and the straight line; the greater a circle is, the more nearly it approximates to straightness. […] as a line which is greater in magnitude than another approximates more nearly to straightness, so the greatest of all ought to be superlatively, more than all, straight, so that in the end the infinite straight line is an infinite circle.[22]

Bruno's hypothesis that, in an infinite universe, seemingly rectilinear forms are in actual fact infinitesimally curvilinear bears considerable weight in re-thinking the application of two-dimensional geometry to a curved plane such as the surface of the Earth: if a

[19] James Joyce, 'The Bruno Philosophy', *Occasional, Critical, and Political Writing*, ed. by Kevin Barry (Oxford: Oxford University Press, 2000), 93-96, 93.
[20] James Lewis McIntyre, *Giordano Bruno* (London: MacMillan & Co., 1903), 159.
[21] McIntyre, 183.
[22] McIntyre, 135-136.

sufficiently long straight line were drawn across the Earth's ovoid surface, it would eventually return to its point of departure and resemble a circle in three dimensions. By positing that the Euclidean geometer operates on too small a scale and that the space he objectifies in two dimensions may in fact be positively curved, Bruno's geometric imaginings foreshadowed several non-Euclidean concepts which would become systematised by Bernhard Riemann almost three hundred years later. Although many of Bruno's fantastical geometric theorems concerning the curvature of space are largely unfounded, his logical alternatives to Euclidean geometry nevertheless demonstrated that Euclid's parallel postulate was equally unsubstantiated. If Bruno was correct in arguing for the essential curvature of every straight line, a theory which cannot be proved wrong, then Euclid's parallel postulate had to be false: that is, if perfect rectilinearity was a product of the imagination and all lines converged or diverged then, on large enough scales, parallel lines would eventually meet.

Bruno was hugely forward-thinking in this regard for it was not until the end of the Renaissance that entire non-Euclidean models for space began to be elaborated around the foundational premise that Euclid's parallel postulate was false, yet even then these geometries were generally not taken seriously. In 1709, the Jesuit priest and mathematician Giovanni Saccheri rekindled the inquiries of Omar Khayyám and attempted to defend Euclidean geometry by developing one such geometric system, in which multiple parallel lines can be drawn through a single point. As Gray discusses in *Ideas of Space*, Saccheri provided '[t]he most fullblooded attempt upon the parallel postulate during the eighteenth century'.[23] He believed that the construction of an alternative geometry in which parallel lines diverged from each other would prove to be logically impossible. To his surprise, however, Saccheri produced a burgeoning *a priori* system in which everything held just as coherently as in Euclid's. Although Saccheri's intendedly hypothetical system is now considered to be an early forerunner of hyperbolic geometry, he abandoned his own creation in disgust. As Constance Reid puts it in *A Long Way from Euclid*:

> When he found that assumptions about parallel lines quite different from the famous "fifth" did not lead him into the expected contradictions but into a strange and fantastic geometry which was nevertheless as consistent as Euclid's, he fell back upon his feelings instead of his brains and peppered the

[23] Gray, *Ideas of Space: Euclidean, Non-Euclidean, and Relativistic*, 2nd ed., 60.

> last pages of his work with such epithets of the logically defeated as "destroys itself," "absolutely false," "repugnant".[24]

Saccheri's horrified turn away from reason in the face of a disfigured geometry which, if accepted, could invalidate the entire Euclidean system foreshadowed the public's reception of non-Euclidean geometries in the nineteenth century. It also highlights a profound affinity between spiritual faith and scientific truth: Saccheri's prevailing defence of Euclidean geometry as the sole means of objectively measuring the universe in spite of scientific evidence suggesting otherwise not only encapsulates the general attitude adopted by the Jesuit church towards nineteenth century non-Euclidean geometries, but it also reflects the hostile attitude towards alternative geometries espoused by the nineteenth-century scientific community.

Although Saccheri was able to smother his geometric creations before they gained recognition and proliferated beyond his control, the modernising scientific world was forced to seriously consider the possibility that Euclidean geometry was not the only valid measure for the universe following the publication of the non-Euclidean geometries of Nikolai Lobachevsky (1829-1830), János Bolyai (1832) and Bernhard Riemann (1868). The key principles and various applications of these geometries are discussed at length by Henri Poincaré in *Science and Hypothesis* (1902). Published in English that same year, it is a text which Joyce, like many of his contemporaries, was familiar with by the time the later chapters of *Ulysses* were composed in 1920; and in *Finnegans Wake*, Joyce includes a direct tribute to the French mathematician: '[t]hanks eversore much, Pointcarried!' (*FW* 304.05). In his account of non-Euclidean geometry, Poincaré examines how Lobachevsky and Riemann managed to create two distinct geometric systems which proved just as universally coherent as Euclid's by simply replacing his fifth postulate and retaining the other four. The hyperbolic geometries of Lobachevsky and Bolyai bear striking parallels with each other, yet they were constructed independently. As Gray puts it, '[t]he work of Bolyai and Lobachevskii [*sic*] is astonishingly similar, and yet each remained in ignorance of the very existence of the other until some years after their work was published'.[25] Both assume 'that several parallels may be drawn through a point to a given straight line' (fig.

[24] Constance Reid, *A Long Way from Euclid* (1963; repr. Mineola, NY: Dover, 2004), 153-154.
[25] Gray, *Ideas of Space: Euclidean, Non-Euclidean and Relativistic*, 2nd ed., 106.

2.1) and that 'the sum of all angles of a triangle is always less than two right angles' (fig. 2.2).[26] Similar to Saccheri's hyperbolic geometric concepts, Lobachevsky's and Bolyai's geometries were rejected primarily on the grounds that they described forms which did not appear to exist in nature. Although this common criticism does not take into account bounded models for space (hyperbolic geometry is applicable on smaller scales, for example, including the interior surfaces of totally curved objects), Lobachevsky and Bolyai struggled to provide concrete examples of hyperbolic geometry in the visible universe and their works were largely considered to be imaginative fantasies. As Merzbach and Boyer discuss in *A History of Mathematics*, Lobachevsky's hyperbolic geometry 'was in every sense a valid geometry, but so contrary to common sense did it appear, even to Lobachevsky, that he called it "imaginary geometry"'.[27] Riemann's elliptic system, on the other hand, which accounts for positive rather than negative curvature, was a geometry which could be directly related to sense-experience. His theorems, which could equally be applied to the Earth's surface, assume that it is impossible to draw a parallel line through a given point to a given line (fig. 3.1) and that the sum of the angles of a triangle is greater than that of two right angles (fig. 3.2).[28] Both of these systems echo the heretical treatises of Bruno in their assumption that a straight line would, if sufficiently extended, curve upon itself and eventually resemble a circle.

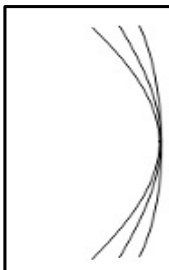

Fig. 2.1:
Parallel lines on a hyperbolic plane

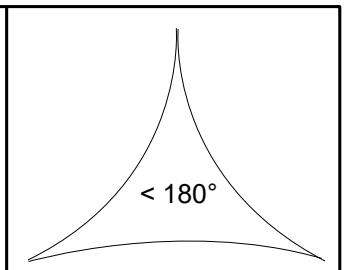

Fig. 2.2:
A hyperbolic triangle

Fig. 3.1:
Parallel lines on an elliptic plane

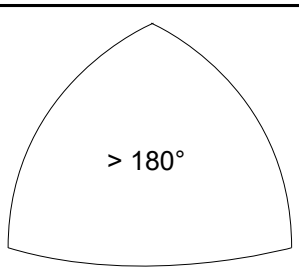

Fig. 3.2:
An elliptic triangle

[26] Henri Poincaré, *Science and Hypothesis*, trans. by W. J. Greenstreet (Mineola, NY: Dover, 1952), 37.
[27] Merzbach & Boyer, 495.
[28] Poincaré, 39.

In the wake of these perfectly tenable non-Euclidean geometries, universally accepted axioms concerning the relative sum of the angles in a triangle, the possibility of drawing parallel lines through a single point as well as the very nature of a straight line itself had become indeterminable. This was highlighted by Bernhard Riemann in his ground-breaking 'Habilitation' lecture in 1854, as Jeremy Gray discusses in *Worlds Out of Nothing*:

> A point upon which Riemann insisted, indeed he opened the lecture with it, was that Euclid's postulates are completely subverted: no longer can they be regarded as unproblematically true assumptions abut physical space. Instead, Riemann argued, all geometry is based on specific metrical considerations, and Euclid's geometry cannot occupy a paramount position as the geometry of space and the source of geometrical concepts which are induced onto embedded surfaces.[29]

The interrogation of Euclidean geometry's 'paramount position as the geometry of space' in the nineteenth century provoked apologist defences from a number of mathematicians including Lewis Carroll who, in *Euclid and his Modern Rivals*, argues that 'there are strong a priori reasons for retaining, in all its main features, and specially in its [...] treatment of Parallels, the Manual of Euclid'.[30] In spite of Carroll's and other similar pleas to retain a Euclidean conception of parallel lines and to continue assuming everything which this entailed, few mathematicians could ignore the fact that Euclidean geometry had lost its monopoly in objective reasoning. The predicates of Euclidean geometry were no more nor less valid than those implied by hyperbolic and elliptic geometric systems, and it had therefore become an entirely relative means of measuring the world. As Poincaré argues, it is pointless deliberating over whether or not one geometry is any truer than the other: '[w]e might as well ask if the metric system is true, and if the old weights and measures are false […]. One geometry cannot be more true than another it can only be more convenient'.[31] Although Euclidean geometry may have been the most 'convenient' system, as Poincaré argues, it had been proved to be a relative system which co-existed with a variety of alternatives. The relative status of Euclidean geometry influenced a range of scientists throughout the late nineteenth and twentieth centuries including Albert

[29] Jeremy Gray, *Worlds Out of Nothing: A Course in the History of Geometry in the 19th Century* (London: Springer-Verlag, 2007), 193.
[30] Lewis Carroll, *Euclid and his Modern Rivals* (1879; repr. London: MacMillan, 1885), ix.
[31] Poincaré, 50.

Einstein, whose general theory of relativity assumes a hyperbolic, four-dimensional model for space-time. Einstein's incorporation of Lobachevskian, rather than Euclidean, geometric laws in physics further demonstrated the increasingly popular notion that, as he famously put it in 1921, 'insofar as the propositions of mathematics give an account of reality they are not certain; and insofar as they are certain they do not describe reality'.[32] For Einstein, hyperbolic geometry proved to be the most 'convenient' for describing four-dimensional space-time.[33] The popularisation of Einstein's non-Euclidean model within modern science entered into wider understandings of geometry as a form of language: Euclidean geometry—previously regarded as the most univocal and ideally objective means of measuring the universe—had become a device open to translation and interpretation whose meanings were no longer 'certain'.

By the turn of the twentieth century, Euclidean geometry had thus become re-conceived as a conventional rather than a necessarily definitive *meter* for visual reality. The emergent realisation that every truth it implied could be deduced by using an alternative system led a range of leading mathematicians, scientists and philosophers to agree with Poincaré's notion that the preference of any one particular geometry over another was largely constituted by traditional dictates. Significantly, this is the period when scholarly and mainstream interest in the Nolan peaked higher than ever before: over fifty books by or about Bruno were published in Europe between 1850 and 1911, which encompasses the period when Joyce would have first encountered James Lewis McIntyre's *Giordano Bruno*, as well as the compiled Italian editions of Bruno's works which he likely encountered through his studies at University College Dublin. Bruno was a pioneer in regarding Euclidean geometry as a traditional or, as Poincaré puts it, a habitual mode of measuring the world, and his critique of geometric traditionalism would have responded to similar concerns which were emerging at the time of his renewed popularity.[34] Maintaining that the traditionally informed inquiries of Euclidean geometers and Aristotelian philosophers were 'removed from nature' and that many of their theories were pure works of the imagination, Bruno, as McIntyre puts it, attempted to 'liberate both himself and others from so many

[32] Albert Einstein, quoted in Morris Kline, *Mathematics: The Loss of Certainty* (Oxford: Oxford University Press, 1980), 97.
[33] Poincaré, 50.
[34] Poincaré, 56.

vain inquiries, and fix their contemplation on things abiding and sure'.[35] He did this by developing his own heretical philosophy of nature which only sought for 'physical (i.e. real or "immanent") causes or principles' (*U* 2.377).[36] By recalcitrantly pursuing projects such as circling the line or, as Leopold Bloom is said to have attempted solving in *Ulysses*, 'the problem of the quadrature of the circle', Bruno in large part aimed to undermine the narrow-mindedness of his contemporaries, who he believed would apply geometry senselessly and fail to apprehend phenomena which eluded Euclidean laws (*U* 17.1071-1072). Drawing from Bruno's Latin works, Arielle Saiber summarises this critique in *Giordano Bruno and the Geometry of Language*:

> [Bruno] mocked what he saw as pedantry in their choice of topics and procedures; he considered them "teoremisti" [theoremists] and archididascali [archdidacts]; and he punningly called them "geametras" (a made-up word) instead of "geometras." He called "stupid" those who tried to geometricize nature, that is, to make nature conform to preordained symmetries. […] More generally, he scorned those who merely measured for measuring sake, or "played with geometry." For Bruno, […] mathematics is more of an "existential problem" than an "abstract intellectual exercise".[37]

Bruno's reformation of Euclidean ideal objects in his mathematically focussed works reflects his conception of geometry as an abstract rhetorical device which, as he does with language in his creation of (strikingly *Wake*an) puns and euphemisms, can be played with and morphed into alternative forms. Unlike many of his contemporaries, however, Bruno continually referred back to physically immanent principles throughout his reasoning. His critique of those 'geometras' who employed geometry simply to measure 'for measuring sake' foreshadowed the more encompassing nineteenth and twentieth-century critiques of Euclidean geometry's treatment as an 'abstract intellectual exercise'—or, as Edmund Husserl argues, an 'intellectualistic game'—which followed the dissemination of non-Euclidean alternatives.[38]

Bruno's attack on Euclidean geometry as a sensually delimiting traditional system presaged a number of related critiques which appeared in the first half of the twentieth

[35] McIntyre, 119.
[36] McIntyre, 120-121.
[37] Arielle Saiber, *Giordano Bruno and the Geometry of Language* (Hampshire: Ashgate, 2005), 46.
[38] Edmund Husserl, *The Crisis of European Sciences and Transcendental Phenomenology*, trans. by David Carr (Evanston, IL: Northwestern University Press, 1970), xxvi.

century, including Edmund Husserl's 'The Origin of Geometry'. Husserl's essay constitutes an interrogative inquiry into the historicity of geometric ideal objects in which, as Jacques Derrida explains in *Edmund Husserl's 'Origin of Geometry': An Introduction*, geometry is considered to be 'a traditional system of ideal objectivities'.[39] Like any other traditional system such as history or language, Husserl argues that Euclidean geometry is assimilated and disseminated by future generations who often do not question the origins of its sense. Calling to mind the motives which underpinned the non-Euclidean geometries of Riemann, Lobachevsky and—as we have just seen—Bruno, Husserl proposes a *Rückfrage*, or 'return inquiry', to the primordial evidence upon which geometric sense is founded.[40] In doing so, Husserl refutes Immanuel Kant's deduction that geometric ideal objectivities existed before geometry was first conceived, in some 'transcendental prehistory'.[41] Rather, he argues that geometric ideal objects have their origin in sense-experience, and that the construction of a geometric system can only occur following an original act of the human imagination. As le Corbusier puts it, '[g]eometry is the means, created by ourselves, whereby we perceive the external world and express the world within us. […] It is also the material basis on which we build those symbols which represent to us perfection and the divine'.[42] In his *Introduction*, Derrida relates this notion to the acquisition of linguistic ideal objectivities which, like geometric ideal objectivities, refer to imagined rather than material constructs (the word 'lion', for instance, refers to an ideal lion, from which every conception of a lion deviates).

In his discussion of Husserl's movement away from geometric equivocity and towards a more univocal empirical language in *Edmund Husserl's 'Origin of Geometry': An Introduction*, Derrida cites Joyce's works as a contrasting example. Reflecting on Stephen's struggles to awake from the 'nightmare' of 'history' in *Ulysses*, Derrida argues that Joyce's plurivocal language takes responsibility for 'buried, accumulated, and interwoven intentions within each linguistic atom, each vocable, each word, each simple proposition, in all wordly cultures and their most ingenious forms'.[43] Contrastingly, he argues that Husserl reduces rather than expands empirical language in an attempt to reveal

[39] Jacques Derrida, *Edmund Husserl's 'Origin of Geometry': An Introduction*, trans. by John P. Leavey (Lincoln, NE: University of Nebraska Press, 1989), 117.
[40] Derrida, 48.
[41] Derrida, 40.
[42] Le Corbusier, xxi.
[43] Derrida, 102.

the 'pure source' of historicity and traditionality.[44] Following Derrida, several critics have discussed how *Finnegans Wake* works within a historical nightmare, whereby every thought, word and act is informed by substratal layers of meaning embedded by the flow of time. This notion could be expanded even further and applied to the *Wake*'s fall into the geometric traditions which formalise our understanding of space. Just as *Finnegans Wake* enters into the 'nightmare' of 'history' and, as Seamus Deane argues, falls into language and 'unlimited semeiosis', so too is it cast into a plurality of geometric traditions, including the tradition of Euclid which began over three hundred years before the dawn of Christianity.[45] Written in the wake of everybody's awareness that established Euclidean ideal objects do not necessarily correspond to reality, Joyce's *Wake* projects a nightmare in which the univocity of each Euclidean element, ideal object and proposition is obliterated, and through which the Euclidean tradition's axiomatic certitudes become entangled in the predicates of non-Euclidean laws.

Joyce and geometric traditionalism

Joyce's developing fascination with the perceived traditionalism of Euclidean geometry, and his engagement with the processes of indoctrination through which Euclidean ideal objectivities become sedimented within modern scientific discourse, would have been nurtured by a number of more conventional geometric source texts which he consulted while writing *Finnegans Wake*. Joyce was familiar with the pedagogical works of Isaac Todhunter, who wrote a number of mathematical textbooks and edited Euclid's *Elements* (appearing in the *Wake* as 'dodd-hunters!' and 'toadhauntered'; John Casey, a nineteenth century Irish geometer who edited *The First Six Books of the Elements of Euclid* and *A Sequel to the First Six Books of the Elements of Euclid*; and Percival Frost, a nineteenth century English mathematician who wrote *A Treatise on Solid Geometry* (*FW* 283.25; 293.F02). In *Finnegans Wake*, 'Casey's Euclid' combines with Frost's to form 'Casey's frost book' (*FW* 206.12-13; 286.09). As discussed previously, Joyce also retained a copy of Hall and Stephens's *A Text-Book of Euclid's Elements* throughout this period, which features in his Trieste library.[46] These source texts provided Joyce with typical examples of the pedagogical writing styles which he would incorporate in the geometry section of the

[44] Derrida, 103.
[45] Seamus Deane, 'Introduction', *Finnegans Wake* (London: Penguin, 2000), vii-xlx, ix.
[46] Gillespie (ed.), *James Joyce's Trieste Library*, 111.

schoolbook in II.ii. They also indicate Joyce's wider concern with the systematic means by which the 'aximones' and 'prostalutes' of '[t]*he aliments of jumeantry*' are acquired, and how fundamental geometric principles originate within the learner's imagination (*FW* 285.27-286.L10). In 'The Origin of Geometry', Husserl stresses how elementary geometry textbooks encapsulate the traditional and senseless manner in which geometry is learned:

> How the living tradition of the meaning-formation of elementary concepts is actually carried on can be seen in elementary geometrical instruction and its textbooks; what we actually learn there is how to deal with *ready-made* concepts and sentences in a rigorously methodical way. Rendering the concepts sensibly intuitable by means of drawn figures is substituted for the actual production of the primal idealities. And the rest is done by success—not the success of actual insight extending beyond the logical method's own self-evidence, but the practical successes of applied geometry, its immense, though not understood, practical usefulness.[47]

Although Husserl's essay was not first published until 1936, by which time Joyce had already drafted the bulk of the 'nightlessons' chapter, he explores many similar ideas regarding the senseless acquisition and application of 'primal idealities' throughout the geometry section, in which Dolph and Kev regurgitate '*ready-made* concepts and sentences in a rigorously methodical way'. By illustrating how the 'elementary concepts' which they acquire prove to be useless when they are applied to measure irregular surfaces, Joyce highlights how their disappointments stem from a lack of 'actual insight extending beyond the […] self-evidence' of Euclid's 'logical method'.

Besides his various encounters with pedagogical geometric texts, Joyce would also have had a basic grasp on the philosophical implications of non-Euclidean geometry's existence given his consultation of Bertrand Russell's *Introduction to Mathematical Philosophy* (1919) while writing *Ulysses.*[48] Phillip F. Herring highlights the significance of this source text in *Joyce's Uncertainty Principle*, pointing out that 'Joyce copied extensive notes [from *The Introduction to Mathematical Philosophy*] for the "Ithaca" episode of *Ulysses*'.[49] Russell's *Introduction* not only encompasses the development of non-Euclidean geometries but also contains discussions of Poincaré's theories on finitude and Kant's *Critique of Pure*

[47] Husserl, 'The Origin of Geometry', 169.
[48] Phillip F. Herring (ed.), *Joyce's Notes and Early Drafts for Ulysses: Selections from the Buffalo Collection* (Charlottesville, VA: University of Virginia Press, 1977), 104.
[49] Phillip F. Herring, *Joyce's Uncertainty Principle* (Princeton, NJ: Princeton University Press, 1987), 91.

Reason. Exploring the impact which re-conceptions of the parallel postulate such as Poincaré's had on the Kantian understanding of geometry as a transcendental phenomenon, Russell notes that:

> Kant, having observed that the geometers of his day could not prove their theorems by unaided argument, but required an appeal to the figure, invented a theory of mathematical reasoning according to which the inference is never strictly logical, but always requires the support of what is called "intuition". The whole trend of modern mathematics, with its increased pursuit of rigour, has been against this Kantian theory. The things in the mathematics of Kant's day which cannot be proved, cannot be known for example, the axiom of parallels. What can be known, in mathematics and by mathematical methods, is what can be deduced from pure logic. What else is to belong to human knowledge must be ascertained other wise empirically, through the senses or through experience in some form, but not a priori.[50]

Kant's notion that the objects of geometry, in particular, are intuitive constructs rather than abstract products of pure reason enters into Husserl's critique of Kant in 'The Origin of Geometry', in which he argues that geometric ideal objectivities did not exist before the creation of geometric ideal objects. As Derrida puts it in his *Introduction* to Husserl's essay, '[i]n the Kantian revelation, on the contrary, the first geometer merely becomes conscious that it suffices for his mathematical activity to remain within a concept that it *already possesses*'.[51]

Khayyám was a significant influence for Joyce in light of modern scientific and philosophical reflections on the origin of geometric symbols, as well as the issues regarding the extent to which sensual evidence formalises their original construction. Joyce owned and heavily annotated a copy of Edward Fitzgerald's translation of Omar Khayyám's *Rubáiyát*, which appears in both his personal and Trieste libraries.[52] Allusions to 'K.M. O'Mara' and his 'Rubyjets' appear throughout the *Wake*, and various passages imitate the prosody and rhyme scheme of the poem (*FW* 122.11-19). In his introduction to the *Rubáiyát*, Fitzgerald highlights several ideological similitudes between Khayyám's verse and his heterodox approach to geometry. He argues, for instance, that Khayyám

[50] Bertrand Russell, *Introduction to Mathematical Philosophy* (1919; repr. New York, NY: Cosimo, 2007), 145.
[51] Derrida, 40.
[52] Gillespie, 179; Thomas E. Connolly (ed.), *The Personal Library of James Joyce: A Descriptive Bibliography* (Buffalo, NY: University of Buffalo, 1955), 15.

'takes a humorous or perverse pleasure in exalting the gratification of Sense above that of the Intellect'.[53] This notion is apparent throughout the *Rubáiyát* as well as the *Wake.* Khayyám's invitation away from logic and into the tavern is echoed in II.iii, for instance, in which the narrative adopts the *Rubáiyát*'s rhythm and rhyme scheme as it follows '[t]he wisehight ones who sip the tested sooth' 'within the tavern's secret booth' (*FW* 368.24-25). Similar to his approach to apprehending truths in art, Khayyám's mathematical inquiries were predicated on the certainties to be gained from sense-experience. Khayyám demonstrates the importance of sensual experience throughout both his literary and mathematical works, illustrating the potentially 'vain inquiries' of those who practice the pure reasoning of 'the Intellect'.[54]

Bruno was an important influence for Joyce in the sense that he, like Khayyám, developed his mathematical concerns (particularly those regarding the senseless application of Euclidean ideal objectivities) in his literary works rhetorically and figuratively. Joyce was not only familiar with Bruno's mathematical and scientific works, but he would also have considered the ways in which Bruno's critique of predominating mathematical traditions and his development of unique geometric theories were reflected in his Italian dialogues and plays, which he read while studying Italian at University College Dublin. Running throughout Bruno's Italian works is a critique of narrow-minded thinking and the unquestioning belief in axiomatic certitudes. This complements Bruno's similar polemic in his Latin works against his 'stupid' Euclidean and Aristotelian contemporaries who refused to think beyond the limits prescribed by traditional assumptions and ideologies.[55] In 'The Heroic Frenzies', Bruno evokes the impossibility of ever finding subjectively-formed ideal objectivities in the material world through the figure of the crazed poet who delusively attempts to attain Diana's divine love. In 'The Ash Wednesday Supper', the Nolan parodies Copernican theory's critics through the portrayal of his obnoxious dinner guests, all of whom initially refuse to consider Bruno's logical thesis. In 'The Candlebearer', Bruno satirises the principal characters' inability to consider lines of reasoning which diverge from their own desires and expectations: the lustful and adulterous Bonifacio fails to perceive his wife's honey trap, for example, while the greedy alchemist Bartolomeo is

[53] Edward Fitzgerald, 'Omar Khayyám, the Astronomer-Poet of Persia', in Omar Kahyyám, *Rubáiyát*, trans. by Fitzgerald, 3rd ed. (London: Bernard Quaritch, 1872), iii-xxiv, xii.
[54] McIntyre, 119.
[55] Bruno, quoted in Saiber, 46.

eventually conned by a self-professed expert in the transmutation of minor metals to gold. Bruno's satire of self-assured reasoning in 'The Candlebearer' illustrates the Neoplatonic argument which he makes in *De umbris idearum* (*The Shadow of Ideas*), in which he argues that the material world exists within a world of shadows which eludes the light of empirical reason. All three of Bruno's Italian plays and dialogues evoke many of the principles which underpin his geometric prioritisation of sensual evidence over *a priori* reasoning, as well as his critique of geometers who senselessly take ideal objects as definitive signifiers of reality (*U* 17.1012-1013).

By frequently adopting an overly pedantic style in these works, Bruno not only subverts his characters' ideologically straight-and-narrow inquiries but goes further in lampooning the Euclidean conception of perfectly straight lines on the level of language and rhetoric. Arielle Saiber expands on this notion in *Giordano Bruno and the Geometry of Language*, arguing that 'Bruno's incorporation of language rich with lists, repetitions, diversions and threads of words reflects the literal- and narrow-mindedness of his characters and serves as a vehicle for Bruno to critique a certain kind of conceptual and behavioural "rectilinearity"'.[56] Several deviating tactics are employed at the beginning of his play 'The Candlebearer', for instance, which begins with the letter of dedication; the 'Argument and Arrangement for the Play'; a description of what is to come; a drunkenly delivered 'Antiprologue', which berates the audience for wanting a prologue; and an angry 'Proprologue', before the play begins. Saiber goes on to examine a number of literary devices in Bruno's Italian works which pervert what she terms 'conceptual and behavioural "rectilinearity"' including brachylogia, systrophe, hyperbaton, oxymoron, chiasmus, sillepsis, hyperbole and ellipsis. These circumlocutory devices are used throughout Bruno's works as a means of highlighting the pointless divergences from sense practised by many of his contemporaries, who—Bruno believed—would stubbornly cling to their theories in spite of contradictory sensible evidence. Such typically Brunonian devices appear throughout *Finnegans Wake*, which is saturated with lists and diversions within diversions. They can also be traced to sections of Joyce's earlier works. 'Penelope', for instance, the intensely brachylogic coda to *Ulysses*, was referred to by Joyce as an 'amplitudinously curvilinear episode' intended to sit in direct contrast with the narrative's rectilinear

[56] Saiber, 7.

approach to discerning scientific truths in 'Ithaca'.[57] Bruno's rhetorical critique of conceptual rectilinearity also plays into his polemic against Euclidean geometry's assumption of ideally straight lines, and his related theory that an infinite straight line would resemble a circle.

Joyce would also have related to emergent conceptions of Euclidean geometry as a 'habit' or a 'tradition' from personal experience.[58] He was introduced to Euclid's *Elements* at an early age, and throughout his Jesuit education he was required to take multiple geometry exams.[59] As Thomas Jackson Rice argues in *Joyce, Chaos and Complexity*, the average secondary school student during this time 'would have learned by rote and drill exercise, year after year, and stood repeated examinations in—as Joyce did four times in five years—the order of definitions, postulates, and propositions in the first six books of the *Elements*'.[60] Joyce was also required to pass two separate exams on Euclid's *Elements* for the matriculation examination at University College in 1899, as Neil Davison points out, as well as an additional exam on trigonometry.[61] The young artist's ritualistic learning of Euclidean geometry was enforced in much the same way as his religious education, in the sense that the axioms of both systems were memorised and applied without question. In *Joyce, Chaos and Complexity*, Rice explores this overlap between the mathematical and religious doctrines which were prescribed by Joyce's Jesuit education, arguing that religion and mathematics '—Euclidean geometry in particular—constituted mutually supporting "logical and coherent" systems commanding belief in late nineteenth-century educational theory and in the Jesuit *Ratio Studiorum*'.[62] Illustrating his claim that Euclidean geometry supported the fundamental logic of the religious catechism, Rice refers to Thomas Smith, who advocates the study of geometry in schools 'as a corrective of prevalent false reasoning' in his introduction to *Euclid: His Life and System* (1902).[63] The tendency amongst priests and scholars to regard Euclidean geometry as a definitively correct mode of logical reasoning calls to mind the Euclidean conception of ideal objects such as

[57] James Joyce, 'Letter to Claud W. Sykes', Spring 1921, in *Letters of James Joyce*, Vol. I of III, ed. by Stuart Gilbert (London: Faber and Faber, 1957), 164.
[58] Poincaré, 56; Husserl, quoted in Derrida, 106.
[59] James Joyce, 'Letter to Frank Budgen 28 February 1921, *Letters of James Joyce*, Vol. I of III, ed. by Stuart Gilbert, 159-160, 159.
[60] Thomas Jackson Rice, *Joyce, Chaos and Complexity* (Champaign, IL: University of Illinois, 1997), 36.
[61] Neil R. Davison, 'Joyce's Matriculation Examination', *James Joyce Quarterly*, Vol. 30, No. 3 (Spring, 1993), 393-407.
[62] Rice, 13.
[63] Thomas Smith, 'Introduction', *Euclid: His Life and System* (1902), quoted in Rice, 55.

perfectly straight lines, the essences from which incorrect or deviant forms are judged. Indeed, the word 'correct' stems from the Latin *corrigere*, meaning to put straight or to set right, and its stem *regere* means more specifically to lead straight or to rule. These early twentieth-century defences of moral, logical and geometric rectitude echo the rectilinear mindsets which Bruno critiqued in his many of his works. They also enter into Joyce's own equivocations of rhetorical and geometric rectitude in *Finnegans Wake* and the later episodes in *Ulysses.* In 'Ithaca', for instance, an entire passage is devoted to Leopold Bloom's 'innate love of rectitude', which encompasses both his religious convictions and his scientific beliefs (*U* 17.1623). Similar to Bloom, an aspect of religious faith was engrained in the young artist's primordial understanding of geometric axioms. Throughout Joyce's early education, the Euclidean tradition was prescribed as the original and only true measure of the Earth. This is reflected throughout II.ii, in which Joyce demonstrates the catechetical nature of acquiring geometric symbols and stages a struggle to envisage phenomena which elude the geometric catechism's corrective system for describing the visual universe.

Geometric traditionalism in II.ii

In II.ii, Joyce presents the dogmas which facilitate the methodological acquisition and transmission of Euclidean geometric axioms within the context of religious, linguistic and other traditional systems of ideal objectivities. Having finished playing their games and brought to light the correct colour of Issy's underpants at the end of II.i, Shem, Shaun and Issy eventually return home to the pub and begin their 'Night Lessons' in II.ii. The whole chapter assumes the form of a schoolbook containing instructions, problems and annotations. As Joyce wrote in a letter to Frank Budgen, 'the technique here is a reproduction of a schoolboy's (and schoolgirl's) old classbook complete with marginalia by the twins, who change sides at half time, footnotes by the girl (who doesn't), a Euclid diagram, funny drawings etc.'.[64] The 'classbook' involves the instruction of subjects in trivium and quadrivium, or 'triv and quad', and it is separated into three sections on history, grammar and geometry (*FW* 306.12-13). The geometry section involves, among other things, 'trigamies', or trigonometrical games, which give rise to the revelation of

[64] James Joyce, letter to Frank Budgen, July 1939, *Letters of James Joyce*, Vol. I of III, ed. by Stuart Gilbert (New York, NY: Viking Press, 1966), 406.

ALP's pudendum (*FW* 300.26). In II.ii, Joyce thus extends the parallels which he draws between play and sexual discovery in the previous chapter. The authors of the 'classbook' are the very same men who are complicit in the writing of the *Wake* itself: the four old men, or Mamalujo, whose siglum corresponds with II.ii's overall chapter number (X). Their numerous aspects include (among a host of others) the four evangelists, the four cardinal compass points, the four Anemoi, the Four Masters of the *Annals*, the four provinces of Ireland, the four bloods of Ireland and four areas in Dublin. As is evident from this brief list, the four old men represent traditions of both time and space: they serve as the recorders and transmitters of the *Wake*'s history, and simultaneously act as fundamental bearings in and around 'Howth Castle and Environs' (*FW* 003.03).

Running throughout II.ii is a typically Brunonian critique of what Arielle Saiber terms 'conceptual [...] "rectilinearity"'.[65] As Saiber points out, Bruno's dialogues and plays are rich with tropes which encourage a multidirectional mode of thought, and which '[satirise] the kind of thought that moves in only one direction'.[66] Dolph and Kev's ritualistic application of Euclidean geometry in II.ii is one such example of '*unidirectional* rectilinearity', in the sense that it involves an unbending conviction in an original set of principles.[67] Throughout the chapter, Joyce directs this critique against the pedagogical text's dogmatic instructions as well as the literal-mindedness of its young practitioners. The four masters prescribe a correct mode of perceiving the world, which extends to an enforced geometrisation of visible and irregular objects. Their students obediently take everything which the four old men say as the God's truth, applying their straight-and-narrow ideologies to the world around them while ignoring phenomena which contradict these dogmas. This notion is reflected in Dolph's name: like the Earl of Godolphin, who served under four monarchs, Dolph acts as a servant rather than a free-thinking agent in his loyal enforcement of the geometric and other laws which the four old men decree.

In II.ii and throughout the *Wake*, Joyce employs circular imagery and circumlocutory rhetorical devices to frustrate the unidirectional modes of thought prescribed by the four masters and their schoolbook. He presents a Brunonian opposition between rectilinear and circumambulatory thought in the opening paragraphs, for instance, which describe Shem,

[65] Saiber, 71.
[66] Saiber. 71.
[67] Saiber, 82.

Shaun and Issy cycling around Dublin before returning home to begin their homework. The route which the cycling children trace resembles, among other things, a mirror-image of Phoenix Park’s circular peripheries which lies at its west; an image of two circles such as those present in a bicycle or Issy’s ‘bissyclitties’; the infinity symbol; and the two circles which are described by in Euclid’s first proposition (fig. 4) (*FW* 284.23). The topographical narrative not only traces the children’s circular route by listing the roads which they follow, but further alludes to a circularity of thought in its referral to a spatial theorist at each landmark along the way, as is the case with ‘Berkeley alley’ (Berkeley Road; George Berkeley) and ‘Gainsborough Carfax’ (Phibsborough Road; Thomas Gainsborough) for instance (*FW* 260.11-12). The circular topographical and conceptual journeys traced by the schoolbook’s introductory passage echoes the opening of Bruno’s ‘The Ash Wednesday Supper’, in which the Nolan walks a circular route around Nola before returning home and mocking the guests attending his dinner party, whose traditional dictums forbid them from accepting heliocentric theory. The thought processes of Bruno’s pedantic guests ironically reflect the heliocentric model which they oppose, in the sense that they assume their own perspective to constitute the absolute centre of the known universe. Joyce, by opening a chapter concerning the indoctrination of geometric codes with an extended rhetorical and physical perambulation as Bruno does in ‘The Ash Wednesday Supper’, frames the chapter’s extended satire of rectilinear thought within and beyond the context of geometry. In *Finnegans Wake* and the *Cena*, it is not necessarily the logic of these straight-and-narrow mindsets which is being undermined, but rather the fact that their predicates are founded on traditional maxims and ideologies. As a consequence, the followers of such rectilinear inquiries are often forced to circumnavigate concepts which they cannot explain. As we shall see, this is exemplified in Dolph and Kev’s application of Euclid’s first proposition to an environment which cannot be fully explained through the use of traditional Euclidean axioms.

Following Bruno, Joyce not only evokes a topographical perambulation to undermine the straight-and-narrow mindsets of the children and the dictums they rote-learn, but further employs a host of divertive devices rhetorically. As we have seen, Bruno begins ‘The Candlebearer’ with letter of dedication, a proprologue and an anti-prologue. This jilted structure is used to critique the narrow-mindedness and pedantry of the play’s three main characters. A similar implementation of narrative diversions appears in the geometry

section of II.ii. The section which deals specifically with Euclid's first proposition (which accompanies the diagram on page 293 (fig. 4)) officially starts on page 286, with the textbook instructing Dolph to turn the page: '[p].t.l.o.a.t.o. […] plates to lick one and turn over. [...] Problem ye ferst, construct ann aquilittoral dryankle Probe loom!' (*FW* 286.03-286.20). However, almost as soon as it begins, a lengthy digression ensues regarding Dolph, HCE, various other imperialists, Tristan and Isolde, and the entire history of things dating back to 'the reptile's age' when dinosaurs roamed the Earth, when Tristan defeated the dragon and when St. Patrick chased out the snakes (*FW* 289.25). The introduction to this interlude, which itself contains clauses within clauses, is chaotically digressive. It includes a lengthy ode to Vico and Bruno written in Latin, in the style of Bruno's lengthy ode to his patron at the beginning of 'The Candlebearer':

> Mux your pistany at a point of the coastmap to be called *a* but pronounced olfa. There's the isle of Mun, ah! O! Tis just. *Bene*! Now, whole in applepine odrer
>
> for—husk, hisk, a spirit spires—Dolph, dean of idlers, meager suckling of gert stoan, though barekely a balbose boy, he too,—*venite, preteriti,*[3] *sine mora dumque de entibus nascituris decentius in lingua romana mortuorum parva chartula liviana ostenditur, sedentis in letitiae super ollas carnium, spectantes immo situm lutetiae unde auspiciis secundis tantae consurgent humanae stirpes, antiquissimam flaminum amborium Jordani et Jambaptistae mentibus revolvamus sapientiam: totum tute fluvii modo mundo fluere, eadem quae ex aggere fututa fuere iterum inter alveum fore futura, quodlibet sese ipsum per aliudpiam agnoscere contrarium, omnem demun amnem ripis rivalibus amplecti* [4]—recurrently often, when him moved he would cake their chair, coached rebelliumtending mikes of his same and over his own choirage at Backlane Univarsity […]
>
> [3] Dope in Canorian words we've made. Spish from the Doc.
> [4] Basqueesh, Finnican, Hunglash and Old Teangtaggle, the only pure way to work a curse.
>
> (*FW* 287.13-F05)[68]

By interrupting the step-by-step, corrective geometry lesson mid-sentence with a single

[68] Approximate translation of Latin passage: '[c]ome without delay, ye men of old, while a small piece of second-grade imperial papyrus, concerning those to be born later, is exhibited with more propriety in the Roman tongue of the dead. Let us, seated joyfully on jars of meats (fleshpots) and beholding in fact the site of Paris whence such great human progeny is to arise, turn over in our minds the most ancient wisdom of both the priests Giordano and Giambattista: the fact that the whole of the river flows safely, with a clear stream, and that those things which were to have been on the bank would later be in the bed; finally, that everything recognises itself through something opposite and that the stream is embraced by rival banks' (*The Finnegans Wake Extensible Elucidation Treasury*, ed. by Raphael Slepon <http://www.fweet.org> [date accessed: 04/01/16]).

tangential sentence encapsulating a history of nearly everything over six pages, Joyce follows Bruno in playfully undermining the desire for the acquisition of unbending rectitude within geometry, thought and language. Moreover, by interrupting an episode which deals with the methodological teaching of geometry through a narrative diversion concerning ancient origins, and by situating the geometry lesson directly after similar lessons on history and grammar, Joyce suggests an ontological correspondence between the acquisition of geometric, historic, linguistic and other traditional systems of ideal objectivities. This includes the acquisition of religious ideal objectivities, for instance. During the six-page digression, Joyce draws conceptual parallels between the acquisition of geometric and religious codes in a historical interlude recounting how Dolph, who was once St. Patrick, 'landed in ourland's leinster' and 'converted it's nataves' by showing 'em the celestine way to by his tristar' (*FW* 288.13-288.22). St. Patrick's demonstration of the Holy Trinity by way of his three-leaved shamrock foreshadows the tripartite properties of the triangle which Dolph demonstrates to Kev in the following section, in which he refers to cardinal numbers and geometric points using 'his fingures' and other tools which are conveniently to hand (*FW* 282.11). In these 'writings of paraboles', Euclid's parabolic geometry is introduced through parables such as those relating to St. Patrick, and the ideal objectivities systematised by geometers like Euclid and those utilised by writers like Joyce combine in 'me elementator joyclid' (*FW* 303.19; 302.12). Following Bruno, Joyce demonstrates how the traditional acquisition of geometric systems, like the indoctrination of linguistic and religious codes, is ritualistic rather than intuitive. As Edmund Husserl argues, geometry and language 'have the mobility of sedimented traditions that are worked upon, again and again, by an activity of producing new structures of meaning and handing them down'.[69] In other words, 'those things which were to have been on the bank would later be in the bed' as these *a priori* 'structures of meaning' proliferate over time and become sedimented within traditional dictums.[70] Echoing Issy's acquisition of 'gramma's grammar' (in which the sense of grammatical laws is engrained in old wives' tales and subjective reminisces on masculinity and femininity) and the children's memorisation of HCE's drunkenly biased and overly scandalous '*bibelous hicstory*', Dolph's—and by extension Kev's—understanding of Euclidean geometry is ultimately divorced from sense and entrenched in the subjective ideologies of his pious instructors (*FW* 268.17-280.L02).

[69] Husserl, 'The Origin of Geometry', 171.
[70] See footnote 55; Husserl, 'The Origin of Geometry', 171.

Serving under the four old men, the schoolchildren—like the natives who Saint Patrick converts in the historical digression—faithfully accept every geometric assumption recorded by the four old men to be a fundamental truth. Further parallels between the rote-learning of religion, language and mathematics are developed when Dolph, preparing for his geometric exercises, recalls the cardinal numbers by counting his ten 'fingures' (fingers or figures) (*FW* 282.11):

> Always would he be reciting of them, hoojahs koojahs, up by rota, in his Fanden's catachysm from fursed to laced, quickmarch to decemvers, so as to pin the tenners, thumbs down. (*FW* 282.23-27)

Using his 'digits', Dolph recites by rote the numbers and cardinal points in his 'Fanden's catachysm'. As well as referring the devil's catechism (Danish: fanden), Joyce further alludes to Rev. John Fander's translation of Joseph Deharbe's *A Full Catechism of the Catholic Religion* (1875), which was one of the texts he studied at Clongowes. In light of this overlap between Dolph's religious indoctrination and his rote-learning of cardinal numbers according to a 'mathematical catechism' like the one in 'Ithaca', Dolph's understanding of what he can see and sense is mediated and corrected by the dogmas of religious codes.[71] He consequently sees the world through 'presbyoperian' eyes which exacerbate his long-sightedness (presbyopia) and Presbyterianism (*FW* 294.01). For Dolph, the symbols of the religious and mathematical doctrines to which he is an apprentice are to be memorised rather than understood: his basic knowledge of mathematics and geometry is acquired through the conventional repetition of rotes and military-style drill exercises, and his understanding of its laws are engrained in moral codes such as those dictated by the catechism, the Decemviri (the ten magistrates of Rome), the Rota (the Supreme Court of the Roman Catholic Church) and the ten commandments. Dolph's mnemonic counting system further incorporates the ten months of the Julian calendar, from March to December ('quickmarch to decemvers'). By coupling Dolph's basic mathematical schooling with an outdated calendrical system, Joyce further suggests that traditional mathematical systems are, like the Roman calendar, language and empire, subject to collapse, upheaval or alteration. By intertwining Dolph's obedient acceptance of cardinal mathematical

[71] James Joyce, 'Letter of February, 1921', *Letters of James Joyce*, Vol. I of III, ed. by Stuart Gilbert (New York, NY: Viking, 1966), 164.

principles with his earnest assertion of religious laws, Joyce illustrates how the learning and acceptance of mathematical and geometric systems is rooted in faith-based acts. This notion is further suggested when the schoolbook later alludes to the possibility of obtaining ‘a surview over all the factionables’, or a panoptic understanding of every geometric fact and fiction (*FW* 285.26). As it turns out, however, this comprehensive survey such as that evoked of Dublin in the opening of II.ii is ‘[b]inomeans to be comprendered. Inexcessible as thy by god ways. The aximones. And their prostalutes’ (*FW* 285.27-286.01). For Dolph, Euclid’s axioms and postulates are by no means to be understood and their meanings are to remain inaccessible, much like God’s mysterious ways are inaccessible to his subjects, or a prostitute would in theory be inaccessible for a man of God.

Dolph, as is the case throughout the schoolbook, ‘wouldn’t took bearings no how anywheres’ else than the coordinates described by his four masters and their dogmatic teachings of ‘nucleuds and alegobrew’, or Euclid and algebra, which circumscribe all that he can ‘rede, rite and reckan’ (*FW* 283.22-24). Having learned how to count and use basic mathematics, Dolph ‘must he to trump adieu atout atous to those cardinhands he a big deal missed’ and go forth into the sensible world with only the company of his brother, applying his rote-learned disciplines to instruct Kev and to measure the mysterious expanses which they face (*FW* 286.12-14). Having been loosed from his cardinal handlers, the four ‘cardinhands’, the narrative describes how Dolph would ‘pick upon his ten ordinailed ungles’ while solving mathematical problems, using his nails to count ordinal numbers and to measure angles in the tradition of his ordained uncles (286.130-288.06). Retaining a profound conviction in his dogmatic education and conflating mathematical symbols with the sensible world, Dolph goes on to systematically transmit his geometric knowledge to his ignorant brother Kev without questioning the sense of his own instructions. This becomes most apparent whenever Dolph attempts to validate his methodological approach to Euclid’s first proposition by falling back on the historically verifiable maxims prescribed by his elders: ‘as our callback mother Gaudyanna […] used to sing’; ‘[a]s great Shapesphere puns it’; ‘as my instructor unstrict [instructed or ensnared (German: *umstricken*)) me’; ‘[a]s Ollover Krumwall sayed’ (*FW* 294.28-30; 295.03-04; 295.21-22; 299.09-10). By invoking the puns of ‘Shapesphere’, Dolph gives himself the poetic license to re-shape circles and fit them onto spheres (as we shall explore in the proceeding section). The fact that Dolph unquestioningly takes the designated texts he reads and the

strict instructions of his mentors as the God's truth suggests that none of the axioms he professes actually derive from his own sense-experience: for all he knows, geometry might as well be hocus-pocus, or 'hoojahs koojahs' (*FW* 286.13). Dolph, the righteous geometer, thereby epitomises Bruno's critique of those theorists who assimilate and continue a tradition in which geometry is treated as an 'abstract intellectual exercise'.[72]

Euclidean geometry and non-Euclidean surfaces: Triangles HCE and ALP

As soon as Dolph and Kev begin to apply their rote-learned geometric principles in order to delineate a topography of their mother's 'nether nadir' they become confounded by unforeseen problems and grand discoveries (*FW* 297.12). The twins' various disappointments and revelations often stem from their senseless application of Euclidean ideal objectivities within their attempted measurements of ALP's curvaceous, irregular and enclosed bodily forms. The narrative surrounding the revelation of ALP's sexual organs is accompanied by a diagram of Euclid's first proposition (fig. 4), which describes 'an equilateral triangle on a given finite straight line' by means of two intersecting equal-radius circles, as Hall and Stephens put it; or, as it is introduced in the *Wake*, '[p]roblem ye ferst, construct ann aquilittoral dyankle Probe loom!' (*FW* 286.19-20).[73] The narrative following Dolph and Kev's construction of the 'equo-angular trillitter' is structured according to the eight stages necessary for solving Euclid's first 'Probe loom' (*FW*, 286.31-287.13):

[72] Saiber, 46.
[73] Euclid, *Elements*, Book I, Prop. 1; repr. in Hall & Stephens, 11.

(i) 'Mux your pistany at a point of the coastmap to be called a but pronounced olfa' ('*mark point A-alpha*') (*FW* 287.13-15).

(ii) 'we see the copyngink strayedline AL (in Fig., the forest) from being continued, stops ait Lambday' ('*draw line from A-alpha to L-lambda*') (*FW* 294.02-04).

(iii) 'With Olaf as centrum and Olaf's lambtail for his spokesman circumscript a cyclone' ('*with point of compasses on alpha and radius alpha-lambda, circumscribe a circle*') (*FW* 294.08-10).

(iv) 'Now, springing quickenly from the mudland-Loosh from Luccan with Allhim as her Elder tetraturn a somersault' ('*turn compasses other way, i.e. with point of compasses on L and radius L-A, and produce an identical right-hand circle*') (*FW* 295.18-21).

(v) 'mack a capital Pee for Pride down there on the batom' ('*mark point P at the bottom of the diagram*') (*FW* 296.06).

(vi) 'mick your modest mock Pie out of Humbles up [the opposite] end' ('*mark point pi at the top of the diagram*') (*FW* 296.08-10).

(vii) 'join alfa pea and pull loose by dotties' ('*join alpha-P and P-lambda by dotted lines*') (*FW* 296.24-25).

(viii) 'to be more sparematically logoical, eelpie and paleale by trunkles' ('*join L-pi and pi-A by continuous lines to complete the diagram*) (*FW* 296.25-27).[74]

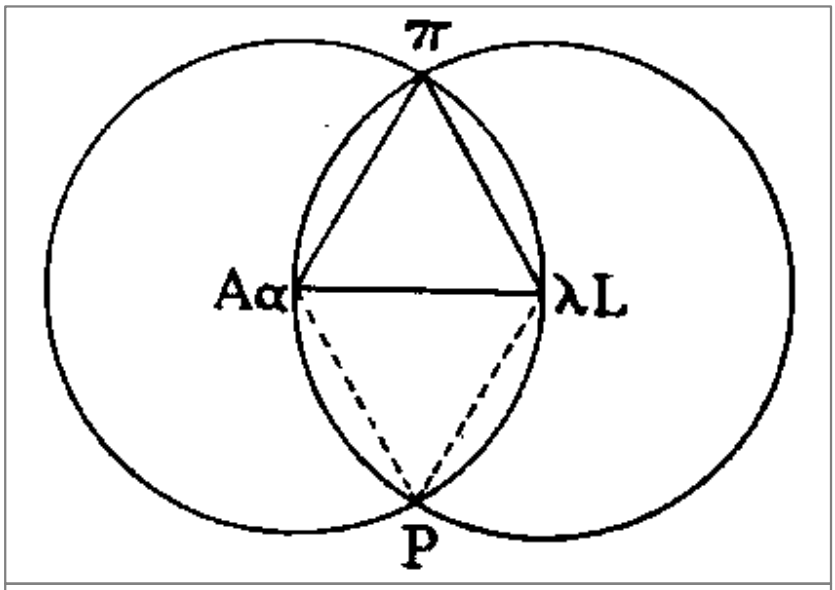

Fig. 4: *FW* 293.

[74] Italicised elucidatory notes from Roland McHugh, *Annotations to Finnegans Wake* (Baltimore, MD: Johns Hopkins University Press, 1980), 287-296.

The intersecting arcs in the accompanying diagram (fig. 4) delineate a *Vesica Piscis* ('bladder of a fish') which has various mystical connotations including the womb, Christ and the union of opposites. The numerous mystical associations of the geometric diagram's various parts have been discussed in several recent critical works. In '"Ocone! Ocone!": ALP's 3D Siglum and Dolph's "Dainty" Diagram, Jonathan McCreedy suggests that the triangles in this '"Dainty" Diagram' are derived from a '"Dante" Diagram' in which ALP's vagina and the 'whome' are re-imagined within the context of Dante's hell and its conical structure.[75] As Carla Baricz points out in 'The *Finnegans Wake* Diagram and Giordano Bruno', the echoing, gyrating cones ('[g]yro O, gyre o, gyrotundo'; '[o]cone! Ocone!') represented by the twin triangles can be understood as a playful response or 'challenge' to Yeats's gyres (*FW* 295.23-24; 297.11).[76] More generally, she acknowledges that:

> the diagram serves many of the images and icons present in the text, from the twins in the womb, to the mobius strip or "Doublends Jined" of the text, to all the double Os (the "loos" and "loops" in the book), to the frontal and dorsal aspects of a body (male and female), to a map of Phoenix Park, to a portrait of the dreamer, to the process of meiosis, and so forth.[77]

Baricz's article expands on the Brunonian connotations of the diagram in particular, and she argues that it is 'much more than just a depiction of the theory of opposites' (a notion which is reinforced in the diagram's depiction of a *vesica piscis*):[78]

> Joyce's pictorial representation echoes the overlapping circles found in Burtt's example of Copernican planetary motion, a diagram whose content is derived from Copernicus's *De Revolutionibus*. As an alternative to Aristotelian cosmology, Copernicus's mathematical/astronomical model revived an interest in the tradition of the Pythagoreans and found a supporter in Bruno, who had become interested in Pythagorean concepts through the Neo-Platonic philosophy of Nicholas of Cusa.[79]

Within a material rather than a primordially metaphysical or conceptual context, the

[75] Jonathan McCreedy, '"Ocone! Ocone!": ALP's 3D Siglum and Dolph's "Dainty" Diagram', *Genetic Joyce Studies*, Issue 11 (Spring 2011), <http://www.geneticjoycestudies.org/> [date accessed: 04/01/16].
[76] Carla Baricz, 'The *Finnegans Wake* Diagram and Giordano Bruno', *Joyce Studies Annual*, 2008, 235-242, 235.
[77] Baricz, 235.
[78] Baricz, 236.
[79] Baricz, 236.

diagram depicts ALP's pudendum and two buttocks as viewed from below ('you can see her it', i.e.: her vulva), while simultaneously representing the Liffey's soaked and soiled banks (her 'muddy old triagonal delta'), a 'coastmap' and the two hemispheres ('*the Arumbian Knives Riders axecutes devilances round the jehumispheure*'), echoing the epic proportions of Molly's 'plump melonous [hemispheres]' in *Ulysses* (*FW* 297.24-346.06-07; *U* 17.2242). Katarzyna Bazarnik expands on the diagram's combined terrestrial and corporeal connotations in *Joyce & Liberature*, arguing that:

> the apex and nadir of the diagram represent the two "capital" P's of the globe, the South (lower) and North (upper) Poles. As in "Penelope" these points correspond to parts of the female body, the anus and the vagina, and the navel […].[80]

In this sense, the triangles in the diagram not only depict mirror images of ALP's genitals, but are also the results of the twins' attempts at mapping global expanses. As Bazarnik points out, '[e]quilateral triangles have a geodesic aspect to them, too. They are used for measuring the area of large tracts of country, the exact position of geographical points, and the curvature, shape, and dimensions of the earth'.[81] The diagram thus depicts a landscape of the Earth as well as the body: Dolph and Kev's endeavour to find the 'whome', or womb, of their 'eternal geomater', entails travelling through the geometric figure's pubic and herbaceous overgrowth ('Fig., the forest') in search of the urinal river's source, which lies the origin of geometry, space, time, the twins and everybody (*FW* 294.03-297.01).

Given that the topographical body to which Dolph and Kev's geometric diagram refers is corporeal and terrestrial, and is therefore curved in three dimensions rather than flat in two dimensions, they face a number of practical issues when attempting to navigate ALP's variably curved territories using the ideally straight, perfectly curved forms of their two-dimensional Euclidean *meter*. More specifically, Dolph and Kev display no awareness of how spherical or elliptic geometries could be used to measure positively curved planes in three dimensions. Practical problems begin to emerge at the second stage for completing Euclid's proposition, in which Dolph instructs Kev to 'circumscript a cyclone', or circumscribe a circle, using the line αλ as the radius:

[80] Katarzyna Bazarnik, *Joyce & Liberature* (Prague: Litteraria Pragensia, 2011), 155.
[81] Bazarnik, 156.

> Now, then, take this in ! One of the most murmurable loose carollaries ever Ellis threw his cookingclass. With Olaf as centrum and Olaf’s lambtail for his spokesman circumscript a cyclone. Allow ter! Hoop! As round as the calf of an egg! O, dear me! O, dear me now! Another grand discobely! After Makefearsome’s Ocean. You’ve actuary entducked one! Quok! Why, you haven’t a passer! Fantastic! Early clever, surely doomed, to Swift’s, alas, the galehus! (*FW* 294.06-16)

To Dolph’s surprise, his ignorant companion seems to have successfully produced something resembling a perfect ‘hoop’ in spite of the fact that he hasn’t a compass (Dutch: *passer*) and isn’t a ‘passer’ in any relevant exams. Although Dolph takes Kev’s shape to be a ‘fantastic’ specimen of perfect regularity which has been delimited against all the odds, the suggestion that Kev’s circle is ‘as round as the [half] of an egg’ suggests otherwise. A similar allusion to ovoid hoops is repeated when Kev constructs an identical circle using point λ as a locus: ‘[g]yre O, gyre O, gyrotundo! Hop lala! As umpty herum as you seat! O, dear me, [...]’ (*FW* 295.23-25). In light of these repeated allusions, Dolph’s incredulous praise of what appears to be a circle ‘as round as the [half] of an egg’ would suggest that he is envisioning the cross-section of an egg as it would appear on a two-dimensional plane: in theory, this would be possible if the egg were to intersect a flat surface at a particular angle. An egg, of course, possesses an irregular form whose variable curves would resemble more closely the contours of the ‘calf of [a leg]’ rather than those of a perfect circle or sphere (*FW* 294.11). As would appear to be the case with ALP’s buttocks, the Earth is not perfectly spherical: rather, it is ‘a humpty daum earth’, that is, a Humpty-Dumpty shaped dome. Like the irregular, three dimensional curves of an ovoid, those described by a cone could also appear to be regular when viewed as a cross-section in two dimensions. This notion is reinforced through repeated allusions to Yeats’s *A Vision* throughout the section revolving around the diagram. Besides Dolph’s Yeatsian exclamations (‘[g]yre O, gyre O, gyrotundo !’), another reference to *A Vision* appears in Shaun’s comments on the left-hand side of the page on page 293, in which he alludes to Yeats’s ‘vortices’ in his description of ‘*The Vortex*. […] *The Vertex*’, which also refers to the vertices of the triangles depicted in the accompanying diagram. Imagined as a three-dimensional vortex or a ‘[w]herapool’, ALP’s top triangle would reach its pinnacle at the vertex of point π. Dolph’s imagination appears confined to a virtual, two-dimensional space in which it would be possible for the cross-sections of irregular, three-dimensional

forms such as ALP's left buttock, one of the hemispheres or a Yeatsian gyre to appear regular in two dimensions (fig. 5). To conceive of Kev's circular object as irregular would be to cast aside the entire geometric tradition upon which he was raised.

The limitations which Euclidean geometry places on the geometer's abilities to sense and to understand new phenomena is further discussed by Henri Poincaré in his discussion of Riemann's elliptic geometry. Comparing Euclidean geometry to the geometric system which 'infinitely flat' beings would use, Poincaré asks:

> What kind of geometry will they construct? In the first place, it is clear that they will attribute to space only two dimensions. The straight line to them will be the shortest distance from one point on the sphere to another—that is to say, an arc of a great circle. In a word, their geometry will be called spherical geometry. What they will call space will be the sphere on which they are confined, and on which take place all the phenomena with which they are unacquainted. […] Well, Riemann's geometry is spherical geometry extended to three dimensions.[82]

Like one of Poincaré's two-dimensional beings, or the Square who encounters the Sphere in Edwin A. Abbott's *Flatland* (fig. 5), Dolph is unable to comprehend how Kev 'actuary' conjured up a perfect circle as if from nowhere (*FW* 294.14). Astounded, he cries in panic ('O, dear me! O, dear me now!'), echoing Alice's ejaculations of incredulity in Wonderland (*FW* 294.11-12). Unwilling to entertain the possibility that Kev has delineated an imperfect shape upon a positively curved surface, Dolph proceeds to damn his apparently ingenious brother to the Swiftian lunatic asylum or jailhouse (Da. *galehus*), thereby embodying the public's initial attitude towards non-Euclidean geometries as they appeared in the early to mid-nineteenth century.

[82] Poincaré, 37-38.

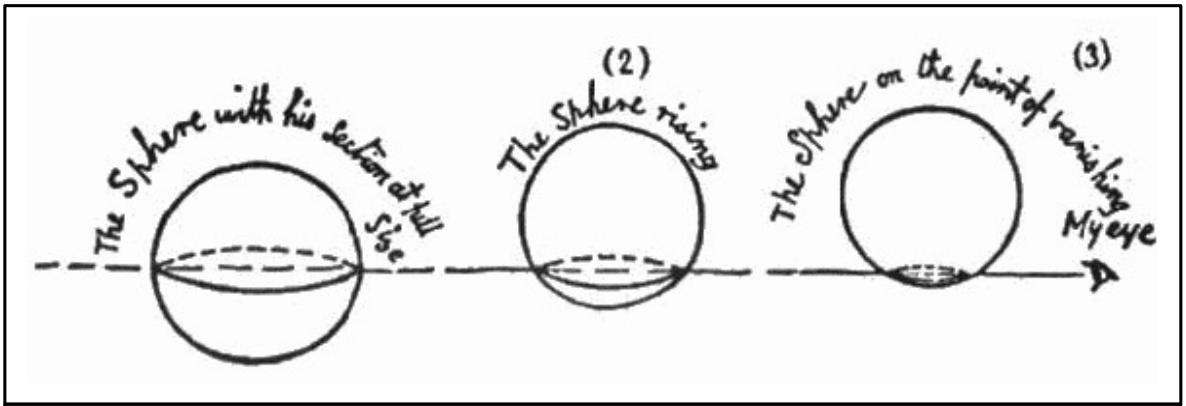

Fig. 5: Edwin A. Abbott, ‘How the Stranger vainly endeavoured to reveal to me in words the mysteries of Spaceland’, *Flatland: A Romance of Many Dimensions* (1884, repr. Mineola, NY: Dover, 1992), 59.

The possibility that Dolph and Kev may unwittingly be working with a positively curved rather than a flat surface is further suggested in the unusual properties of the triangle as it appears in this section. Riemannian geometry assumes that on a positively-curved plane such as the surface of the Earth, the sum of the angles of a triangle would be greater than that of two right angles (fig. 3.2). The children’s textbook alludes to this notion in one of the opening geometric exercises, which concerns the triangle hce (the geometric points and initials which make up HCE in this section, as is the case with his wife, can be understood as ‘an equoangular trillitter’: an equilateral triangle and a trilling tri-letter (*FW* 286.21-22). Like his angular wife, HCE is an ‘Angleshman’ (*FW* 284.L01-L02):

> Show that the median, hce che ech, interecting at royde angles the parilegs of a given obtuse one biscuts both the arcs that are in curveachord behind. (*FW* 283.32-284.04)

In light of the angles described by the sigla of the fallen HCE (⊓) and ALP (△), a similar proof can be drawn whereby the two symbols overlap in sexual union to describe the right angles (‘royde angles’) of HCE’s ‘parilegs’, and his penis intersecting (‘interecting’) an obtuse angle: ⧄. However, if ‘hce che ech’ is treated as a triangle with its own ‘median’, as it is presented by the schoolbook in this passage, this proof becomes impossible in Euclidean geometry. The equilateral triangle is the only triangle which can be bisected into two identical halves by its median at right angles (fig. 2.1). However, triangle hce cannot be a Euclidean equilateral triangle given that one of its angles is ‘obtuse’. Moreover, the lines which form HCE’s obtuse angle—his pair of legs which meet at the groin—are curvy

cords, which mirror the variable lines of ALP's body parts which are 'as round as the calf of [a leg]' (*FW* 294.11). Both of these facts suggest that the triangle hce, rather than being a Euclidean triangle at all, is Riemannian, and that its lines curve outwards. If this were the case then it would be possible to prove that the median of an obtuse-angled triangle could bisect the triangle's vertex at right angles (fig. 6.2). Dolph and Kev are therefore presented with a geometric problem which can only be proved using non-Euclidean geometry. If they were to abandon their traditional methodology, they would learn that HCE's purportedly rectilinear penis, or 'median', may in fact be curvaceous like his legs, which bend behind his rounded arse, or 'arcs'. Joyce thereby foreshadows the problems which the brothers experience when they go on to delineate the body parts of ALP, whose own 'parilegs' form a similar 'curveachord' to her husband's (fig. 6.3) (*FW* 294.03).

Dolph and Kev experience a related problem when attempting to determine whether the median of the triangle αλπ runs 'vortically' through the 'nether nadir' (point P) and the navel's apex (point π):

> […] we carefully […] lift […] the maidsapron of our A.L.P., fearfully! till its nether nadir is vortically where (allow me aright to two cute winkles) its naval's napex will have to beandbe. (*FW* 297.07-14)

As with triangle hce, this is largely down to the fact that they are mapping a curved bodily landscape which eludes the ideal objectivities implied by Euclidean geometry. In order to prove that point P, the anus, lies directly below point π, the clitoris, Dolph must derive the median of the αλπ triangle which would bisect the angle at point π and the mid-point of the line αλ. Assuming that αλπ is 'ann aquilittoral dyankle', this would be achieved by bisecting the equilateral triangle into two right-angled triangles as we have just seen (fig. 6.1) (*FW* 286.19-20). Therefore, αλπ and παλ should, according to Dolph's calculations, be acute angles given that the sum of the angles in any Euclidean triangle cannot exceed that of two right angles. However, this does not seem to be the case. The reason why Dolph needs to temporarily halt his inquiry and 'aright', or correct (in both senses of the word), 'two cute winkles [German: angles]' may be because these angles are not acute at all (*FW* 297.13). This would certainly be the case if, as in the case of the triangle hce, the triangle αλπ were positively curved, in which case the sum of its angles would be greater than that of two right angles. If this were true for the triangle ALP as well as the triangle αλπ which

lies directly above, then the vaginal form which the twins finally produce would resemble an egg, thereby echoing Dolph's description of Kev's shape as being 'as round as the [half] of an egg' (*FW* 294.11). Seeing in nature nothing other than those forms which correspond to the ideal objects and laws of Euclidean geometry, Dolph can only determine where ALP's 'nether nadir' ought to be in relation to her apex by stubbornly refusing the evidence of his own senses.

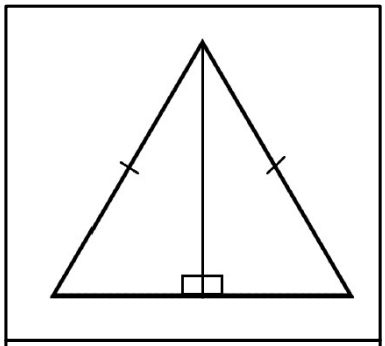

Fig. 6.1

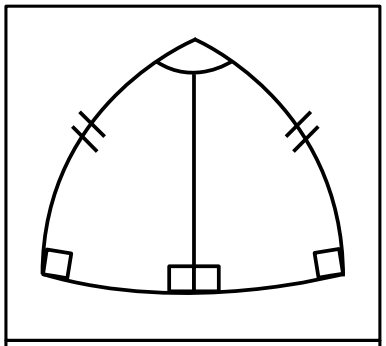

Fig. 6.2

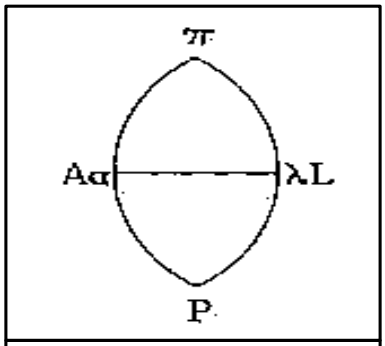

Fig. 6.3

The candlebearer (i)

Joyce's exposition of the universe through the twins' two-dimensional and narrow-minded geometric imaginings in II.ii reflects a notion which had become widespread by the early twentieth century: that, as Euclid himself is claimed to have said to Ptolemy, 'there is no royal road to geometry'; or, as it is echoed in the *Wake*, 'sknow royol road to Puddlin' (*FW* 287.04.05).[83] In light of emergent proofs that Euclidean geometry did not constitute the only perfectly logical system for describing space, Euclidean geometers, like religious apologists, were being perceived by a number of their critics as actively ignoring phenomena or theories which diverged from traditional lines of reasoning. Paul Valéry, an acquaintance of Joyce in Paris, expands upon this notion in 'Crisis of the Mind':

> [Geometry] was an enterprise requiring gifts that, when found together, are usually the most incompatible. It required argonauts of the mind, tough pilots who refused to be either lost in their thoughts or distracted by their impressions. [...] they trusted in words to lead them through space like far-

[83] Euclid, quoted in Richard J. Trudeau, *The Non-Euclidean Revolution* (Boston, MA: Birkhäuser, 2008), 5.

> seeing blind men.[84]

In II.ii, Lewis Carroll is depicted as one such '[argonaut] of the mind', for example, whose 'murmurable loose carollaries' are heard before Dolph instructs Kev to 'circumscript a cyclone' ('[o]ne of the most murmurable loose carollaries ever Ellis threw his cookingclass'), giving rise to the murmurings of loose corollaries associated with the first steps of Euclid's first problem (*FW* 294.07-08). Through his extended satire of Dolph and Kev, who recurrently refute the evidence of their own senses, Joyce responds to contemporary conceptions of Euclidean geometry as being a sensually delimiting system. Like the Nolan's dinner guests in the *Cena* who refuse to imagine a Copernican universe, Dolph and Kev are 'argonauts of the mind' who refuse to bend or think beyond the rules of the traditional system for describing space which they have ritualistically acquired.

With specific regard to the *Wake*'s Brunonian influences, many aspects to Dolph's unbending conviction in the rectitude of Euclidean geometry can be traced to Bruno's 'The Candlebearer'. The three main characters of Bruno's moralistic Renaissance play, Bonifacio, Bartolomeo and Mamfurio, are each propelled by a single desire and, like Dolph, they blinker themselves from any perspective which diverges from their own. The tragic flaws which result in their humiliating and torturous punishments consist of their inability to apprehend truths which lie beyond the flickering lights cast by the flame of their own desires. This metaphor forms a part of Bruno's more general critique of ideal objectivity, including that of geometry, and his Neoplatonic conception of the material world as a world of shadows which eludes the light of reason as discussed in *Shadows of Ideas*. In the letter of dedication for 'The Candlebearer', Bruno highlights this conceptual parallel:

> [...] here then is the candle which is proffered to you through this *Candelaio* which I send to you from this land where I find myself and where it may serve to illuminate certain *Shadows of Ideas* which in truth seem to frighten the beasts […].[85]

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[84] Paul Valéry, 'Crisis of the Mind' (1919), trans. by Michael Cowley, *Selected Writing of Paul Valéry*, ed. by Michael Cowley (New York, NY: New Directions, 1950), 117-122, 119.

[85] Bruno, 'The Candlebearer', trans. by Gino Moliterno, in Moliterno, 'The Candlebearer at the *Wake*: Bruno's *Candelaio* in Joyce's Book of the Dark', *Comparative Literature Studies*, Vol. 30, No. 3 (1993), 269-294, 279.

In the opening of *Shadows of Ideas*, Bruno uses the image of the dark side of the moon to illustrate his thesis that the truth can never be elucidated in its entirety. Given that we only approach truths from our own perspective, he argues, the man of logic must be open to alternative lines of inquiry in order to make logical deductions of the unknown.[86] This notion is apparent throughout the final stages of Dolph and Kev's solution of Euclid's first proposition, in which the twins must work coincidentally and each ask what the other can see in order to conceive ALP's moon as a whole. Responding to Bruno's *Shadows of Ideas*, Joyce illustrates how the twins' parallactic views of common bodily parts enable them to conceive common geometric, linguistic and other figurative objects from divergent and coincident perspectives.

Joyce's satire of Dolph and Kev's narrow-mindedness, and his expositions of their abortive theories and failed expectations in particular, echoes Bruno's extended parodies of his characters' stubborn refusal to investigate unexplored shadows of ideas in 'The Candlebearer'. As Bruno states in the proprologue:

> *Eccovi avanti gli occhii: ociosi principii, debili orditure, vani pensieri, frivole speranze, [...] falsi presuppositi, [...] offuscamento di sensi, turbazion di fantasia, smarito peregrinaggio d'intelletto, fede sfrenate, cure insensate, studi incerti, somenze intempestive, e gloriosi frutti di pazzia.*
>
> Before your eyes will unfold pointless theories, moronic schemes, meaningless ideas, frivolous hopes, [...] false presuppositions, […], offended senses, struggles of the imagination, confusions of the intellect, unrealistic convictions, insane concerns, hazardous inquiries, prematurely sown seeds of folly and the beautiful fruits of dementia.[87]

Throughout the play itself, the image of the candle symbolises the three main characters' delimited and delimitating conceptual purviews, which is largely the cause of their 'intellects' growing 'confused' and their 'hopes' becoming 'frivolous'. On a more basic level, the candle metaphor is represented by Bonifacio's penis which, like his rectilinear mode of thought, causes him to ignore theories which frustrate his sexually-driven objectives (the candle also represents Bruno's penis, as the Nolan makes clear in his letter of dedication to Morgana: 'you will either place it in your cabinet or insert it into your

[86] Giordano Bruno, *De Umbris Idearum* (Paris: Apud Aegidium Gorbinum, 1582).
[87] Giordano Bruno, 'Le Chandelier', in *Œuvres Complètes*, Vol. I of VII, ed. by Yves Hersant (Paris: Les Belles Lettres, 1993), 43 (my translation).

candleholder').[88] The extent to which Bonifacio thinks and sows 'seeds of folly' with his penis is encapsulated in act V, in which this would-be adulterer fails to discern his wife's face in the semi-darkness of Vittoria's boudoir as he enters in disguise, clutching his member. This image is alluded to in II.iii in which HCE, having relieved himself, returns to the pub 'heavyside breathing' with 'his stickup in his hand' and fails to completely discern the gossip surrounding his own sexual misadventures through the drunken haze of his own thoughts (II.iii, 09-20).[89]

Similar to the way in which Bonifacio's thoughts are guided by the light of his phallic candle, Mamfurio's way of thinking is circumscribed within the enlightening proverbs of canonical writers and texts which he believes to provide the correct way for reading the world. As Bruno writes of him in his proprologue:

> *Voi vedrete un di questi che mastica dottrina, olface opinioni, sputa sentenze, minge autoritadi, eructa arcani, exuda chiari e lunatici inchiostri* […].
>
> You will see one of these pedants chew doctrines, sniff opinions, spit maxims, piss quotations, belch mysteries, exude enlightening and sublime writings […].[90]

Mamfurio can only express and conceive notions which are incorporated in the 'doctrines', 'opinions', 'maxims' and 'quotations' of the texts he has read and memorised. The liberal manner in which he employs these references calls to mind the Euclidean geometers who Bruno, in several of his Latin works, accuses of senselessly applying theoretical ideals to the material world with little regard for sense-experience. The pedant's automatic digestion and excrement of rote-learned writings parallels Dolph's parrot-like repetition of traditionally-learned theories and maxims in II.ii, as well as Joyce's parodic referral to traditional dictums and canonical literary works throughout the *Wake* as a whole. By 'arecreating' or recreating the mathematical knowledge of his four schoolmasters 'om lumerous ways'—in both numerous and luminous ways—Dolph, the match-wielding, would-be discoverer of ALP's vagina is cast as a Brunonian candlebearer senselessly chewing doctrines and pissing quotations wherever he goes (*FW* 282.28-29).

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88 Giordano Bruno, 'The Candlebearer', trans. by Moliterno, in Moliterno, 'The Candlebearer at the *Wake*: Bruno's *Candelaio* in Joyce's Book of the Dark', 278.

89 For a more detailed synopsis see Moliterno, 274-276.

90 Bruno, 'Le Chandelier' (my translation), 50.

In his essay 'The Candlebearer at the *Wake*', Gino Moliterno identifies several allusions to Bruno's play elsewhere in *Finnegans Wake*. Following a 'Sing' of 'Old Finncoole' in III.iv, for instance, an Italian play is called for: '[p]lay actors by us ever have crash to their gate. Mr Messop and Mr Borry will produce of themselves, as they're two genitalmen of Veruno, Senior Nowno and Senior Brolano' (*FW* 569.23-32). Not only is Bruno of Nola made manifest through the Nolan Browne motif, but his comedy is evoked in the phrase the 'producing of themselves' which, Moliterno argues, is a direct verbal echo of the argument and ordering of the comedy '("we present, of himself, first . . .")'.[91] Moliterno further points out that the names of Bonifacio and Bartolomeo are used to describe HCE as the drunken, penis-handling publican throughout II.iii: "Barthalamou"; "Burniface"; "bonafacies"; and "Bompromifazzio"; as well as, in III.iv, 'boniface and bonnyfeatures' (*FW* 314.22; 315.09; 337.06; 345.23; 577.11). Earwicker, more generally, is a wick-bearing candle man said to have approached the lamp-bearing ALP and put a 'wick-in-her' (*FW* 583.31). By bringing these various allusions together with a close reading of the passage concerning Mr Porter's candle in III.iv, Moliterno demonstrates that 'Joyce had not only read the *Candelaio*, perhaps in his younger days, but [...] also had it beside him' during the composition of certain passages in the *Wake.*[92]

The Brunonian candle-bearing man of pure reason, who fails to see beyond the light of his own logic, is a central motif in Dolph's attempt to illuminate that which lies between his mother's legs. The candlebearer metaphor was one of the earliest seeds which gave birth to II.ii, and it can be traced to Joyce's notebooks for the chapter at the University of Buffalo:

> ⊏ describes a circle (cuts)
> ∧ bisects a line
> ⊏ does theme for ∧
> holds candle[93]

Joyce's engagement with Bruno's 'The Candlebearer' is exemplified in the particular passage which grew around this original concept. After determining that ALP's 'nether

[91] Moliterno, 283.
[92] Moliterno, 289.
[93] James Joyce, *Finnegans Wake* notebook VI.B.12: 21, *Finnegans Wake: A Facsimile of Buffalo Notebooks VI.B.9 – VI.B.12*, ed. by David Hayman (New York, NY: Garland Publishing, 1978), 236.

nadir is vortically where […] its naval's napex will have to beandbe' following their completion of the final stage of Euclid's problem, Dolph advises Kev to light a match as they approach the nether nadir and travel deeper into the darkness of ALP's 'maidsapron':

> You must proach near mear for at is dark. Lob. And light your mech. Jeldy! And this is what you'll say. Waaaaaa. Tch! Sluice! Pla! (*FW* 297.14-17)

Unable to see in the dark, Kev is thought to light his match and, as if the consequence were predetermined, immediately cries out as 'sluice' from ALP *Schluss* (or end) descends upon him and spits out ALP's 'equoangular trillitter' backwards, in the opposite direction of the current ('[p]la!') (*FW* 286.21-22; 297.17). By centring an episode which deals with the straight and narrow modes of reading the world prescribed by geometric traditions around the act of producing a flame, Joyce does much more than simply allude to the 'joke about a boy invited by a woman to inspect her private parts, whereupon, as it was dark, he lighted a match and said "start peeing now, it's on fire!"' (although this is certainly relevant).[94] In light of Bruno's rhetorical critique of rectilinear thought in 'The Candlebearer', the extended analogy also suggests that the final image which Dolph and Kev apprehend while exploring the shadows beneath their mother's skirt isn't necessarily an ideally objective one—which might otherwise be suggested given their rigorous application of Euclidean geometry—but rather a projection of their own subjective logics and sexual urges.

This notion is explored further in the passage which precedes the final revelation of ALP's pudendum, in which the narrative openly critiques Dolph and Kev's coincident lines of approach by assuming the style of another Euclidean proposition ('[l]et it be taken that her littlenist is of no magnetude [...]') (*FW* 298.08-09):

> […] hence shall the vectorious readyeyes of evertwo circumflicksrent searclhers never film in the elipsities of their gyribouts those fickers which are returnally reprodictive of themselves. (*FW* 298.14-18)

By delimiting the scope of Dolph and Kev's seemingly victorious 'readyeyes', or radii, within a radius vector, the pedagogical narrative suggests that they cannot see beyond the

[94] Raphael Slepon (ed.), elucidatory note for *FW* 297.14-17, *The Finnegans Wake Extensible Elucidation Treasury* <http://www.fweet.org> [date accessed: 04/01/16].

circles (‘searclhers’) of light which they cast around themselves, like a search-light. As a result, the two ’circumflicksrent’ searchers are unable to fill in the ellipses of their whereabouts and envisage those tenebrous areas which lie beyond their circumlocuted scope. Therefore, the ‘surviews’ of Dolph and Kev are each confined to a circle located at their relative points, π and P respectively. They consequently remain unable to envisage ALP’s form as a whole in spite of Dolph’s bold promises to Kev at the beginning of their inquiry: ‘I’ll make you to see figuratleavely the whome [whole] of your eternal geomater’ (*FW* 296.30-297.01). This would certainly be the case if ALP, whose buttocks represent the two hemispheres, were positively curved: the brothers, situated at poles apart, would not be able to see beyond their shared horizon on the line αλ (fig. 4). Although the twins manage to work together and develop ‘innate little bondery’ as they piece together ALP’s body parts, their respective conceptions of sensibly apparent territories remain circumscribed by a neat little boundary (*FW* 296.29).

Not only are Dolph and Kev blind to ALP’s bodily form as a whole, but they are also incapable of visualising a complete image of those forms which appear within the boundaries of their ‘vectorious ready eyes’: Dolph’s vision of the clitoris is veiled by the flickering light of his match, whereas Kev’s appears in the fluctuating ‘refluction’, which appears to be ‘flument, fluvey and fluteous’) and ‘the constant of fluxion’ as it is reflected by ALP’s urinal stream below (FW 287.22-23; 297.29; 299.18). By filling in ‘the elipsities of their gyribouts’, or the ellipses and other unknowns regarding their whereabouts, with forms based on their own subjective predictions the two ‘flickers’ (figures or fuckers) create a mental image which is eternally and predictably reproductive of themselves. Dolph and Kev can be understood as Brunonian candle bearers, blind to the larger picture which lies beyond the circumscribed scope of traditional and subjective modes of thought, and unable to fully conceive the circumflexing lines of curved objects and their horizons. Wandering a world of shadows, the twins find themselves incapable of bringing to light an alternative ‘surview’ of the mother, the river and the world they think they know ‘[o] so well’ (*FW* 285.26; 390.34).

Conclusion

By impregnating the empirical language of Euclidean geometry with imagery relating to the non-Euclidean forms and planes discussed by Giordano Bruno and Henri Poincaré throughout the children's 'series exerxeses' in II.ii, Joyce fragments the univocity of each geometric element, leaving in his wake a chaotic 'whorl' of plurivocal meanings regarding the fundamental constitution of space and the body (*FW* 286.08; 006.24). Mediated through the *Wake*, the Euclidean catechism's ideal objectivities and cardinal axioms disintegrate into confounding 'doubleviewed' meanings, or 'doublecressing twofold thruths', and fixed empirical certainties become enshadowed in doubt (*FW* 296.01; 288.03). Joyce thereby bastardises the primordial sense of geometric ideal objects in a similar way to his commitment of 'violence' on literature, as Margot Norris argues.[95] Along with language, the original unity of geometric sense becomes eroded by 'the obluvial waters of' Anna Livia Plurabelle's chronic river, which disintegrate and coalesce both linguistic and geometric signifiers and signifieds (*FW* 080.25). Exploring the semiotic wastes of Euclidean geometry and its deformed progenitures, much like the Hen who picks through the litter by the Liffey in I.ii and uncovers the defamatory Letter, Joyce unearths 'certain *Shadows of Ideas*' concerning the parallel postulate which Euclidean geometers for over three hundred years were forced to either circumnavigate or deny.[96] Following Bruno, Joyce both reflects and interrogates Euclidean geometry's history of uncertainty, offering examples in which non-Euclidean geometries based on alternative parallel postulates provide the most convenient means for describing what we see. It becomes unclear how the confounded Dolph, ignoring his senses and using only the *meters* prescribed by his four forefathers, 'measured his earth anyway'; and the extent to which, if he was successful, the represented properties of 'his earth' deviate from the sensible territories which he attempts to map (*FW* 303.28). In spite of his attempts at systematising the visible universe through a process of rectification (or attempting to 'draw the line somewhawre'), he nevertheless continues to see 'all sorts in shapes and sizes, marauding about the moppamound' which he cannot explain (*FW* 292; 464).

[95] Margot C. Norris, 'The Consequence of Deconstruction: A Technical Perspective of Joyce's *Finnegans Wake*', *ELH*, Vol. 41, No. 1 (Spring, 1974), 130-148, 147.

[96] Bruno, 'The Candlebearer', trans. by Gino Moliterno, in Moliterno, 279.

Chapter 2. Squaring the Circle: Geometry and Topography in 'Ithaca'

> *Like a geometer who sets himself to square the circle, and is unable to think of the formula he needs to solve the problem so was I faced with this new vision: I wanted to see how the image could fit the circle and how it could be that that was where it was.*
>
> — Dante Alighieri, *Paradiso* (canto 33, lines 133-8).[1]

In a letter to Frank Budgen (1921), Joyce wrote of 'Ithaca':

> I am writing Ithaca in the form of a mathematical catechism. All events are resolved into their cosmic physical, psychical, etc. equivalents, e.g., Bloom jumping down the area, drawing water from the tap, the micturition in the garden, the cone of incense, lighted candle and statue so that not only will the reader know everything and know it in the baldest coldest way but Bloom and Stephen thereby become heavenly bodies, wanderers like the stars at which they gaze.[2]

Similar to the lessons in the *Wake*an classbook, which the Earwicker children faithfully memorise and apply, 'Ithaca' is written 'in the form of a mathematical catechism'. The 'mathematical catechism' refers to a variety of mathematical and scientific facts and, like the Christian catechism, it assumes a methodical question-and-answer structure. As a result, Bloom's and Stephen's imaginings of the universe are related in the 'baldest coldest way'; a style reminiscent of Husserl's reduction of empirical language into its purest possible form. By adopting such a 'bald' style for the episode, Joyce accentuates the narrative's more general movement towards an ever-distant horizon of ideally objective knowledge as it follows Bloom and Odysseus in charting the seas and the stars which guide them home.

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1 Dante, *The Divine Comedy*, trans. by David H. Higgins (Oxford: Oxford University Press, 1981), 499.

2 James Joyce, 'Letter of February, 1921', *Letters of James Joyce*, Vol. I of III, ed. by Stuart Gilbert (New York, NY: Viking Press, 1966), 164.

The mathematical catechism's questions and answers are often reflective of what Bloom and Stephen are thinking and seeing, although it is difficult to determine the extent to which the narrative eye's encompassing purview escapes the boundaries of its focalising characters' perspectives. It apprehends their actions from afar, while also picking apart their innermost thoughts in great detail. In 'Joyce and Science', Sam Slote argues that 'much of the science in *Ulysses* is filtered through Bloom, who is an enthusiast of popular science, as is illustrated by some of the books he owns (catalogued in 'Ithaca' [….]') as well as by his attempts at ratiocination throughout the day'.[3] In 'Ithaca', however, attributing the popular scientific notions upheld by the narrative to Bloom becomes problematic. Ascertaining where Bloom's and Stephen's conceptions of spatial reality begin, and where those projected by the catechetical narrative eye's end, is often impossible. While it is tempting to attribute certain passages to Stephen and others to Bloom, the two characters become syntactically inseparable in ambiguous phrases such as:

> What two temperaments did they individually represent?
> The scientific. The artistic. (*U* 17.559-560)

This suggests that either: (a) Bloom embodies the scientific temperament and Stephen the artistic; (b) Stephen embodies the scientific temperament and Bloom the artistic; or (c) both Bloom and Stephen represent the scientific and the artistic temperaments. As Slote argues, 'we […] see in "Ithaca" the "fusion" of Bloom's and Stephen's perspectives, the artistic and the scientific: the languages of science meet those of art'.[4] Linguistic and grammatical ambiguities such as these erode divisions between the characters' thoughts and the narrative's attempts at objectively representing them. In his more recent essay 'Questioning Technology in "Ithaca"', Slote discusses the narrative's contrivance of 'the idea of a union of Bloom and Stephen' in light of 'the act of enframing' through which this idea is created.[5] He argues that Bloom and Stephen do not function as discrete medial windows into the world of 'Ithaca', but rather 'as resources to be exploited through variable contrived frames'.[6] In a broader sense, Joyce's hyper-objective articulations of

[3] Sam Slote, 'Joyce and Science', *Palgrave Advances in James Joyce Studies*, ed. by Jean-Michel Rabaté, (London: Palgrave Macmillan, 2004), 162-182, 163.
[4] Slote, 'Joyce and Science', 165.
[5] Sam Slote, 'Questioning Technology in "Ithaca"', Hypermedia Joyce Studies, Vol. 8, No. 2 (2007), <http://hjs.ff.cuni.cz/archives/v8_2/main/essays.php?essay=slote> [date accessed: 04/01/16].
[6] Slote, 'Questioning Technology in "Ithaca"'.

visual space in 'Ithaca' constitute a hyperbolic rendering of 'the scientific temperament' embodied by Bloom, Stephen or both. The narrative's calculations are 'often exaggerated to extreme and comedically absurd proportions', as Slote argues, which magnifies the ridiculous ends to which the 'scientific temperament' of its characters are pursued.[7]

As is the case throughout the geometry section of the schoolbook in the *Wake*'s 'nightlessons' chapter, the catechism's dependence on ready-made concepts in 'Ithaca' gives rise to a range of visual distortions. As Matthew Creasy argues in his essay 'Inverted Volumes and Fantastic Libraries', the 'formal surface' of 'Ithaca' 'seems predicated upon "the accuracy of knowledge." Whilst the glitter of its vocabulary ("hydrostatic quiescence") contributes to this appearance of precision, neutrality and fact, it is, however, deceptive'.[8] Echoing Dolph's desire for rectitude in solving his geometric problems, the catechetical narrative refers to mathematically proven and scientifically accepted axioms throughout its *a priori* measurements of the Earth and other 'heavenly bodies'.[9] Resulting from the unbending convictions which underpin its measurements, however, the narrative commits numerous errors which derive from the application of ideal geometric objects to natural surfaces. As a result, the narrative's topographical and astronomical readings often result in skewed conceptions of the spaces and territories to which it refers.

Several critics have examined the sense of mathematical and scientific incertitude which Joyce evokes in 'Ithaca', particularly in light of early twentieth-century responses to Einstein. In his seminal essay 'Science in "Ithaca"', Avrom Fleishman argues that Joyce responds to Einstein's general theory of relativity and expanding universe theory in 'Ithaca' by highlighting the relative and subjective nature of the narrative's scientific observations. Under particular consideration in Fleishman's article is the narrative's treatment of solar parallax, the measurement of which depends on not one but two coincident perspectives (in the case of 'Ithaca', Bloom's and Stephen's) on the scientific object (a role which Fleishman attributes to Molly).[10] In a more recent essay on 'Joyce's Use of Mathematics in

7 Slote, 'Questioning Technology in "Ithaca"'.

8 Matthew Creasy, 'Inverted Volumes and Fantastic Libraries: *Ulysses* and *Bouvard et Pécuchet*', *European Joyce Studies 19: James Joyce and the Nineteenth-Century French Novel*, ed. by Finn Fordham & Rita Sakr (Amsterdam: Rodopi, 2011), 112-127, 116.

9 Joyce, 'Letter of February, 1921', *Letters of James Joyce*, Vol. I of III, 164.

10 Avrom Fleishman, 'Science in Ithaca', *Wisconsin Studies in Contemporary Literature*, Vol. 8, No. 3 (Summer, 1967), 377-391, 378.

"Ithaca"', Michael Livingston relates the function of mathematical error in the episode to early twentieth-century notions of subjectivity and the scientific limit. Drawing from Einstein's general theory of relativity, he argues that Joyce undermines scientific objectivity by either deliberately or accidentally impregnating the omniscient narrative with mathematical errors. By including various algebraic, geometric and astronomical miscalculations within the narrative, Livingston argues, Joyce presents mathematics as a narrative tool which is prone to error, like language.[11] Livingston's essay complements Patrick McCarthy's examination of geometric incertitude and narrative unreliability in his essay 'Joyce's Unreliable Catechist: Mathematics and the Narration of "Ithaca"'. Discussing Bloom's abortive attempts at squaring the circle, McCarthy highlights several parallels between non-Euclidean geometry and the episode's unreliable narrative, in which the mathematical catechism's ideal of rectitude is subverted through the narrative's miscalculations.[12] In her essay 'Joyce, Euclid, and "Ithaca"', Joan Wilcox expands on how Joyce's invocation of mathematical uncertainty in 'Ithaca' responds to the development of non-Euclidean geometries. Focusing on Joyce's allusion to non-Euclidean versions of the parallel postulate in the opening of the episode, she argues that Joyce presents literature as a 'consistent' or 'axiomatic' 'meaning-system' which can be played with, transformed and rendered unfamiliar (as is the case with Euclidean geometry in II.ii).[13]

As we can see, the mathematical errors in 'Ithaca' have been examined with reference to a range of more widespread doubts concerning the possibility of a single subject effecting an ideally objective form of geometric discourse in an Einsteinian, non-Euclidean age. Surprisingly few critics, however, have investigated how the narrative's mathematical and scientific errors consequently distort the images which it attempts to educe from its characters' visible universe. Responding to its sister-chapter in Homer's *Odyssey*, 'Ithaca' is an episode which concerns oceanographic navigation and astronomy (in his schema, Stuart Gilbert not only cites the 'art' of 'Ithaca' as 'science', but also provides 'comets' as its 'symbol').[14] It is therefore surprising that very few critics have fully examined the

[11] Michael Livingston, '"Dividends and Divisors Ever Diminishing": Joyce's Use of Mathematics in "Ithaca"', *James Joyce Quarterly*, Vol. 41, No. 3 (Spring, 2004), 441-454.

[12] Patrick A. McCarthy, 'Joyce's Unreliable Catechist: Mathematics and the Narration of "Ithaca"', *ELH*, Vol. 51, No. 3 (Autumn, 1984), 605-618.

[13] Joan Parisi Wilcox, 'Joyce, Euclid, and "Ithaca"', *James Joyce Quarterly*, Vol. 28, No. 3 (Spring, 1991), 643-649, 646.

[14] Stuart Gilbert, 'The Gilbert Schema', *Ulysses: The 1922 Text*, ed. by Jeri Johnson (Oxford: Oxford University Press, 2008), 734-735, 735.

narrative's abortive attempts at measuring the Earth, the ocean, and the stars which guide Bloom's imaginings, like the wanderings of Odysseus, towards a final envisioning of human bodies and home.

With reference to the episode's topographical and astronomical misconceptions, this chapter explores how the narrative's skewed readings of the visual universe usually stem from a belief in two false assumptions. Firstly, that cartographical representations of curved three-dimensional surfaces in two dimensions are to be taken at face value. The narrative's misconception of the relative sizes of the oceans, for example, derives from a wholehearted belief in the literalness of Mercator's projection, which in fact provides a variably distorted image of the Earth in its application of positively curved rhumb lines. In other words, this problem concerns Bloom's and the narrative's conflation of maps with their territories. Secondly, that every widely accepted work of mathematical and scientific literature is true. Many of the narrative's misconceptions concerning the formal properties of the universe stem from its unbending faith in traditional, out-dated or disproved scientific notions contained in archaic texts. Echoing the practice of a Brunonian candlebearer, the narrative's senseless conception of the visual world is largely prescribed by the canonical texts to which it and its characters refer. Failing to consider the uncertainties which are located beyond the scope of its characters' limited and often outdated knowledge base, the narrative envisages an ultimately distorted universe whose tenebrous properties are filled with the projections of its focalising subjects' deviant beliefs.

This chapter also explores how Joyce saturates the episode's topographies with various pre-scientific traditions for describing the universe. These include ancient Greek astronomy, for example, which enters into the catechism's cross-examination of Molly and celestial spheres. By embedding the narrative's attempts at objective observation with metaphysical accounts of the universe stemming from Greek myth, Joyce not only transforms human bodies into their 'cosmic equivalents' (as is the case with Molly, who transforms into Diana) but also explores—as he does in the *Wake*—the processes by which pre-scientific cultural ideals become woven into the language of modern science.[15]

[15] Joyce, 'Letter of February, 1921', *Letters*, Vol. I of III, 164.

'Ithaca' was composed nearly ten years before Joyce began exploring how the Euclidean geometric tradition can deposit erroneous assumptions within the consciousness of Everybody, thus distorting everyone's visualisation and conceptualisation of the Earth and beyond. However, by 1921 Joyce was evidently aware of how the senseless topographical application of geometric axioms can disorientate an Everyman. By exploring the misconceptions which arise from the narrative's application of geometric ideals in 'Ithaca', Joyce highlights an incongruity between visual objects and their *meters*. In other words, he explores the possible limits of squaring the circle, both topographically (in terms of projecting curved natural surfaces such as heavenly and corporeal bodies onto a two-dimensional map, as in Mercator's projection) and metaphorically (in the sense that the curved natural world's irregular features are rectified as they are represented textually on a two-dimensional, rectilinear page). By highlighting an impasse between the map and the territory, and the book and the world, Joyce reflects on in his own project of representing a complete 'picture of Dublin' in *Ulysses*.[16]

Non-Euclidean geometry in 'Ithaca'

As Phillip F. Herring points out, the notesheets for 'Ithaca' are filled with 'geometric doodling'.[17] Among these pictorial and written sketches of geometric concepts are several references to non-Euclidean geometries. Judging from Joyce's notes on Henri Poincaré's discussion of hyperbolic and elliptic geometries in '"Ithaca" 13' (see Introduction), he would have encountered Poincaré's chapter on 'Non-Euclidean Geometries' in *Science and Hypothesis*—and, by extension, Poincaré's discussion of the distortions which arise whenever Euclidean objects are projected onto positively or negatively curved planes and solids (such as Milly's spine)—by the time he began writing the episode:

> Eucl. space no total curvature of spine (Milly)
> Lobatchewsky const. tot. curv. neg
> Riemann ″ ″ ″ pos.[18]

[16] Frank Budgen, *James Joyce and the Making of Ulysses* (1934; repr. Bloomington, IN: Indiana University Press, 1961), 67-8.

[17] Philip F. Herring, 'Descriptive Essay of "Ithaca"', *Joyce's Ulysses Notesheets in the British Museum*, ed. by Herring (Charlottesville, VA: The University Press of Virginia, 1972), 58-60, 59.

[18] Joyce, 'Ithaca 13', *Joyce's Ulysses Notesheets in the British Museum*, ed. by Phillip F. Herring (Charlottesville, VA: The University Press of Virginia, 1972), 13.86-88.

As Thomas Jackson Rice argues in 'The Geometry of Meaning in Dubliners', 'Joyce's notes for *Ulysses* and his allusions to geometry in 'Ithaca' demonstrate that he was familiar with the history and concepts of non-Euclidean geometry by the late 1910s'.[19] Responding to Rice, Federico Sabatini pursues the possibility that Joyce 'became acquainted with the new revolutionary theories during his sojourn in Rome from 1906 to 1907, when Roberto Bonola's book *La geometria non-euclidea: esposizione storico-critica del suo sviluppo* (*Non-Euclidean Geometry: A Critical and Historical Study of its Development*) was highly celebrated'.[20] Whether Joyce actually read Bonola's *Non-Euclidean Geometry* is uncertain: as Rice argues in *Joyce, Chaos and Complexity*, '[t]here is no evidence that Joyce read Bonola, although he would very likely have been aware of him'.[21] Nevertheless, both hyperbolic and elliptic geometries had been widely heard of in the English-speaking world by 1904 through the translation and publication of popular texts including Bonola's *Non-Euclidean Geometry* and Poincaré's *Science and Hypothesis*, as well as the theories of Bolyai, Lobachevsky and Riemann themselves. In this light, it is possible that the subjects of *Ulysses* and 'Ithaca' would be aware of Euclidean geometry's alternatives, as Rice puts it with regard to Joyce, 'in much the same way that a literate person today would recognize, say, Stephen Hawking without necessarily having read *A Brief History of Time*'.[22] Unlike Joyce, however, it is impossible that the citizens of Dublin in 1904 could have had any knowledge of Einstein's general theory of relativity (1916) or expanding universe theory (1917) in which Einstein assumes that the universe is four-dimensional, closed, and—by extension of the fact that straight lines curve upon each other within a closed universe—hyperbolic (Lobachevskian). If non-Euclidean geometries meant anything to anyone living in 1904, they would therefore most likely be understood as ultimately abstract models which were yet to be applied.

As we have seen, non-Euclidean models for space are explored in *Finnegans Wake*, and the notion of four-dimensional space was certainly in Joyce's mind when he composed 'Ithaca'. This is indicated in his note to the '4$^{th.}$ dimension' in his notebook for the episode, which appears within the context of Bloom considering the 'roundness' and 'tangent' of

[19] Thomas Jackson Rice, 'The Geometry of Meaning in Dubliners: A Euclidian Approach', *Style*, Vol. 25, No. 3 (1991), 393-404 , 400.
[20] Federico Sabatini, '"Sifted science will do your arts good": Non-Euclidean Geometries in *Finnegans Wake*', *mediAzioni*, Vol. 12, <http://mediazioni.sitlec.unibo.it> [date accessed: 04/01/16], 6-7.
[21] Thomas Jackson Rice, *Joyce, Chaos and Complexity* (Champaign, IL: University of Illinois, 1997), 53.
[22] Rice, 53.

Molly's 'hemispheres'.[23] By setting this self-reflexively scientific episode within a non-Euclidean but pre-Einsteinian historical period, Joyce sets up a contrast between, on the one hand, the modern scientific conceptions of the universe alluded to by the narrative (which would have been familiar to many of Joyce's readers after 1919); and, on the other, the narrative's recourse to the archaic notions upon which its subjects reflect.

This contrast is established in the opening passages of 'Ithaca', which calls Euclid's parallel postulate into question by assuming that Bloom and Stephen trace 'parallel courses' through Dublin, despite the fact that they begin (and end, presumably) 'united':

> What parallel courses did Bloom and Stephen follow returning?
>
> Starting united both at normal walking pace from Beresford place they followed in the order named Lower and Middle Gardiner streets and Mountjoy square, west: then, at reduced pace, each bearing left, Gardiner's place by an inadvertence as far as the farther corner of Temple street: then, at reduced pace with interruptions of halt, bearing right, Temple street, north, as far as Hardwicke place. Approaching, disparate, at relaxed walking pace they crossed both the circus before George's church diametrically, the chord in any circle being less than the arc which it subtends. (*U* 17.1-10)

The seemingly contradictory response to this opening question can be explained in several ways. Firstly, the term 'united' can be interpreted figuratively, as is the case in Ray Mines and Reed Way's essay on 'Mathematics in Ithaca':

> Since Stephen and Bloom are bodies of a certain size, they can begin united (in effect, touching each other) and still proceed on different but parallel lines. Just as wheels connected by an axle are joined but move parallel to one another, Stephen and Bloom can start united but follow parallel courses, particularly if —as this detail suggests—Bloom is assisting the still somewhat incapacitated Stephen.[24]

For Mines and Way, Joyce's use of the word 'united' signifies an approximation of proximity between two bodies rather than an absolute point in space they occupy simultaneously. Avrom Fleishman summarises this notion in 'Science in "Ithaca"': 'two

[23] Joyce, 'Ithaca 9', *Joyce's Ulysses Notesheets in the British Museum*, 9.101-116.

[24] Ray Mines and Reed Way, '"Nought Nowhere Was Never Reached": Mathematics in *Ulysses*', *James Joyce Quarterly*, Vol. 35, No. 1 (Autumn, 1997), 25-36, 26.

human beings can come together only to the extent of approximating each other's courses, but they can never be united—because they are two!'.[25] This interpretation has led several critics to doubt whether Joyce had any knowledge of Riemannian geometry, which assumes that it is possible for parallel lines to intersect. Livingston, for instance, argues that based on Mines and Way's interpretation '[w]e can be reasonably certain [...] that Joyce was familiar with algebra and basic Euclidean geometry, but his knowledge seems limited to these mathematical fields'.[26] However, judging from Joyce's early notes on the non-Euclidean geometries of Lobachevsky, Bolyai and Riemann in his notebooks for 'Ithaca', as well as the texts which he is likely to have consulted when compiling them, it is more likely that his geometric knowledge was not limited to 'basic Euclidean geometry'; and it is questionable whether Joyce's knowledge of Euclidean geometry was all that 'basic' given that he had to pass two geometry modules for his matriculation examination at UCD. With reference to Joyce's notes on non-Euclidean geometries, Joan Wilcox argues that the apparent contradiction in the opening of 'Ithaca' directly alludes to the history of abortive attempts at proving Euclid's parallel postulate in her essay 'Joyce, Euclid and "Ithaca"'. She asserts that the word 'parallel' in this context does not necessarily imply that Bloom and Stephen remain the same distance apart at every point of their journey: rather, it suggests that their courses diverge and re-converge as parallel lines would behave on a Riemannian plane. If this were the case, then it would be possible to prove that Bloom and Stephen's respective paths are at once divergent and convergent (fig. 3.1). A similar allusion to Riemannian geometry appears when Bloom later recalls the far-reaching tracks of the Great Northern Railway:

> Retreating, at the terminus of the Great Northern Railway, Amiens street, with constant uniform acceleration, along parallel lines meeting at infinity, if produced: along parallel lines, reproduced from infinity, with constant uniform retardation, at the terminus of the Great Northern Railway, Amiens street, returning. (*U* 17.2085-2089)

The narrative's rendering of Bloom's visual field in this reminiscence conforms to the laws of Riemannian space. Rather than remaining parallel *ad infinitum*, the infinitely extended railway tracks meet at the furthest visible point on the horizon. Through the use of a textual

[25] Fleishman, 383.
[26] Michael Livingston, '"Dividends and Divisors Ever Diminishing": Joyce's Use of Mathematics in "Ithaca"', *James Joyce Quarterly*, Vol. 41, No. 3 (Spring, 2004), 441-454, 444.

chiasmus, Joyce further illustrates how this visual phenomenon occurs both behind and, as Bloom returns to Amiens street, in front of the train, thereby evoking the ellipse which parallel lines would describe on a surface with total positive curvature. Joyce not only refers to Riemann's redefinition of parallel lines as summarised by Poincaré in *Science and Hypothesis*, but further illustrates Bruno's argument that 'nothing is perfectly straight', 'no two lines in nature are entirely and in all respects equal to one another', and that 'in the maximum there is no difference between the infinite circle and the straight line', as James Lewis McIntyre discusses in *Giordano Bruno*.[27] Following Bruno, Joyce employs a 'geometry of language' to embody this elliptic phenomenon verbally.[28]

Arguments over whether or not Joyce intended to allude to non-Euclidean geometry in the opening of 'Ithaca' lose their significance in light of the more pertinent fact that, as Wilcox points out, an overbearing sense of uncertainty is explicit in the narrative's application of Euclid's parallel postulate which causes Bloom's and Stephen's tracings (or tracing) through Dublin to seem physically and logically impossible. By obfuscating the geometric laws which govern the mathematical catechism's opening description, Joyce suggests that Euclidean descriptions of reality are not as clear-cut as they first appear. Having consulted Henri Poincaré's *Science and Hypothesis* while writing 'Ithaca', moreover, Joyce was aware of the variances which distinguished Euclidean and non-Euclidean definitions of the parallel postulate. Poincaré's notion that '[o]ne geometry cannot be more true than another it can only be more convenient', in particular, is reflected in the opening passage of 'Ithaca', in which Riemannian geometry can be used alongside Euclid's system to explain the apparently contradictory nature of Bloom and Stephen's 'parallel courses'.[29]

This visual overlap between Euclidean and non-Euclidean articulations of the pair's journeys is effected by its oblique phrasing. Joyce takes great pains to employ equivocal phrases suggesting that Bloom and Stephen take separate courses in spite of the notion that they begin united. In the final sentence of the opening passage, for example, the solitary adjective 'disparate'—emphasised through the use of parentheses—not only refers to the two men, who possess disparate dispositions. It equally refers to their disparate lines of movement through Dublin; lines which are so structurally dissimilar as to refute a basis for

[27] James Lewis McIntyre, *Giordano Bruno* (London: MacMillan & Co., 1903), 175; 135.
[28] Arielle Saiber, *Giordano Bruno and the Geometry of Language* (Hampshire: Ashgate, 2005).
[29] Poincaré, 50.

comparison. Similarly, the narrative describes how Bloom and Stephen cross the circus before St George's Church ‘diametrically’. This not only suggests that the pair each trace a diametric chord cutting through the centre of the circus, but also that their paths are themselves diametric, that is, opposite or contrary to each other.

The suggestion that the pair’s parallel courses are curved is further enforced in the narrative’s topographical tracing of their journey. If Bloom and Stephen walk from Beresford Place to Eccles Street then their relative courses must bend, as there is no one perfectly straight road in north-east Dublin which would lead the two wanderers directly from their point of departure to their point of arrival. By tracing their journey on a map it becomes evident that their route bends anti-clockwise in two dimensions, following the north-eastern arc of the North Circular Road. This relates to the notion that on a two-dimensional topography of a spherical or ovoid surface, as Mercator proved, the shortest distance between two points describes a curve rather than a line in actuality. By exploiting the circular structure of Dublin’s peripheries in this way Joyce suggests that Bloom’s and Stephen’s parallel courses would form a circular shape if sufficiently extended, just as lines would behave on a Riemannian plane or at a Brunonian infinity. By subverting the Euclidean ideal of infinite rectitude in its confused rendering of parallel lines, the opening of this episode foreshadows the opening of II.ii, in which the Earwicker children trace a circular route around Dublin by following the North Circular Road. The curved lines evoked in both introductory passages emphasise the curved nature of the surface on which they are traced. By highlighting the Earth’s curvaceousness in each case, Joyce reinforces the idea that two-dimensional geometric representations become deformed when they are projected onto the Earth’s three-dimensional plane, in which ‘pedestrians’ and ‘vehicles’ would always be travelling ‘slowly, quickly, evenly, round and round and round the rim of a round and round precipitous globe’ (*U* 17.500-503). As Mercator proved, those travelling ‘slowly’ would not necessarily be travelling at a reduced speed, but may in fact be tracing a ‘rim’ of a comparatively larger circumference; and in order for two parallel courses to be constantly travelling ‘evenly’ around a ‘precipitous globe’ one must be travelling more ‘quickly’ than the other.

By invoking Euclidean ideals and alluding to their alternatives in the opening passages of ‘Ithaca’, Joyce establishes a dialogical gap between the omniscient narrator’s purview

(which in this case relates the wandering pair's journey to Eccles Street from above) and the visual fields of its characters, in which parallel lines appear to '[meet] at infinity' (*U* 17.2086). Throughout the episode, as we shall see, the mathematical catechism's attempts at rectifying such irregularities give rise to confused interpretations of the geometric 'laws by which images [...] succeed each another'.[30]

Geometrising the universe

In its 'bald' and 'cold' mediation of Bloom's and Stephen's thoughts, the catechetical narrative evokes an idealistic visual landscape whose various forms are transformed into their closest Euclidean equivalents. Oddly, this is frequently overlooked in critical examinations of the mathematical errors in 'Ithaca'. By translating the variable forms of Bloom's and Stephen's visible world into ideal Euclidean objects through an active correction (i.e.: straightening) of curved lines and surfaces, the narrative dissolves the formal discrepancies which would normally differentiate these objects from each other. For instance, upon entering Bloom's kitchen Stephen is described as seeing 'four smallsized square handkerchiefs folded unattached consecutively in adjacent rectangles' which hang upon a 'curvilinear rope' (*U* 17.150-153). By suggesting that the handkerchiefs are each folded in half, into identical rectangles, the narrative provides a reductive description of their actual shapes. In order to appear as rectangles, the 'square' handkerchiefs must be folded into identical halves. For this to be physically possible, however, they would need to be hung from a completely straight, and not a 'curvilinear', rope. Hanging four handkerchiefs from a curved cord running through their centres would give rise to an assortment of overlapping, asymmetrical and curvilinear quadrilaterals, and each of them would possess a different shape and size. If anything, the handkerchiefs would more closely resemble hyperbolic geometric planes given the constant negative curvature of their saddle-like surfaces. The narrative eye thus ignores the variably curved nature of the baselines upon which these similarly curvaceous objects appear.

This two-dimensional correction of curved three-dimensional solids extends to a variety of other objects which are located in and around Bloom's home. These include Bloom's staircase (which is described as 'three continuous flights at successive right angles'); his

[30] Poincaré, 64-65.

windows (including the 'opaque singlepane oblong window' of his watercloset and 'the semitransparent semicircular glass fanlight over the halldoor'); his fire-building paraphernalia (a 'thin cylinder' of paper and 'a black diminutive cone') and his cranium (a 'hollow sphere') (*U* 17.1537; 17.1540-1541; 17.115; 17.1321-1326; 17.1275). Even imagery associated with 'human copulation' is, ironically, rendered sterile when mediated by the narrative catechism, which describes the act of lovemaking as an 'energetic piston and cylinder movement' accompanying 'circular extension and radial reentrance' (*U* 17.2158-2159). As is the case with Dolph and Kev's rectilinear approaches to ALP's curves, the male organ is described as a radial line while the 'circular extension' relates to the female organ, a notion which is further explored in 'the amplitudinously curvilinear episode Penelope'.[31] By translating everyday objects into their ideal Euclidean equivalents the mathematical catechism evokes a 'sterile landscape' whose sterility is borne from the hyper-objectivisitic and idealistic mode of its 'inspection' (*U* 17.1597-1598). The narrative's recurrent referral to the abstract realm of Euclid's *Elements* ultimately detaches its imagery from the sensuous experiences of its subjects. The forms which it renders are the components of an imagined landscape whose artefacts are, as Bruno would argue, an 'illusion of the senses'; and Bloom's conceptions of his home become further mystified, like Odysseus's upon his return to Ithaca's misty shores.[32]

By recurring to ideal Euclidean principles in an effort to apprehend the visual world as objectively as possible, the narrative ultimately fails to consider that the propositions of Euclidean geometry—or indeed any geometry—'do not describe reality', as Einstein puts it.[33] Broadly speaking, its quixotic dependence on the facticity of abstract concepts in its representations of the material universe reflects Immanuel Kant's argument in the *Critique of Pure Reason* that 'we can have no cognition of an object as a thing in itself, but only as an object of sensible intuition that is, as phenomenon', as he argues in the preface to the second edition.[34] The narrative, which struggles to scrutinise the physical world from without the catechetical modes of thinking in which it is entrenched, reflects 'the presupposed intangibility of the thing in itself' in its translation of visual objects into their

[31] Joyce, 'Letter of February, 1921', *Letters*, Vol. I of III, 164.
[32] McIntyre, 175.
[33] Albert Einstein, quoted in Morris Kline, *Mathematics: The Loss of Certainty* (Oxford: Oxford University Press, 1980), 97.
[34] Immanuel Kant, *The Critique of Pure Reason*, trans. by J. M. D. Meiklejohn (London: Henry J. Bohn, 1855), xxxiii.

ideal Euclidean equivalents (*U* 17.2212-2213). The visual errors which derive from the narrative's treatment of Euclidean geometry as a universal language, moreover, highlight Poincaré's notion that geometries are conventions which have no grounding in experimental facts. As he argues in *Science and Hypothesis*, '[i]f geometry were an experimental science, it would not be an exact science. It would be subject to continual revision. Nay, it would from that day forth be proved to be erroneous, for we know that no rigorously invariable solid exists'.[35] Like Poincaré, who refuted the understanding of geometry as an exact experimental science, Bruno regarded the employment of geometric figures 'as merely an artifice for rough practical measurements'.[36] As McIntyre discusses in *Giordano Bruno*, Bruno deduced that 'nothing is perfectly straight, nothing is perfectly circular among composites, nothing absolutely solid but the atoms, nothing absolutely void but the spaces between them'.[37] Bruno further argued that if—as he believed—'the atom' corresponds with 'the minimal circle', then '[t]he "squaring of the circle" is therefore impossible'.[38]

In light of Bruno's critique of geometry as 'an illusion of the senses', the formal discrepancies between visual phenomena and material objects in 'Ithaca' expand to overwhelming degrees.[39] On a micrological level, for instance, the handkerchiefs hanging in Bloom's kitchen would display hugely irregular surfaces, no matter how well pressed they appeared to be. Handkerchiefs, strings and all other finite forms, as Philip Kuberski suggests in *Chaosmos*, 'contain within them the elements of infinity'.[40] Referring to Benoit Mandelbrot's example of '[t]he circumference of a ball of twine', which could be anything 'between a brisk eight inches and a number approaching infinity', Kuberski argues that:

> With the exception of ideal Euclidean constructions such as lines, circles, and triangles—which, because they are imaginary, are always equivalent to their measurements—nothing in the sublunary realm can be measured without a certain violence or approximation that reveals our own position. We think of the world with reference to unreal entities such as circles and spheres, lines and planes, but the world we live in, the world of dust, trees, and smoke is

[35] Poincaré, 49-50.
[36] McIntyre, 180.
[37] McIntyre, 175.
[38] McIntyre, 180.
[39] McIntyre, 175.
[40] Philip Kuberski, *Chaosmos: Literature, Science, and Theory* (Albany, NY: State University of New York Press, 1994), 45.

> relentlessly different, and similar only to itself. Measuring an object, we measure our measurements and ourselves.[41]

The figurative dissonance between the narrative's geometric imaginings of what Mandelbrot refers to as 'quotidian physical phenomena' and their microscopic (or, in the case of water and its 'two constituent parts of hydrogen with one constituent part of oxygen', molecular) substructures may seem relatively insignificant in the grand scheme of things (*U* 17.212).[42] But when the narrative eye casts its geometrising gaze to the astral heavens and derives from the catechism its own grand scheme—or General Unified Theory—concerning the size, dimensions and formal structure of the universe and everything it contains, its measurements of the cosmically large and even the infinite bear practical problems which are fundamentally linked with those it suffers when attempting to objectively describe the minutest of details. Bloom is affirmed by Stephen as 'a conscious rational reagent between a micro and a macrocosm ineluctably constructed upon the incertitude of the void': that is, a substance used in chemically analysing the minimal, the maximal and 'the void' in between (*U* 17.1013-1015). As well as referring to an epistemological lacuna of uncertainty between 'the known' and 'the unknown', the 'void' equally refers to 'the spaces between [atoms]', as McIntyre discusses in *Giordano Bruno*.[43] Echoing Bruno's cosmology, in which the geometric laws governing elemental particles correspond with those which describe infinitely large objects, the visual distortions caused by the narrative's 'geometrico-chemico' inspection of the visual world's most elemental details become hugely amplified when it applies Euclidean geometry to measure the oceans, the Earth and the cosmos.[44]

One such macroscopic visual distortion is evoked in the narrative's exhaustive account of Bloom's admiration of water's 'vastness' and 'profundity' in the ocean, which encompasses his admiration of its 'surface particles' and individual 'units':

> What in water did Bloom, waterlover, drawer of water, watercarrier, returning to the range, admire?
>
> […] its vastness in the ocean of Mercator's projection: its unplumbed

41 Kuberski, 45-46.
42 Benoit Mandelbrot, qtd. in Kuberski, 45.
43 McIntyre, 175.
44 Joyce, 'Letter of February, 1921', *Letters*, Vol. I of III, 164.

> profundity in the Sundam trench of the Pacific exceeding 8000 fathoms: the restlessness of its waves and surface particles visiting in turn all points of its seaboard: the independence of its units: […] its preponderance of 3 to 1 over the dry land of the globe: its indisputable hegemony extending in square leagues over all the regions below the subequatorial tropic of Capricorn: […] (*U* 17.183-195)

In assuming 'the Sundam trench of the Pacific' to be over '8000 fathoms' deep, this account over-estimates the ocean's maximum profundity by approximately three thousand fathoms. It also incorrectly assumes the Sundam trench to be the deepest point in the ocean. In their *Annotations to Ulysses*, Don Gifford and Robert Seidman expand upon this error:

> The Sundam or Sunda Trench off Sumatra was unsounded in 1904, but its depth turns out to be 3,158 fathoms (18,948 feet). In 1904 the greatest known depth was off Guam, 5,269 fathoms (31,614 feet). […] In the late nineteenth century, oceanographers knew that mid-nineteenth-century soundings (which were supposed to have reached over 7,000 fathoms) were erroneous and that no such depths existed in the ocean: those earlier soundings had been made with rope and were effectively disproved by soundings made with wire after 1872. Nor were these facts the exclusive concern of oceanographers—they were common knowledge after the well-publicized oceanographic expedition of the [...] *Challenger*.[45]

In light of Gifford and Seidman's gloss, the narrative's imagined version of an oceanic trench 'over 8,000 fathoms' deep could effectively contain the Sundam *and* the Guam (8,427 fathoms in total)! Although the Sundam Trench remained 'unplumbed' in 1904, the sheer extent to which its possible depth is misconstrued is unusual, even by late eighteenth-century estimates. The overblown magnification in this passage stems from the outdated and implicit assumption that a weighted measuring rope would describe a straight line when extended thousands of fathoms under '[restless] waves' (*U* 17.188). By taking the early nineteenth-century oceanographies which apparently inform him at face value, the narrative (or Bloom, whose thoughts are being referred to) fails to consider the likely possibility that a measuring rope would curve in accordance with 'tides or watercourses' when plunged to such depths (*U* 17.224). As with its rectilinear renditions of square handkerchiefs and parallel topographical tracings, in which curvilinear forms are corrected

[45] Don Gifford & Robert J. Seidman, *Ulysses Annotated: Notes for James Joyce's Ulysses*, 2nd ed. (Berkeley, CA: University of California Press, 1988), 569-70.

and re-conceived as ideally straight objects, the narrative's oceanographic conjectures imply a conceptual straightening of curved lines. In this case, however, it is not the object of the catechism's inquiry which is rectified, as is the case with its imagined straightening of the 'curvilinear rope' in Bloom's kitchen, but rather the basal tool by which this object is measured: that is, a curvilinear measuring rope (*U* 17.150).

Bloom's admiration of water's 'vastness in the ocean of Mercator's projection' also entails an implicit equation of real distances with the warped *meter* by which its vastness is measured (*U* 17.186). In supposing that the 'preponderance' of water 'over the dry land of the globe' is '3 to 1', or seventy-five percent, the narrative miscalculates its 'preponderance' as it was known in 1904 by three percent; by modern-day estimates, it is off by around five percent.[46] By alluding to the Flemish cartographer, Joyce highlights the notion that—as is the case with this error—'the ocean of Mercator's projection' will always appear larger than the ocean itself. Mercator's projection is further evoked in the image of 'square leagues' of water extending 'over all the regions below the subequatorial tropic of Capricorn' (*U* 17.194-195). A rectangular canvass composed of, say, square handkerchiefs would become variably disfigured if it were stretched to cover a rounded object. Projected onto a sphere, the canvass's 'square leagues' would become positively curved and each square would possess a different shape and size.

If this amounts to the circling of the square, then Gerardus Mercator could be said to have effected—as Walter Ghim puts it in *Vita Mercatoris*—'the squaring of the circle'.[47] In an effort to explain why certain transatlantic shipping routes took much longer to travel than others of seemingly similar distances, Mercator came to the conclusion that, on large enough scales, the shortest route between two points on the Earth must be variably curved. This notion was supported by the fact that a ship travelling towards a constant compass point never travels in a straight line, but gradually spirals towards the nearest pole. As Stephen Crane points out in his biography, *Mercator: The Man Who Mapped the Planet*, 'nobody had yet devised a method of sailing along a "great circle" course, with the continual changes of direction it would demand'.[48] Mercator provided a solution to this problem by figuratively unravelling and straightening the curved rhumb lines, or loxodromes, which give rise to this spiralling phenomenon. By virtually skinning the Earth,

[46] Gifford & Seidman, 570.

rectifying its loxodromes and projecting its curved surface onto a two dimensional, right-angled grid of longitude and latitude, Mercator enabled the widespread cartographical application of Euclidean geometry, harmonising—as Crane puts it—'the geographer of globes and maps; the spherical with the planar; the three-dimensional with the two-dimensional'.[49] But this is not to say that Mercator provided an accurate representation. As the inter-connected squares of a rectangular canvass must necessarily distort when stretched to cover the surface of a sphere, so too must the features of a spherical surface deform when projected onto a rectangular map. By translating the laws of spherical geometry into the language of Euclid's *Elements*, Mercator's projection enlarges the size of the poles to impossible proportions (fig. 7). As Crane surmises, '[i]n what appeared to be a Ptolemaic regression, he had created polar landmasses which ran the full width of the map'.[50] The poles' neighbouring oceans are also overblown: they become progressively stretched along the line of longitude as they near Earth's zenith and nadir, at which points the projection's variable scale becomes infinite.

While the narrative acknowledges Bloom's awareness of the ocean's 'vast circumterrestrial ahorizontal curve', its conception of the terraqueous globe's entire surface is confused with a two-dimensional projection. In other words, the Earth is viewed as a 'mapball' (*U* 17.208).[51] It is not the vastness of water in the ocean which Bloom is said to admire, but 'its vastness in the ocean of Mercator's projection' (*U* 17.186). By making this distinction, Joyce highlights how Bloom's admiration of the ocean's magnitude is ultimately rooted in a symbolic cartography. Contrary to the abstract geometric laws which govern the seascape of Bloom's imagination, oceanic 'leagues' cannot be sectioned into Euclidean 'squares': leagues would only appear to fit neatly into squares 'in the ocean of Mercator's projection'. Projected onto a positively curved surface, such as 'the regions below the subequatorial tropic of Capricorn', squares would assume their elliptic equivalents and parallel lines would converge.

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47 Walter Ghim, trans. by A. S. Osley, quoted in Stephen Crane, *Mercator: The Man Who Mapped the Planet* (London: Phoenix, 2002), 230.

48 Stephen Crane, *Mercator: The Man Who Mapped the Planet* (London: Phoenix, 2002), 229.

49 Crane, 230-1.

50 Crane, 231-2.

51 James Joyce, 'Ithaca 4', *Joyce's Ulysses Notesheets in the British Museum*, 4.427-431.

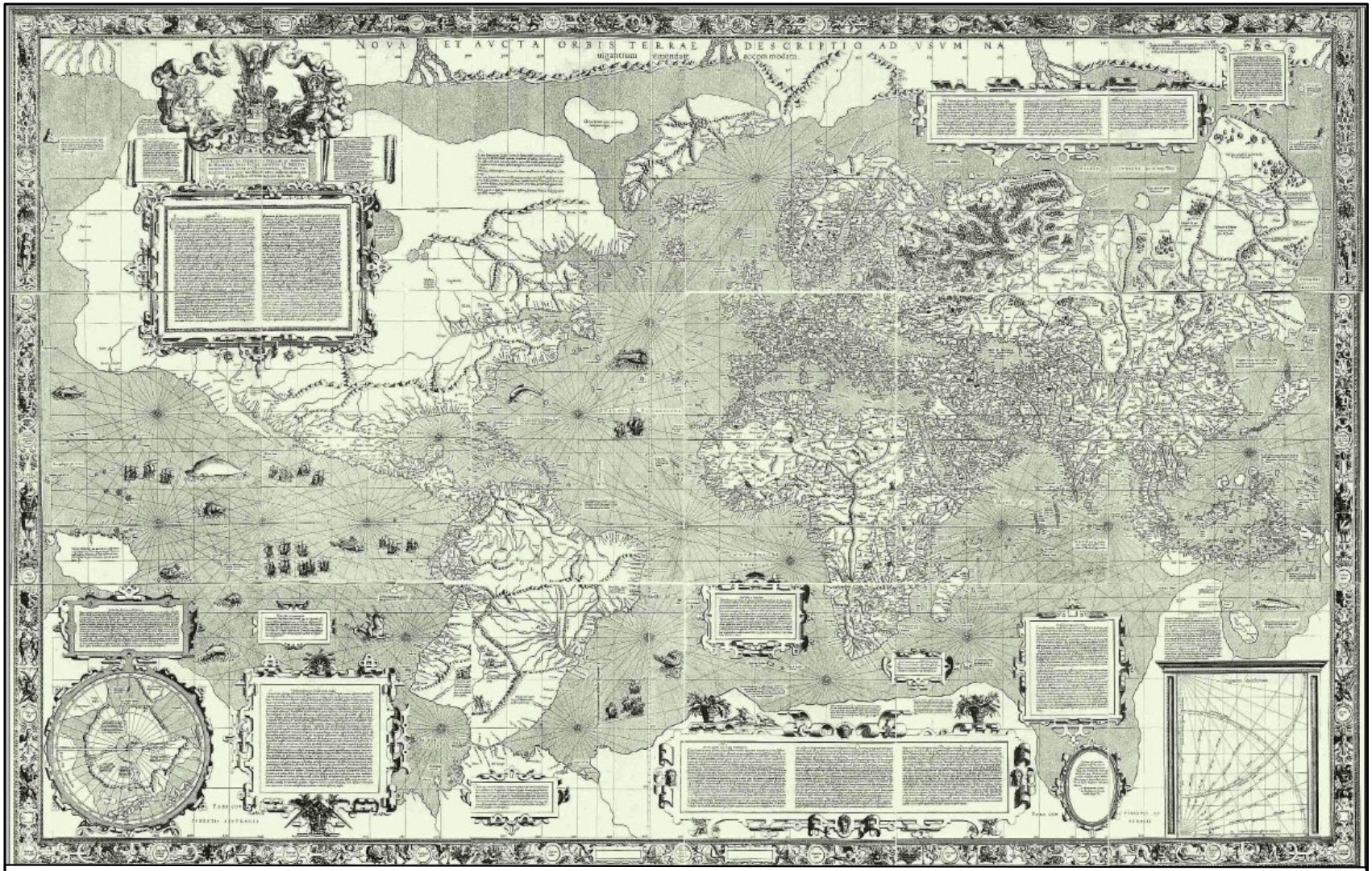

Fig. 7: Gerardus Mercator, *Noval et aucta orbis terræ descriptio ad usum navigantium emendate accommodata*, Duisburg, 1569.

The rectifying process implied by Mercator's projection not only informs the narrative's erroneous measurements of the Earth and its oceans: it also enters into its attempted measurements of cosmically large expanses. Believing 'Sirius (alpha in Canis Maior)' to be '10 lightyears (57,000,000,000,000 miles) distant', for instance, the narrative overestimates the actual distance between Sirius and the Earth by approximately 1.4 light years, according to widely accepted estimates in 1905 (*U* 17.1046-1047).[52] By including this error alongside similar spatial distortions which derive from the virtual straightening of curved lines, Joyce invokes the non-Euclidean geometries of Bolyai-Lobachevsky, Riemann and Poincaré (as well as the reductive cosmology of Bruno) in suggesting that, at large enough distances, the shortest path between two points in space is curved. This notion would shed light on the nature of the catechism's cosmic over-valuation: as with its over-reckoning of the Sundam's profundity, which derives from the equation of a curvaceous measuring rope with an ideally straight line, the narrative error in this case suggests that the seemingly straight line of sight between Sirius and the terrestrial observer is, in reality, curved. As with its conception of the Sundam's profundity, the narrative's senseless referral to ideal geometric constructs mystifies the particular dimensions of its subject.

That notwithstanding, very few of the narrative's representations of space in 'Ithaca' derive from first-hand experience. Similar to the way in which Mercator mapped the entirety of the globe despite having never crossed the borders of modern-day Belgium, Bloom, Stephen—and Joyce, in effect—envisage entire regions of the planet which they have never seen. The narrative's conception of notions which lie beyond its characters' scopes of past and present experiences is largely based on synthetic logics whose principles derive from secondary material. Thoughts which are attributed to Bloom, who is relatively well-read in a range of early to late nineteenth-century scientific literature, are often validated with reference to axiomatic facts deriving from scientific and mathematical texts. '[I]neluctably constructed upon the incertitude of the void', the catechism attempts to dispel Bloom's underlying sense of incertitude and fill a natural void of experiential knowledge concerning micro- and macroscopic forms by referring to the theories expounded in them (*U* 17.1014-1015). Much like 'technicists and objectivists' who 'degrade science into a skill or game' with little regard for sense-experience, as criticised

[52] Gifford & Seidman, 581-2.

by Husserl in *The Origin of Geometry*, or one of Bruno's '*geametras*', the narrator takes the significance of Bloom's scientific and mathematical texts at face value.[53] Errors consequently arise whenever the narrator applies a particular axiom or, by extension, theory which has been disproved. Its estimation of the Sundam's profundity, for example, which remained uncertain to the scientific community in 1904, is founded on an antiquated proof which had been universally dismissed soon after its publication, almost fifty years before the episode takes place. The catechism does not overtly account for the possibility that the theories which appear in such antiquated treatises are universally coherent and yet founded on false premises, as the non-Euclidean geometers of the nineteenth century argued with regard to Euclidean geometry. By faithfully taking a range of *a priori* constructs to be experimental facts in an attempt to fill 'the incertitude of the void', the catechism circumscribes its readings of the visual universe further within the confines of its subjects' limited scopes.

Mathematical traditionalism in 'Ithaca'

Several critics have discussed the broader implications which accompany the existence of geometric and other errors in 'Ithaca', and whether these errors are intentional on the part of the author. In his essay 'Joyce's Unreliable Catechist: Mathematics and the Narration of "Ithaca"', Patrick McCarthy examines a range of mathematical errors in the episode including those which derive from Bloom's vain attempts at effecting 'the quadrature of the circle' (*U* 17.1071-1072). Relating the mathematical uncertainties underlying this age-old endeavour to a more general sense of narrative uncertainty in the episode and the novel as a whole, McCarthy explores how these errors render the catechetical narrative as unreliable as Molly's interior monologue in 'Penelope'. More generally, he argues—as Mines and Way put it in their own article on mathematics in 'Ithaca'—'for a connection between the ontological status of non-Euclidean geometry and the uncertainty or indeterminacy at the heart of *Ulysses*'.[54] Michael Livingston builds on McCarthy's interpretation in his essay '"Dividends and Divisors Ever Diminishing": Joyce's Use of

[53] Jacques Derrida, *Edmund Husserl's 'Origin of Geometry': An Introduction*, ed. & trans. by John P. Leavey (Lincoln, NE: University of Nebraska Press, 1989), 98; Giordano Bruno, *Articuli centum et sexaginta adversus huius tempestatis mathematicos atque philosophos* (Prague: George Raczicenus, 1588), 21.

[54] Mines & Way, 25.

Mathematics in "Ithaca"', in which he explores how the narrative's mathematical errors evoke early twentieth-century concerns regarding the scientific limit and the ontological status of Euclidean geometry. He further argues that many of these narrative errors are unintentional, and that 'it is perilous to assume that Joyce is a "man of genius" when it comes to mathematics'.[55] Critics such as McCarthy, Mines, Way and Joan Wilcox, on the other hand, suggest that the majority of the errors in 'Ithaca' are the result of Joyce's deliberate play with cardinal mathematical principles.

Whether or not Joyce employed mathematics and geometry within the narrative (or as a narrative device, as Livingston argues) to create spatial misconceptions intentionally, the ideal principles which formalise the catechism's objective style are—as we have seen—subverted through their very application to the material universe. The discrepancy in 'Ithaca' between ideal objectivities and the objects which they represent certainly echoes contemporary scientific notions concerning the traditionalism of Euclidean geometry; and it is likely that Joyce was acquainted with such notions given the source material for the episode, which includes Bertrand Russell's *Introduction to Mathematical Philosophy* as well as Poincaré's *Science and Hypothesis*. Although numerous critics have examined the breadth of mathematical errors in 'Ithaca' (many relating the nature of these errors to the episode's historical and scientific context), few have explored their inceptive causes. The origins of the narrative's spatial miscalculations cannot merely be explained in terms of ignorance, as Livingston argues, for its deliberations are saturated with facts stemming from a range of sources, many of which are regurgitated *verbatim.* Like Dolph in *Finnegans Wake*, or Mamfurio in Bruno's 'The Candlebearer', the narrative's conceptual blindness does not necessarily stem from its ignorance of mathematical and geometric principles, but rather from its automatic application of them (which feeds into the narrative's more general confusion between the map and the territory). Its errors are not illogical: rather, they stem from a wholehearted belief in the erroneous facts printed in certain books, many of which are contained in Bloom's library.

In attempting to determine the intentionality of mathematical errors in 'Ithaca', the more pertinent question of how these errors come to arise in the first place can be easily overlooked. The narrative's calculations—particularly those concerning planets, stars and

[55] Livingston, 441.

the universe—refer to phenomena which have never been experienced or to theories which have never been successfully validated. As is the case with the catechism's abortive estimation of the Sundam trench's profundity, its erroneous measurements of cosmically large spaces are informed by secondary material rather than first-hand observations; usually because no first-hand observation exists in the first place. This notion becomes apparent whenever the narrative eye envisages phenomena which simply do not exist in nature. For instance, Bloom is said to conduct '[m]editations […] of the infinite lattiginous scintillating uncondensed milky way, discernible by daylight by an observer placed at the lower end of a cylindrical vertical shaft 5000 ft deep sunk from the surface towards the centre of the Earth' (*U* 17.1042-1046). The notion that the Milky Way is 'discernible' with the naked eye by daylight is a complete fabrication. The quantification of a shaft '5000 ft deep' and the specification of its necessarily 'cylindrical' shape merely serves to make the proposition even more ludicrous, as it would not matter how deep or cylindrical a shaft the observer dug: it would still be impossible to discern the Milky Way by daylight.[56] Joyce not only evokes a literal visuality limit regarding the boundaries of unaided perception, but further illustrates a conceptual circumscription regarding the extremities of experiential knowledge. The fact that Bloom is said to have imagined sighting the Milky Way by daylight suggests that he has never attempted to do so. It is even dubious whether Bloom is able to see the Milky Way 'under the heaventree of stars' in his garden, in which this erroneous notion is constructed (*U* 17.1039). Indeed, the narrative does not refer to Bloom seeing the Milky Way at all: he merely conducts 'meditations' upon it. The numerical and geometric precision of the catechism's mythical assumption that the Milky Way is 'discernible by daylight by an observer placed at the lower end of a cylindrical vertical shaft 5000 ft deep' suggests that it likely stems from another source. In 'Joyce and Science', Sam Slote traces this notion to Aristotle's *De Generatione Animalium*, in which Aristotle claimed 'that stars can be seen in the daytime if the observer were placed at the bottom of a deep shaft or well [...], although this has since been disproved, first by Robert Hooke in "An Attempt to Prove the Motion of the Earth from Observations" (1674)'.[57] By basing its astronomical calculations on the assumptions of such outdated treatises, the narrative catechism ignores the sensible visuality limits which are accessible through the eyes of its focalising character in favour of the supposed visuality limits prescribed by the

[56] Gifford & Seidman, 581.
[57] Slote, 'Joyce and Science', 167.

catechism's scientific and pseudo-scientific texts, many of which (as is the case here) are lacking in valid experiential evidence.

The catechism's spatial misconceptions regarding phenomena which lie beyond the visual scope and past experiences of its subjects often stem from a bibliomanic prioritisation of texts over reality; or, in topographical terms, the map over the territory. As we have seen, its conception of the globe's surface is based on a deference to Mercator's projection. Within the context of Bloom's collection of books and maps in 'Ithaca', the narrative's predominant fixation on the Saussurian sign is taken to a literal extreme. For example, among Bloom's 'considerations' which 'rendered [his] departure desirable' include '[t]he attractive character of certain localities in Ireland and abroad, as represented in general geographical maps of polychrome design or in special ordnance survey charts by employment of scale numerals and hachures' (*U* 17.1968-1972). Similar to the narrative's unfaithful conception of the oceans, which entails an admiration of virtually projected 'square leagues', Bloom's 'considerations' of foreign locales in this passage are grounded in his attraction to the 'polychrome design' and 'scale numerals and hachures' of 'maps' and 'charts' (*U* 17.194-195). The 'attractive character' of these distant regions stems entirely from the geometrically precise and colourful nature of their cartographies. In admiring these documents, Bloom apparently fails to imagine the particularities of the 'localities' which they represent. His desire to travel in this passage contrasts sharply with his double-viewed visualisation of foreign lands in the streets of Dublin earlier that day. In 'Calypso', for instance, Bloom's faculties become immersed in the sounds, sights and smells of the city, which transport him to an extended and detailed reverie of the East: churches transform into mosques, pubs become carpet shops and Oriental caricatures populate St George's street. In 'Ithaca', however, the visual attractions which characterise 'localities in Ireland and abroad' (i.e.: their 'polychrome design' and 'scale numerals and hachures') are uniform. By relating Bloom's fantasies of travel through a series of topographical representations, the catechism fails to recognise the extent to which his 'desire' finds its origin in the sensory world.

The narrative's investment in the absolute realism of map projection is reflective of its reciprocal faith in a selection of mathematical texts. For instance, its various geometric assumptions can be traced to the particular edition of Euclid's *Elements* which resides in

Bloom’s library, whose bibliographical details are related by the catechism as exhaustively as in its embellished description of Bloom’s favourite maps. Unlike the title, these details are anything but ‘short’ or ‘plain’:

> *Short but yet Plain Elements of Geometry* written in French by F. Ignat. Pardies and rendered into Engliſh by John Harris D. D. London, printed for R. Knaplock at the Biſhop’s Head, MDCCXI, with dedicatory epiſtle to his worthy friend Charles Cox, eſquire, Member of Parliament for the burgh of Southwark and having ink calligraphed statement on the flyleaf certifying that the book was the property of Michael Gallagher, dated this 10th day of May 1822 and requeſting the perſon who should find it, if the book should be loſt or go aſtray, to reſtore it to Michael Gallagher, carpenter, Dufery Gate, Enniſcorthy, county Wicklow, the fineſt place in the world. (*U* 17.1398-1407)

In light of the narrative’s geometric misconceptions concerning bodies of total curvature throughout ‘Ithaca’, it is significant that the only geometric handbook which Bloom apparently has to hand was published in 1711; almost two hundred years before the episode takes place. By suggesting that Bloom’s and by extension the catechism’s geometric axioms stem partially from this edition of Pardies’s early eighteenth-century text, Joyce evokes a distinction between the episode’s articulations of Euclidean geometry as a univocal language for the visual world, and the modern scientific understanding of geometry as a relative system which had become popular by 1904. By 1904, commentaries on the geometries of Bolyai-Lobachevsky and Riemann including Roberto Bonola’s *Non-Euclidean Geometry* and Poincaré’s *Science and Hypothesis* were widely available as English translations, and those with a layman’s knowledge of geometry would at least have been aware of these discussions. By including such texts as Pardies’s *Short but yet Plain Elements of Geometry* in Bloom’s library amidst a historical backdrop of rapid mathematical and scientific technological advancement, Joyce illustrates how the narrative’s outdated assumptions often derive from the antiquarian treatises which its confused subjects happen to possess. Joyce’s response to the perceived traditionalism of Euclidean geometry is encapsulated at the end of this encompassing bibliographical description, which is weighed with a highly subjective statement in the final parentheses claiming ‘county Wicklow’ to be ‘the fineſt place in the world’. As Poincaré argues, the assumption that any one particular geometry is ‘truthful’—as implied by the catechism—or more truthful than another is an entirely subjective statement: it would be tantamount to admiring the vastness, say, of a locale based on its particular *meter* (as does Bloom, in

admiring the map and not the territory). There is nothing to suggest that other 'placeſ' exist which are as 'fair' as Wicklow; or, in light of the development of non-Euclidean geometries in the mid-eighteenth century, that Euclid's geometry is universally coherent and 'plain'.

The catechism's outdated understanding of applied geometry is highlighted in its discussion of Bloom's past attempts at squaring the circle; an ancient endeavour stemming from the Old Babylonian period which a range of critical thinkers before and since Giordano Bruno have deemed to be impossible. The passage concerning 'the problem of the quadrature of the circle' follows on from the narrative's description of Bloom's 'obverse meditations […] of the incalculable trillions of billions of millions of imperceptible molecules contained by cohesion of molecular affinity in a single pinhead' (*U* 17.1057-1072). Bloom's 'obverse meditations', which entail visualising molecular forms on progressively smaller scales, give rise to the image of 'dividends and divisors ever diminishing without actual division till, if the progress were carried far enough, nought nowhere was never reached' (*U* 17.1067-1069). In light of Joyce's reading of McIntyre's *Giordano Bruno*, it is significant that the problem of squaring the circle is discussed within the context of *minima*, for Bruno came to his conclusion that 'the squaring of the circle is [...] impossible' based on his attempts to account for curved atomic substructures in his reductive geometric system.[58] Echoing Bruno, Bloom's preoccupation with the 'incalculable' and 'imperceptible' nature of minimal forms leads to his eventual conclusion that there would be a point at which 'divisible component bodies' could no longer be divided and 'nought nowhere' would be 'never reached'. The catechism expands on this notion when explaining the reasons why Bloom 'did […] not elaborate these calculations to a more precise result':

> Because some years previously in 1886 when occupied with the problem of the quadrature of the circle he had learned of the existence of a number computed to a relative degree of accuracy to be of such magnitude and of so many places, e.g., the 9th power of the 9th power of 9, that, the result having been obtained, 33 closely printed volumes of 1000 pages each of innumerable quires and reams of India paper would have to be requisitioned in order to contain the complete tale of its printed integers of units, tens, hundreds, thousands, tens of thousands, hundreds of thousands, millions, tens of millions, hundreds of

[58] McIntyre, 180.

> millions, billions, the nucleus of the nebula of every digit of every series containing succinctly the potentiality of being raised to the utmost kinetic elaboration of any power of any of its powers. (*U* 17.1070-1082)

By 1886, Bloom's previous belief in the possibility of effecting 'the quadrature of the circle' would have appeared to many as delusional. Following the publication of Ferdinand Lindemann's proof that π is a transcendental number in 1882, one need not have been a Brunonian scholar to know that the squaring of the circle was fundamentally impossible. As Patrick McCarthy points out in 'Joyce's Unreliable Catechist':

> This problem 'was shown in the year of Joyce's birth to be unsolvable: in 1882 Ferdinand Lindemann proved that π is not only irrational (i.e., it cannot be expressed as the ratio of two integers) but transcendental (i.e., it cannot be the solution of any algebraic equation), from which it followed that one could not construct a square with precisely the same area as a given circle.[59]

The 'elaborations' of Bloom's microscopic 'calculations', in assuming the possibility of squaring the circle, imply the treatment of a transcendental number as an irrational one. Like many similar attempts to solve this problem before (and since, as Gifford and Seidman point out) 1882, Bloom's pointless meditations are 'obverse' in relation to the more recent and widely accepted mathematical theories which were being published at around the turn of the twentieth century. His quixotic belief in the possibility of squaring the circle stems partly from his reading of books on the subject. As is illustrated when the number π is imagined proliferating across 'innumerable quires and reams of India paper', books are also the cause of his eventual disillusionment with the problem. By conflating the geometric and linguistic signs which are printed in 'innumerable quires' with sensible constructs, the catechism conceives a visual world formalised by the world of signs in which its subjects are absorbed.

Bloom's preoccupation with the impossible act of squaring the circle encapsulates a methodological issue in geometry which has been raised by a range of mathematicians and philosophers including Bruno. Bloom essentially practices complex geometric problems such as 'the quadrature of the circle' as an intellectual exercise or pastime. As he is presented by the mathematical catechism, Bloom embodies the type of geometer scorned

[59] McCarthy, 611.

by Bruno, who—as Arielle Saiber puts it in *Giordano Bruno and the Geometry of Language*—'measured for measuring sake, or "played with geometry", treating it as an '"abstract intellectual exercise"'.[60] He can be understood as one of the 'technicists and objectivists' criticised by Husserl in *The Origin of Geometry*, who—according to Derrida in *Edmund Husserl's 'Origin of Geometry': An Introduction*—'[degrade] science into a skill or game'.[61] This aspect of Bloom's engagement with geometric concepts is highlighted when the catechism asks:

> For what reason did he meditate on schemes so difficult of realisation?
>
> It was one of his axioms that similar meditations or the automatic relation to himself of a narrative concerning himself or tranquil recollection of the past when practised habitually before retiring for the night alleviated fatigue and produced as a result sound repose and renovated vitality. (*U* 17.1754-1758)

For Bloom, the mathematical ritual of attempting to square the circle provides a means of reposing his mind, by which he can achieve a state of transcendental contemplation. In light of this passage, the narrative's earlier attempts at projecting Euclidean geometry onto material surfaces can be seen as a playful recapitulation of the mathematical catechism's principles, which are repeated like mantras. By guiding its wandering inquiries in accordance with the various mathematical and esoteric traditions which are associated with its characters, the catechism's own meditations become distanced from the singular ideals which it seeks to apprehend.

Rectilinear thought

The narrative catechism in 'Ithaca' often ignores phenomena which do not correspond with the particular mode of measurement which its focalising characters assume, or those scientific and mathematical texts upon which they depend. It assumes a rectilinear mode of inquiry, in the sense that it selectively ignores experimental facts which contradict an original set of guiding principles. Arielle Saiber discusses this notion with regard to the Nolan's critique of his characters' 'literal- and narrow-mindedness' in his plays and

[60] Saiber, 46.
[61] Derrida, 98.

dialogues.[62] As discussed earlier in this thesis, Saiber explores how Bruno, through the ironic use of rhetorically diverting devices such as lists, brachylogia and systrophe, subverts 'a certain kind of conceptual and behavioural "rectilinearity"'.[63] Bruno's linguistic parody of 'conceptual [...] rectilinearity' complements his related geometric critique of infinitely straight lines, which he argues would become circular or 'divergent' if infinitely extended. In a rhetorical sense, texts such as 'The Ash Wednesday Supper' and 'The Candlebearer' illustrate how straight-and-narrow lines of inquiry eventually curve back to their points of departure when pursued *ad infinitum*, giving rise to the many pointless and circular arguments which Bruno's characters expound.

Bruno's figurative appropriation of geometric concepts in his works can be traced to Joyce's own in 'Ithaca'. As we have seen, Joyce encountered Bruno's critiques of rectilinear thought while studying his plays and dialogues at University College Dublin. In his letter to Budgen in 1921, Joyce refers to 'Ithaca' as 'a mathematico-astronomico physico-mechanico-geometrico-chemico sublimation of Bloom and Stephen [...] to prepare for the final amplitudinously curvilinear episode Penelope'.[64] Given Joyce's description of 'Penelope' as a 'curvilinear' episode, it is significant that 'Ithaca' is said to 'prepare' for it. 'Penelope', or indeed many of the earlier episodes in *Ulysses* which are mediated through streams of consciousness, involve—as Stefan Zweig describes *Ulysses*—'a frantic, rushing flight of ideas which whirlingly float indiscriminately with themselves'.[65] Contrastingly, the consciousness through which the narrative voice in 'Ithaca' is focalised belongs to 'a conscious rational animal proceeding syllogistically from the known to the unknown' (*U* 17.1012-1013). If 'Penelope' is a 'curvilinear' episode, then 'Ithaca'—which Joyce referred to as 'the ugly duckling of the book'—is a 'rectilinear' episode, in the sense that it envisages phenomena methodically through a series of isolated observations.[66] In light of Bruno's critique of rectilinear thought as a slippery slope to circular logics, the catechism's rectilinear inquiries often turn back upon themselves. By taking *a priori* facts, many of which are founded on false axioms, to be the 'known' ends of its inquiries, the catechism's proofs often amount to defunct fabrications.

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62 Saiber, 7.
63 Saiber, 7.
64 Joyce, 'Letter of February, 1921', *Letters*, Vol. I of III, 164.
65 Stefan Zweig, 'Stefan Zweig on Ulysses (1928)', *James Joyce: The Critical Heritage 1928-41*, Vol. I of II, ed. by Robert H. Deming (London: Routledge, 1987), 444-6, 444.
66 Richard Ellmann, *James Joyce* (Oxford: Oxford University Press, 1983), 500.

Following Bruno, whose critique of the infinitely straight line complemented his subversion of rectilinear mindsets on the level of language and rhetoric, Joyce embodies a range of geometric uncertainties through the construction of 'curvilinear' and 'rectilinear' thought processes similar to those from which these uncertainties first arose. This is characterised when the narrative discusses Bloom's 'innate love of rectitude', for example (*U* 17.1623). Aiming to prove 'that he had loved rectitude from his earliest youth', the catechism provides an extensive list of religious, scientific and political ideologies and affiliations which Bloom has previously identified himself with by binarily opposing or accepting:

> Prove that he had loved rectitude from his earliest youth.
>
> To Master Percy Apjohn at High School in 1880 he had divulged his disbelief in the tenets of the Irish (protestant) church (to which his father Rudolf Virag (later Rudolph Bloom) had been converted from the Israelitic faith and communion in 1865 by the Society for promoting Christianity among the jews) subsequently abjured by him in favour of Roman catholicism at the epoch of and with a view to his matrimony in 1888. [...] in 1882 […] he had advocated [...] the political theory of colonial (e.g. Canadian) expansion and the evolutionary theories of Charles Darwin, expounded in *The Descent of Man* and *The Origin of Species*. In 1885 he had publicly expressed his adherence to the collective and national economic programme advocated by James Fintan Lalor, John Fisher Murray, John Mitchel, J. F. X. O'Brien and others, the agrarian policy of Michael Davitt, the constitutional agitation of Charles Stewart Parnell (M. P. for Cork City), the programme of peace, retrenchment and reform of William Ewart Gladstone (M. P. for Midlothian, N. B.) […]. (*U* 17.1634-1651)

By relating Bloom's religious beliefs to his scientific principles via his previous political affiliations, this historiographical account implies that his wholehearted advocations of these systems are all distinct but complementary forms of 'rectitude'. This conglomeration of objective and subjective ideals within the context of rectitude evokes an overlap between the mathematical catechism's rigorous scientific method and Bloom's hard-line religious and political opinions, in the sense that his various devotions are all fixated on the idea of a correct line of reasoning whose original axioms hold consistently true. As in Bruno's plays and dialogues, this 'love of rectitude' is subverted through the numerous diversions and lists in the passage which branch away from the central point being

discussed (*U* 17.1623). The connotation of correctness in 'rectitude' also highlights the way in which geometric ideal objectivities such as rectilinearity are unquestioningly rote-learned, as in the *Wake*an classbook. It further appertains to the narrative's active 'correction' of variable forms throughout 'Ithaca', by which irregular forms are geometrically rectified.

By adopting a typically Brunonian 'geometry of language' in 'Ithaca, Joyce responds to Bruno's critique of rectilinear thought and his related notion that the subject must account for divergent branches of inquiry, or lines of reasoning, in order to encounter previously unknown ideas.[67] This becomes apparent when the narrative discusses how Bloom's observations diverge from Stephen's, for example, as the pair walk 'parallel courses' to Eccles street: '[w]ere their views on some points divergent?' (*U* 17.01; 17.27). By presenting the ensuing passage, which concerns the pair's divergences of opinion on 'the importance of dietary and civic selfhelp' and 'the eternal affirmation of the spirit of man in literature', within the context of their concomitant perambulation through Dublin, Joyce entangles their rhetorical divergences with broader topographical and geometric deviations (*U* 17.28-30). In turn, Bloom's and Stephen's respective views on the Earth, which are developed in the next passage, are described in terms of their convergences:

> In what final satisfaction did these antagonistic sentiments and reflections, reduced to their simplest forms, converge?
>
> Satisfaction at the ubiquity in eastern and western terrestrial hemispheres, in all habitable lands and islands explored or unexplored (the land of the midnight sun, the islands of the blessed, the isles of Greece, the land of promise), of adipose anterior and posterior female hemispheres, redolent of milk and honey and of excretory sanguine and seminal warmth, reminiscent of secular families of curves of amplitude, insusceptible of moods of impression or of contrarieties of expression, expressive of mute immutable mature animality. (*U* 17.2227-2236)

As Bloom and Stephen trace 'parallel' courses to Eccles Street their lines of thought diverge and—in light of this passage—subsequently converge (*U* 17.1). The variable interrelations between Bloom's and Stephen's lines of thought thus mirror how their physical tracings across Dublin would behave on a plane of total positive curvature, in

[67] Saiber.

which parallel lines would first diverge from and then converge towards each other when extended. This parallel is further suggested in light of the fact that the pair’s relative points of view converge on the subject of hemispheres as they near their destination. For Bloom and Stephen, the dark and distant lands inhabited by women ‘redolent of milk and honey’ which they coincidentally imagine are ‘unexplored’. Just as the phenomena associated with ‘terrestrial’ and ‘female hemispheres’ are at the horizon of their thoughts, so too are Molly and Leopold Bloom’s home physically located at the end of their curved courses on the Earth. By approaching a common conceptual point from coincident perspectives, the duumvirate expand on notions which are partially known and collectively elucidate unexplored phenomena; similar to the way in which celestial objects, as Bruno discusses, require multiple lines of observation in order to be fully discerned. In a corporeal sense, Bloom’s and Stephen’s coincident conceptions of ‘female hemispheres’ involve one point of view emanating from an ‘anterior’ perspective’ and the other from a ‘posterior’ one, as is the case with Dolph and Kev’s topography of ALP’s triangle in *Finnegans Wake.* By discerning a shared object of contemplation coincidentally, Stephen and Bloom are able to picture the world as it appears beyond their linear and corrective perspectives.

The candlebearer (ii)

As we have seen, the mathematical catechism’s conceptions of space and place in ‘Ithaca’ are based on secondary deductions which have become uncertain over time due to scientific progress and the consequent upheaval of traditional axioms. By faithfully taking the cardinal facts which it acquires to be correct, the narrative voice often becomes lost in a subjective conception of objective reality whose features belong to the map and not the territory. Its rhetorical adoption of Bloom’s ‘innate love of rectitude’, moreover, impedes the reader from conceiving the spaces which it describes from without the boundaries of a temporally bound knowledge base (*U* 17.1623). Joyce evokes this notion through Bruno’s motif of the candlebearer (see ‘The candlebearer (i)’). Foreshadowing the ‘Triangle’ section of *Finnegans Wake*, which Joyce began composing five years later, Joyce explores this Brunonian concept of an abstract visuality limit in ‘Ithaca’ by intertwining images connoting a circumscribed visual field with notions concerning the boundaries of sense-based knowledge. Responding to ‘The Candlebearer’, in which candle light symbolises the

delimited and delimiting field of knowledge possessed by the candle bearer, as well as broader notions concerning the scientific limit, similar to Husserl's concept of a 'horizon' of ideal objectivity in geometry and science.[68] Joyce's exploration of this notion in 'Ithaca' can be traced to his notebooks for the episode:

> *R* <SD radius vector LB & SD = o> *688:26ff.?*
> *B* <visuality limit 3—16> *677:29?*[69]

In 'Ithaca', this note on Stephen and Bloom's 'visuality limit' and Stephen's 'radius vector' is effected in a similar way to the 'vectorious readyeyes', or radius vectors, of the two 'circumflicksrent searclhers' in *Finnegans Wake* (*FW* 298.14-15). As in the *Wake*, imagery relating to luminous and perceptual boundaries in 'Ithaca' often relates to the subject's inability to grasp phenomena located beyond their scope of sight and knowledge.

The motif of light, combined with the notion of a conceptual 'visuality limit', plays a significant role in the narrative structure of 'Ithaca'. The narrative eye is hardly ever in darkness: artificial lights, many emanating from Bloom's candle, predominate its visual field. By elucidating various images in light of their illuminative sources, the narrative draws attention to its own perceptual limits as well as those of its characters. This becomes immediately apparent when the catechism describes the 'discrete succession of images' which Stephen perceives through the windows of Bloom's home, once the pair have arrived at 7 Eccles Street and the latter has entered:

> What discrete succession of images did Stephen meanwhile perceive?
>
> Reclined against the area railings he perceived through the transparent kitchen panes a man regulating a gasflame of 14 CP, a man lighting a candle of 1 CP, a man removing in turn each of his two boots, a man leaving the kitchen holding a candle.
>
> Did the man reappear elsewhere?
>
> After a lapse of four minutes the glimmer of his candle was discernible through the semitransparent semicircular glass fanlight over the halldoor. The halldoor

[68] Edmund Husserl, 'The Origin of Geometry' (1936), trans. by David Carr; repr. in Jacques Derrida, *Edmund Husserl's 'Origin of Geometry': An Introduction*, ed. & trans. by John P. Leavey (Lincoln, NE: University of Nebraska Press, 1989), 155-180, 176.

[69] Joyce, 'Ithaca 12', *Joyce's Ulysses Notesheets in the British Museum*, 12.468-474.

> turned gradually on its hinges. In the open space of the doorway the man reappeared without his hat, with his candle.
>
> Did Stephen obey his sign?
>
> Yes, entering softly, he helped to close and chain the door and followed softly along the hallway the man's back and listed feet and lighted candle past a lighted crevice of doorway on the left and carefully down a turning staircase of more than five steps into the kitchen of Bloom's house.
>
> What did Bloom do?
>
> He extinguished the candle by a sharp expiration of breath upon its flame, [...]. (*U* 17.108-124)

The circumscribed visual field which Bloom experiences from within his tenebrous home —evoked through the repeated references to his candle—is mediated through Stephen's similarly fragmented and delimited conception of Bloom, who appears as an unidentified 'man' moving to and from windows with various degrees of transparency. By layering Bloom's delimited visual field with that of another subject, Joyce evokes the concept of visual subjectivity—symbolised in the imagery of windows—within the narrative's portrayal of luminous visuality limits, such as those evoked by the narrative's candlebearer. More generally, Joyce illustrates Poincaré's notion that 'geometry is only the summary of the laws by which […] images succeed each other' by evoking the motions of Bloom and his candle about the house through a series of snapshots.[70]

This Brunonian relationship between, on the one hand, the subject's limited experiential knowledge and, on the other, imagery pertaining to or evoked by candle light is developed towards the middle of the episode, in which Bloom and Stephen enter 'into the penumbra of the garden' (*U* 17.1038). Significantly, this is one of the few moments in 'Ithaca' in which Bloom's candle, and artificial lights in general, are rendered temporarily invisible. Bloom '[sets] the candlestick on the floor' before going outside where, beneath '[t]he heaventree of stars', he contemplates the shadows which obscure his scientific knowledge and reflects upon the extreme limits of visual and cognitive perception (*U* 17.1033-1039). Discharged of his 'Lighted Candle in Stick', Bloom becomes acutely aware of the chasm between objective reality and his reductive impressions of its phantasmagoria (*U* 17.1023).

[70] Poincaré, 64.

It is in his garden, for instance, where it is said that he eventually realised that 'the quadrature of the circle' is impossible given the sub-structural forms of 'imperceptible molecules' (*U* 17.1062-1072). Pursuing a chain of increasingly cynical thoughts, the narrative unpacks Bloom's 'logical conclusion': that the cosmos is 'a Utopia, there being no known method from the known to the unknown: an infinity renderable equally finite by the suppositious apposition of one or more bodies equally of the same and of different magnitudes: a mobility of illusory forms immobilised in space, remobilised in air' (*U* 17.1137-1144). Building on the narrative's earlier description of Bloom as 'a conscious rational reagent between a micro and a macrocosm ineluctably constructed upon the incertitude of the void', Bloom's conception of a void between 'known' and 'unknown' entities in this passage is rooted in the absence of a known scientific or mathematical 'method' which can account for infinite and infinitesimal magnitudes (*U* 17.1012-1015). Material forms are perceived to be 'illusory' in light of the constantly 'mobilising' atoms which compose form, echoing Bruno's critique of Euclidean geometry based on the formal properties of the atom. Acknowledging that Bloom will never be able to envisage physical forms as they appear beyond the limits of sight and reason, the passage concludes that, for Bloom, the visible universe is 'a Utopia'; that is, non-existent. This is also applicable to the universe projected by the narrative catechism, which reconfigures material forms into utopian Euclidean objects and geometries which '[do] not describe reality'.[71] Curtailing his self-reflexive inquisitions under the night sky, Bloom finally '[reassumes] his candle' and returns indoors. After its candlelight reveals to him once again the known and finite spaces of his home, the focalised narrative reverts to a geometrised mode of observation. By directly alluding to Bloom's role as a literal and metaphorical candlebearer before and after this turning point in the narrative, Joyce associates the narrative's recurring Brunonian motif with the extremities of subjective experience.

This concept of an absolute limit to sense-experience, effected through recurring allusions to Bloom's candle, is further evoked by the geometric image of a radius vector. By highlighting the tenebrous nature of *topoi* situated beyond Bloom's maximally extended lines of sight, Joyce demonstrates how a delimited visual scope affects the subject's *a priori* deductions concerning obscure, distant or invisible bodies. When Stephen and

[71] Albert Einstein, quoted in Morris Kline, *Mathematics: The Loss of Certainty* (Oxford: Oxford University Press, 1980), 97.

Bloom urinate in the garden, for example, Joyce illustrates how both characters form deductive conceptions of the other's 'invisible audible collateral organ' based on fragments which enter into their respective visual and acoustic ranges (*U* 17.1200). Foreshadowing Dolph and Kev's corporeal topography of ALP in *Finnegans Wake*, this entails envisaging the murky source of a urinal stream:

> At Stephen's suggestion, at Bloom's instigation both, first Stephen, then Bloom, in penumbra urinated, their sides contiguous, their organs of micturition reciprocally rendered invisible by manual circumposition, their gazes, first Bloom's, then Stephen's, elevated to the projected luminous and semiluminous shadow.
>
> Similarly?
>
> The trajectories of their, first sequent, then simultaneous, urinations were dissimilar: Bloom's longer, less irruent, in the incomplete form of the bifurcated penultimate alphabetical letter, who in his ultimate year at High School (1880) had been capable of attaining the point of greatest altitude against the whole concurrent strength of the institution, 210 scholars: Stephen's higher, more sibilant, who in the ultimate hours of the previous day had augmented by diuretic consumption an insistent vesical pressure.
>
> What different problems presented themselves to each concerning the invisible audible collateral organ of the other?
>
> To Bloom: the problems of irritability, tumescence, rigidity, reactivity, dimension, sanitariness, pilosity.
> To Stephen: the problem of the sacerdotal integrity of Jesus circumcised (1 January, holiday of obligation to hear mass and abstain from unnecessary servile work) and the problem as to whether the divine prepuce, the carnal bridal ring of the holy Roman catholic apostolic church, conserved in Calcata, were deserving of simple hyperduly or of the fourth degree of latria accorded to the abscission of such divine excrescences as hair and toenails. (*U*, 17.1186-1209)

Just as Kev—who marks a 'capital pee' 'down there on the batom' of the Euclidean diagram in *Finnegans Wake*—must map ALP's shadowy pudendum in light of her reflective urinal stream, thus filling in the gaps in his field of sight and sound, so do Bloom and Stephen form conceptions of each other's 'invisible audible collateral organ' based on the sounds and 'trajectories' of their simultaneous urinations (*FW* 296.05-06). Further parallels between 'Ithaca' and the geometry section of *Finnegans Wake* become apparent when Molly, like ALP, appears as 'a star' above and between the phallic candle-bearing

pair (thus forming a triangle), which they 'both simultaneously [observe]' (*U* 17.1210-1211). Stephen and Bloom are reduced to deducing rather than directly observing their reciprocal objects of contemplation. The fact that they are 'reciprocally rendered invisible by *manual* circumposition' (my emphasis) implies that their inability to observe is self-imposed; much like the narrow-minded candle-bearer's light of reason is self-projected, as Bruno suggests. The 'circumposition' of their lines of sight, or radius vectors, also implies a circular visual boundary, such as that cast by the Brunonian candlebearer. Shadows function in a similar way to lights in this passage, as they are said to project varying grades of luminosity ('projected luminous and semiluminous shadow'). While Bloom's and Stephen's coincident lines of thought and deductions concerning the appearance of each other's member is presented by the catechism as an objective account, the images which they conceive are probabilities and not realities: they are based on external aspects such as religion, and secondary characteristics such as urination. This suggests that Bloom's vision of Stephen's penis is essentially utopic, like the narrative's conception of unobservable heavenly bodies and atomic particles. Mirroring Bloom's attempted imaginings of Stephen's penis, the catechism's topographies of corporeal and astral bodies in 'Ithaca' are ultimately the reflections of its own logic; they are 'returnally reprodictive of themselves' (*FW* 298.17-18). Echoing Dolph assertion that 'we're only all telescopes', the mathematical and scientific tools which are applied in 'Ithaca' often reflect a set of traditionally acquired predispositions (*FW* 295.11-12). Like 'the reflecting telescope' and 'astronomical kaleidoscopes' which Bloom hopes to invent, the instruments through which the narrative eye in 'Ithaca' visualises the universe reflect its own modes of observation (*U*, 17.566-572).

The cosmos, the body and myth

By reconfiguring phenomenological reality in the most objective way possible, the catechism's rectifying mode of inquiry in 'Ithaca' gives rise to utopian conceptions of the universe and the forms which it contains. Its rectilinear lines of reasoning are so profoundly rooted in the idea of rectitude that they produce skewed and circular logics. By filling the tenebrous gaps in Bloom's and Stephen's sense-based knowledge with *a priori* deductions, the catechism's conclusions often turn out to be mythical constructions due to its unquestioning reliance on false assumptions. The myths generated by the catechism's

rectilinear approach accumulate as the narrative follows Bloom's observations of stars and planets, referring to the constellations of ancient Greek myth which they evoke. In this context, Joyce evokes a harmony between the narrative's application of scientific and pre-scientific *meters*. In doing so, he foreshadows Husserl's notion that the 'primal premises' of Euclidean geometry 'lie in the prescientific cultural world'; similar to the pre-scientific heroes and deities which are mapped using points and lines in the night sky.[72] Kuberski identifies a similar concept, arguing that '[o]ne of [Joyce's] constant concerns when working in [material pertaining to modern physics] was to blend the abstruse with the banal, the scientific with the mythic, and the most advanced insights into the oldest wisdom'.[73] In 'Ithaca', such parallels between 'the scientific and the mythic' are developed in Bloom's conflation of fleshly with heavenly bodies.[74] Similar to ALP in II.ii of the *Wake*, reflections evoked by the various sights and memories of Molly's corporeal form are intertwined with cosmic imagery. Several critics have discussed the various overlaps which are evoked between Molly's body and curved planetary structures in *Ulysses*. In 'Science in Ithaca', for instance, Fleishman relates the concept of solar parallax to Bloom and Stephen's 'coincidental and divergent' conceptions of Molly, arguing that 'the twin observations of Venus in relation to the sun are embodied in the two protagonists' attitudes to Molly, the love-goddess of the novel'.[75] Fleishman's discussion of Molly's embodiment of both a star and an anthropomorphic goddess sheds light on Joyce's more general exploration of the common ground scientific and pre-scientific constructs in 'Ithaca', as well as the visual overlaps which are evoked as human and heavenly bodies coincide.[76] Finn Fordham, focusing on the final 'curvilinear' episode of *Ulysses* in his essay 'Spinning with Penelope', builds on this notion that Molly's flesh embodies the curves of cosmic orbs. Treating the episode as a body in motion, he argues that 'Molly, more than a person or character, is inflated and idealised beyond the human into the "prehuman" and "posthuman" earth ball "Penelope"'.[77] Fordham's discussion of the difficulties in '[mapping] Penelope's terrain, her open space of post-coital post-vorticial dissolution'—in which 'Penelope' signifies both the episode and its speaking subject—relates to similar

[72] Husserl, 172.
[73] Kuberski, 59.
[74] Joyce, 'Letter of February, 1921', *Letters*, Vol. I of III, 164.
[75] Fleishman, 381.
[76] Joyce, 'Letter of February, 1921', *Letters*, Vol. I of III, 164.
[77] Finn Fordham, 'Spinning with Penelope', *European Joyce Studies 17*, ed. by Richard Brown (Amsterdam: Rodopi, 2006), 85-96, 85.

difficulties which are experienced by the narrative gaze as it follows Bloom's attempts to 'map' his wife in the comparatively rectilinear episode 'Ithaca'.[78] These difficulties are largely rooted in the catechism's idealising inflation of Molly's corporeal form 'beyond the human' and into gargantuan forms resembling moons, planets and stars.

Molly's apparent form inflates to cosmic proportions as the narrative lists the 'special affinities [which] appeared to [Bloom] to exist between the moon and woman' including 'her luminary reflection'; 'her potency over effluent and refluent waters'; 'the stimulation of her light, her motion and her presence'; 'her splendour, when visible' and 'her attraction, when invisible'. (*U* 17.1157-1170). By referring to women through the rhetorical use of a singular noun, 'woman', Joyce suggests that Molly—the 'woman' who predominates Bloom's thought—stands for all women, just as Bloom is an Everyman. This transformation of feminine into lunar bodies is later developed in a topographical context, when the narrative expands on Bloom's fanciful considerations of travelling abroad:

> Under what guidance, following what signs?
>
> At sea, septentrional, by night the polestar, located at the point of intersection of the right line from beta to alpha in Ursa Maior produced and divided externally at omega and the hypotenuse of the rightangled triangle formed by the line alpha omega so produced and the line alpha delta of Ursa Maior. On land, meridional, a bispherical moon, revealed in imperfect varying phases of lunation through the posterior interstice of the imperfectly occluded skirt of a carnose negligent perambulating female, a pillar of the cloud by day. (*U* 17.1991-1999)

Reflecting the way in which Bloom imagines guiding himself 'by […] the polestar' at sea, the catechism evokes the oneiric image of a quasi-planetary, quasi-bodily moon with which Bloom orientates himself on land. Molly's bodily members enlarge to such proportions that they are referred to as landmarks. Moon and woman, moreover, are combined in the twofold image of a 'posterior', which represents a pair of buttocks as well as the dark side of a 'bispherical moon'. The 'imperfect varying' luminosity and 'occluded' nature of what lies under the 'imperfectly occluded skirt of a carnose negligent perambulating female' echoes the imagery relating to the moon's occluded nature as listed in the narrative's relation of the 'special affinities […] between moon and woman' (*U* 17.1157-1170). This

[78] Fordham, 91.

polysemic portrayal of Bloom's imagined womanly moon foreshadows the *Wake*an scene in which Dolph and Kev lift their mother's skirt to envisage her colossal hemispheres, or full moon. In 'Ithaca', a similar image is developed when Bloom enters the conjugal bed (with an 'approximate erection', echoing the third act of Bruno's 'The Candlebearer') where he kisses 'the plump mellow yellow smellow melons of [Molly's] rump, on each plump melonous hemisphere, in their mellow yellow furrow, with obscure prolonged provocative melonsmellonous osculation' (*U* 17.2241-2243). Through the simple act of kissing his wife's 'rump', Bloom's actions mirror those of Odysseus, who kisses the soil of his occluded land. Osculating lunar and bodily 'hemispheres' are thus intertwined in the landscape of Bloom's imagination; and by evoking the mediation of Bloom's thoughts between the two Joyce highlights the extents to which the catechism's tenacious assertions become enshrouded by the idealistic and mythical imaginings of its subjects.

The cosmic features of Molly's bodily landscape are expanded further as her 'constellations' are considered in relation to planetary cycles:

> Which various features of the constellations were in turn considered?
>
> […] the Libyan floods on Mars about the period of the birth of the younger astroscopist: the annual recurrence of meteoric showers about the period of the feast of S. Lawrence (martyr, 10 August): the monthly recurrence known as the new moon with the old moon in her arms: […]. (*U* 17.1103-1118)

The image of crimson waters suggested in 'the Libyan floods on Mars' is enhanced in the line 'about the period of the birth of the younger astroscopist'. As Gifford and Seidman point out, 'Libya is an equatorial region on Mars, so named by the Italian astronomer Giovanni Schiaparelli (1835-1910), whose work on the geography of Mars […] and its "canals" led to considerable speculation about the possibility of life on Mars'.[79] By juxtaposing this allusion to the red planet's dry but once fecund canals with imagery pertaining to lunar cycles, Joyce equivocates Molly's menstrual periods with larger cosmic forces. This bilateral connotation is further evoked in the narrator's final consideration of the 'obscurity of terrestrial waters, pallor of human beings' (*U* 17.1135-1136). By suggesting a direct link between obscure waters and bloodless humans, the narrative presents Molly, like ALP, 'in the attitude of Gea-Tellus, fulfilled, recumbent, big with seed'

[79] Gifford & Seidman, 584.

(*U* 17.2313-2314).

Building on these astronomical conceptions of Molly as a lunar and a planetary landmark in space, the catechism discusses her movements in relation to the dynamism of stars. When urinating in the garden with Stephen, for example, Bloom's anticipation of 'the diffusion of daybreak' and 'the apparition of a new solar disk' transform into a memory which gravitates around the appearance of Molly's 'invisible luminous body' (*U* 17.1257-1267). Significantly, this occurs shortly after the light in Molly's bedchamber appears above the penis-handling stargazer and his urinating companion as a 'celestial sign' (*U* 17.1210):

> What prospect of what phenomena inclined him to remain [in the garden]?
>
> The disparition of three final stars, the diffusion of daybreak, the apparition of a new solar disk.
>
> Had he ever been a spectator of those phenomena?
>
> Once, in 1887, after a protracted performance of charades in the house of Luke Doyle, Kimmage, he had awaited with patience the apparition of the diurnal phenomenon, seated on a wall, his gaze turned in the direction of Mizrach, the east.
>
> He remembered the initial paraphenomena?
>
> More active air, a matutinal distant cock, ecclesiastical clocks at various points, avine music, the isolated tread of an early wayfarer, the visible diffusion of the light of an invisible luminous body, the first golden limb of the resurgent sun perceptible low on the horizon. (*U* 17.1256-1268)

During this nocturnal game of charades at Luke Doyle's house, Bloom's observation of the morning sun rising in the east becomes virtually inseparable from the image of Molly entering his sight. By turning his gaze 'in the direction of Mizrach, the east', Bloom not only faces a virtual compass point but also looks towards (or at) a symbolic East which is represented by his Gibraltan wife, who appears by the eastern wall of the house. This parallel is solidified when corporeal and astral imagery combine in Bloom's remembering of 'the first golden [corporeal and celestial] limb' of rosy-fingered dawn.

By elucidating the phenomena of Molly's fleshly presence—which becomes the ultimate

object of the catechism's lines of inquiry towards the end of 'Ithaca'—through pluralistic images pertaining to celestial bodies, Joyce illustrates how the catechism's rectilinear readings of the world give rise to epically distorted visual landscapes. In 'Ithaca', Molly's occluded bodily landscape is often referred to in much the same way as an Odyssean seafarer would read the astral heavens in charting his course by night. In this way, heavenly bodies are transformed into humanoid forms, and humans 'become heavenly bodies, wanderers like the stars at which they gaze'.[80] Echoing Bruno's theory of coincident contraries, the visual laws which govern human bodies reflect those revealed by bodies of lunar, planetary and astral proportions. The catechism refers to overblown scales in its measurements of relatively infinitesimal territories, and this is epitomised when the catechism relates Molly and Leopold's relative positions in bed towards the end of the episode: '[l]istener, S. E. by E.: Narrator, N. W. by W.: on the 53rd parallel of latitude, N., and 6th meridian of longitude, W.: at an angle of 45 degrees to the terrestrial equator'). Concurrently, the formal properties of relatively smaller bodies such as Molly's are stretched to accommodate dimensions 'beyond the human'.[81]

Conclusion

By exploring how the catechism's attempts at visualising reality by referring to extraneous sources and perspectives leads to a progressive slip away from the thing-in-itself and further into the spaces imagined by his subjects, Joyce reflects similar issues which are equally at stake in his own endeavour to map Dublin textually in *Ulysses*. Joyce, who was physically removed from his subject while writing it, relied heavily on books, directories, magazines, newspaper clippings, maps and various other material accounts of Dublin in June 1904 which he could get his hands on. By interpolating the text with an encyclopaedic range of historical events originating from without the novel's fictionalised universe, Joyce attempted to provide 'a picture of Dublin so complete that if one day the city suddenly disappeared from the Earth it could be reconstructed out of [his] book'.[82] By adopting a catechetical narrative mode in 'Ithaca', Joyce explores the problems associated with the *a priori* application of second-hand accounts of visual reality. More specifically, he evokes the abstract nature of Euclidean geometry and its topographical applications through the

[80] Joyce, 'Letter of February, 1921', *Letters*, Vol. I of III, 164.
[81] Fordham, 85.
[82] Budgen, 67-8.

narrative’s spatial misconceptions, questioning the possibility of ‘squaring the circle’ in both geometric and cartographical terms.

Like the material signs which Murphy uses to flesh out his alleged exploits at sea in ‘Eumaeus’ (which include a photograph, a tattoo, a scar and a postcard), the maps and didactic texts which inform *Ulysses* cannot be equated with their territories at face value for, as Joyce illustrates in ‘Ithaca’, they have the propensity to disfigure original contexts and—as is the case with Mercator’s projection—blow images out of proportion. By highlighting how myths are propagated when the map is mistaken for the territory, Joyce suggests that a rectilinear approach to mapping the sensory world would not provide a ‘complete’ picture of the spaces in which we live. Joyce explores this notion in the latter half of ‘Ithaca’, in which the narrative’s astronomical calculations become intertwined with idealistic visions which elevate Molly to the status of myth and enlarge her body to epic proportions, enabling the reader to obtain a clearer conception of her presence in Bloom’s thoughts. These notions concerning the absolute limit to an objective conception of bodies and planets in space; the importance of acquiring coincident and parallactic perspectives within attempted visualisations of the unknown; as well as the potential to orientate oneself in space using pre-scientific cultural constructs are explored in *Ulysses* as a whole. Running through Joyce’s quasi-objectivistic, topographically accurate snapshot of Dublin is another subjectively perceived dimension to the city whose picture is composed of streams of consciousness, mythical parallels and—as is the case with Molly’s transformation into a celestial being in ‘Ithaca’—fleshly embodiments of the city and its organs.

Chapter 3. 'Shut your eyes and see': Verbal Geometry and Textual Topography in *Ulysses*

> *Philosophy is written in this grand book, the universe, which stands continually open to our gaze. But the book cannot be understood unless one first learns to comprehend the language and read the letters in which it is composed. It is composed in the language of mathematics, and its characters are triangles, circles, and other geometric figures without which it is humanly impossible to understand a single word of it; without these, one wanders about it in a dark labyrinth.*
>
> —Galileo Galilei, 'The Assayer'[1]

Chapters one and two considered how Joyce presents geometric and topographical forms of representation as languages, rather than ideally objective systems, for measuring and describing sensible reality. This chapter examines how Joyce reflects contemporary scientific concerns regarding the plurality of geometric languages within the text's verbal landscape. Focusing principally on 'Wandering Rocks', it explores how Joyce re-formalises the labyrinthine structure of Dublin's streets through a multivalent (as opposed to a linear) narrative form whose various temporal interconnections can be traced and mapped by the reader. It also investigates Joyce's figurative use of language, examining in particular how his construction of parallactic, triangular and chiastic textual patterns through time emulates fundamental geometric laws regarding the continuity of visual space.

'Wandering Rocks' is the focus of this chapter on textual topography, not only because it is generally considered to be one of the most topographical episodes in *Ulysses* (given the way it pictures a wide range of urban spaces from numerous viewpoints), but also because it encapsulates—on an intensifying scale—the convergence between urban and textual spaces which characterises Joyce's writing of Dublin throughout *Ulysses*. As would be the case for inferring how Stephen travels from Sandymount Strand in 'Proteus' (episode III)

[1] Galileo Galilei, 'The Assayer' (1623), trans. by Stillman Drake, *Discoveries and Opinions of Galileo*, ed. by Stillman Drake (New York, NY: Anchor Books, 1957), 229-280, 237-8.

to the National Library in ‘Scylla and Charybdis’ (episode IX), for instance, the reader’s conception of where the characters of ‘Wandering Rocks’ are located, where they are heading and which route they are likely to trace in between depends not only on an understanding of where they would be situated on a map, but also on a consideration of where the narrative strands which follow them are situated in relation to each other in the text. Consisting of a textual montage of inter-referential vignettes riddled with flash-backs, flash-forwards and flashes across to the imaginings of other consciousnesses, Joyce’s ‘Wandering Rocks’ illustrates the extreme extents to which the textual narrative’s temporal logic can be reconceived spatially, whereby the reader is impelled to think backwards and forwards through narrative time.

This chapter is divided into three sections. The first section, ‘Critical reflections on “Wandering Rocks”, the labyrinth, space and time’, provides a critical context for thinking about ‘Wandering Rocks’ spatially. More specifically, it relates the figure of the labyrinth, which Joyce appropriates as the technic for ‘Wandering Rocks’, to the episode’s multivalent and web-like temporal structure. Rather than being purely a metaphor for the way in which ‘Wandering Rocks’ misleads the reader, it argues, the figure of the labyrinth also functions as a formal narrative device whose fundamental principles inform the episode’s intricate temporal form. Like the pathways of a mannerist maze (such as that delineated by the characters’ criss-crossing journeys through the streets of Dublin) which intersect at certain points in space, the narrative vignettes in ‘Wandering Rocks’ overlap at particular points in narrative time. In this light, this section considers how Joyce enables the plotting of each vignette onto the episode’s larger temporal framework, as one would trace intersecting journeys on a map.

The second section, ‘Textual topography’, examines how Joyce develops an interplay between the episode’s temporal logic and the narrative’s topographical tracings of Dublin. Focusing on Joyce’s use of interpolations (i.e. narrative junctures which indicate simultaneity and establish multiple vignettes within a common spatio-temporal context through cross-references) it discusses how the temporal logic governing when and how particular vignettes succeed one another in narrative time formalises the geometric and topographical logic governing when and how particular images appear to succeed one another as related objects—or the roving narrative eye which views them—move through

urban space. The multivalent temporal structure of ‘Wandering Rocks’ provides a textual analogue for the shifting narrative eye’s visualisations of Dublin, in the sense that both provide an indirect and cumulative rendering of the city as a totality through the piecing together of coincident and tangential snapshots. This second section provides a diagram illustrating how the episode’s conceptual web of temporal relations can literally be translated into a spatial equivalent, in which narrative tangents through time are depicted as being extended in space (fig. 8). Using this diagram as a basic conceptual model, it discusses how the episode’s multivalent narrative form entails a figurative unravelling and a flattening of time, whereby multiple points in time—past, present, future and imagined—are artificially portrayed in juxtaposition with each other (like the points around the globe in Mercator’s projection) through a process of cross-reference and repetition.

The third section, ‘Verbal geometry’, investigates how Joyce re-conceives language itself in spatial terms. It demonstrates how geometric constructs and related topographical concepts which entail a meeting of lines—including parallax, triangulation and the chiasmus—are evoked through conceptual and aural repetitions, in which particular objects are revisited along different lines of sight and from variant angles. It further examines how the figurative, syntactical and phonic distortions which accompany these repetitions embody the geometric variances which describe objects as they appear to move in relation to the viewer. With reference to ‘Sirens’, this section expands on the way in which Joyce’s use of distortive aural echoes throughout *Ulysses* encapsulates the apparent transformations which differentiate coincident visual perspectives. By rendering Dublin’s mobile, wandering urban landmarks through a concurrently modulating acoustic environment in both ‘Wandering Rocks’ and ‘Sirens’, it argues, Joyce’s figurative use of language provides the reader with a sense of space which both encompasses and transcends the visual.

This chapter also expands on Joyce’s repeated allusions to Giordano Bruno’s candlebearer motif, which is discussed in chapters one and two, and considers how the branching linguistic, textual and topographical patterns of ‘Wandering Rocks’ illustrates Bruno’s notion that the subject must consider their own viewpoint in relation to a possible range of others in order to conceive what is hidden and perceive previously unknown ‘*Shadows of*

Ideas'.[2] In light of Bruno's critique of 'rectilinear' thinking in 'The Candlebearer', and his construction of interlocking visual and conceptual viewpoints through triangular linguistic patterns in 'The Heroic Frenzies', this chapter examines how Bruno informed Joyce's construction of a textual topography in 'Wandering Rocks', which enables the reader to infer the relative locations of characters in Dublin whose paths are not fully revealed.

Critical reflections on 'Wandering Rocks', the labyrinth, space and time

By devoting an entire episode to an event which is only briefly mentioned in the *Odyssey*, Joyce causes his novel—which otherwise follows the narrative structure of Homer's epic relatively closely—to go off track. No corresponding episode appears in the *Odyssey*, although Odysseus does briefly mention having travelled to the *planetai* (or 'clashing rocks') during his odyssey in book XXIII. This notion of pursuing the road not taken (in a narrative sense)[3] plays an important role in Joyce's 'Wandering Rocks', whose vignettes—like the characters' journeys through the city—converge upon, branch away from and run parallel with each other. As Fritz Senn puts it in his essay 'Charting Elsewhereness', 'Joyce not only expanded a mere option into a separate episode, he also made the episode one *of* alternatives'.[4] This not only applies to the topographical alternatives in 'Wandering Rocks', i.e. the branching streets and alternative courses which it depicts, but also to the way in which the narrative vignettes coincide with each other. By considering the logic by which they interconnect, the reader is able to discern their ends and origins within the larger narrative scheme.

'Wandering Rocks' consists of nineteen vignettes (or eighteen, if we take the final section concerning the viceregal cavalcade's progress through Dublin as a coda). The vignettes are narrated sequentially, although they do not necessarily occur in their presented order. Previous and forthcoming vignettes are alluded to through the use of interpolations, which indicate moments of simultaneity and unify the segmented narrative into a synchronised

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2 Giordano Bruno, 'The Candlebearer', trans. by Gino Moliterno, in Moliterno, 'The Candlebearer at the *Wake*: Bruno's *Candelaio* in Joyce's Book of the Dark', *Comparative Literature Studies*, Vol. 30, No. 3 (1993), 269-294, 279.

3 Rather than in a literal sense, given that Odysseus does indeed venture to the *planetai* according to his summary recapitulation of his odyssey to Penelope in book XXIII.

4 Fritz Senn, 'Charting Elsewhereness: Erratic Interlocations', *European Joyce Studies 12: Joyce's "Wandering Rocks"*, ed. by Andrew Gibson & Steven Marrison (Amsterdam: Rodopi, 2002), 155-185, 157.

unity. The sense of simultaneity and organic wholeness which characterises ‘Wandering Rocks’ becomes clear as soon as the opening vignettes are considered in light of each other. Continuing on from the opening of vignette one, in which Father John Conmee crosses paths with a one-legged sailor outside the Presbytery near Mountjoy Square (‘[a] onelegged sailor, swinging himself onward by lazy jerks of his crutches, growled some notes’), the narrative eye travels from Malahide (where Conmee’s journey ends) back to north-west Dublin in vignette three (*U* 10.7-8). In vignette three, a character who we presume to be the same one-legged sailor reappears having slowly travelled from the Presbytery steps to Eccles Street (‘[a] onelegged sailor crutched himself round MacConnell’s corner, […] and jerked himself up Eccles street’) (*U* 10.228-229). On Eccles Street, the one-legged sailor ‘[swings] himself violently forward past Katey and Boody Dedalus’, who later appear in vignette four having journeyed quickly from Eccles Street to their home in Cabra—in which an interpolation concerning Father Conmee appears (‘Father Conmee walked through Clongowes fields […]’)—and so on, the temporal and spatial overlaps getting even more complex as the vignettes accumulate and their inter-relations multiply (*U* 10.233-264). The characters’ paths and viewpoints interconnect in much the same way as the narrative vignettes overlap, and both sets of multiplicities are unified by their own relative spatio-temporal logic.

Stuart Gilbert and Carlo Linati both cite the technic of ‘Wandering Rocks’ as the ‘labyrinth’ in their schemata for *Ulysses*; Linati’s schema adds the gloss: ‘shifting labyrinth between two shores’.[5] As is evident from the summary above, the reader can easily lose track of where the narrative eye’s gaze is directed, and when particular events occur in relation to each other. Several critics have drawn analogies between the processes of reading ‘Wandering Rocks’ and navigating a labyrinth. In his seminal chapter on ‘Wandering Rocks’ in *James Joyce’s Ulysses: Critical Essays*, Clive Hart discusses the disorienting effect caused by the episode’s reader-traps. These mainly consist of linguistic ambiguities and mistaken identities, which make it difficult to ascertain, for example, whether the one-legged sailor who appears in Eccles street in vignette one is the same one-legged sailor who passes Father Conmee in vignette three (due to Joyce’s repeated use of

[5] Jeri Johnson (ed.), ‘Appendix A: The Gilbert and Linati Schemata’, *Ulysses: The 1922 Text* (Oxford: Oxford University Press, 2008), 734-9.

the indefinite article).[6] Comparing the enunciative uncertainties faced by the reader to the illusions and near-misses which frustrate many of the characters in the city, Hart argues that '[r]eading this chapter is like walking in the maze of a city's streets. One finds oneself continually taking wrong turnings, being caught in dead ends, having to retrace one's steps'.[7] Fritz Senn also relates the episode's disorienting effect to the idea of navigating a labyrinth in his essay 'Charting Elsewhereness: Erratic Interlocations'. He argues that Joyce disorients the reader through the use of 'interlocations' (i.e. interpolations with a topographical emphasis) which jump between and intertwine different locations.[8] In light of the sense of 'elsewhereness' which the interlocations evoke, Senn argues that '[t]he whole chapter is [...] a labyrinth, that is to say, something characterised by a lack of perceptible design, where readers easily lose their bearings and therefore have recourse to maps or topographical guidance'.[9] Richard Brown, drawing from Frank Budgen and Clive Hart's early discussions of 'reader-traps' in his essay 'Time, Space, and the City in "Wandering Rocks"', complements Hart's and Senn's readings in arguing that:

> literature was never so much like a crossword puzzle, as it is here, and the figure of the puzzle or labyrinth was never so wholeheartedly embraced as a literary device; to an extent, indeed that we may seem substantially to challenge and to redefine the traditional legitimations of forms of literary discourse.[10]

As well as encapsulating the idea that the episode's puzzling nature reflects the perplexities of the labyrinth, Brown's claim responds to the more general notion that 'Wandering

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6 Clive Hart, 'Wandering Rocks', *James Joyce's Ulysses: Critical Essays*, ed. by Clive Hart & David Hayman (Berkeley, CA: University of California Press, 1974), 181-216, 189.

7 Hart, 189-90.

8 The cross-referential interruptions in 'Wandering Rocks' have been referred to as 'interpolations' (Jeri Johnson, 'Explanatory Notes', *Ulysses: The 1922 Text*, ed. by Johnson (Oxford: Oxford University Press, 2008), 763-980, 863-864); 'interlocations' (Senn, 'Charting Elsewhereness: Erratic Interlocations', 155); and 'intercalations' (Stefan Haag, 'Listen and be Touched: Aural Space in "Wandering Rocks"', *European Joyce Studies 12: Joyce's "Wandering Rocks"*, ed. by Andrew Gibson & Steven Marrison (Amsterdam: Rodopi, 2002), 107-120, 107). While the term 'interlocations' emphasises the topographical disruptions which occur as a result of the episode's narrative junctures, 'intercalations' stresses the temporal nature of these disruptions (the latin prefix *intercalat-* signifying the proclamation of something as being inserted in the calendar (O.E.D.)). This chapter employs the term 'interpolations', which emphasises the idea of insertion, primarily because it prioritises neither the spatial nor temporal aspects of these interruptions. As we shall explore in more detail, Joyce's insertion of interpolations involves a combination of narrative overlaps in both space and time.

9 Senn, 158.

10 Richard Brown, 'Time, Space and the City in "Wandering Rocks"', ed. by Andrew Gibson & Steven Marrison, *European Joyce Studies 12: Joyce's "Wandering Rocks"* (Amsterdam: Rodopi, 2002), 57-72, 65.

Rocks’ epitomises the way in which ‘the reading of the city as a kind of text and the reading of the text as a kind of city come together’ in *Ulysses* as a whole.[11]

Other than serving as a useful metaphor for the way in which ‘Wandering Rocks’ misdirects and confuses the reader, the figure of the labyrinth is also evoked on a technical level: both topographically and textually. On the one hand, Joyce derives a topographical labyrinth—or, as Hart puts it, a ‘maze’ composed of ‘a city’s streets’—by continually referring to street names and reiterating the relative locations of its characters, as if it were following their movements on a map.[12] Through a process which Eric Bulson calls ‘naming’ as opposed to ‘describing’, by which street names, landmarks and other topographical indicators are referred to obliquely, ‘Wandering Rocks’ presupposes that the reader is either familiar with Dublin or else has a map of the city to hand.[13] According to Frank Budgen, ‘Joyce wrote the *Wandering Rocks* with a map of Dublin before him on which were traced in red ink the paths of the Earl of Dudley and Father Conmee’.[14] By following Joyce and having ‘recourse to maps’, the reader would be able to make topographical sense of his characters’ movements and discern the interlocking, maze-like structure formed by their paths.[15] Discussing this cartographical aspect of *Ulysses* in his essay ‘Over Assemblage: *Ulysses* and the Boîte-en-Valise from Above’, Paul Saint-Amour argues that:

> The text asks its readers to repeat its own obsession with mapping urban space, situating characters within a reticulated plane of districts, streets, tramlines, buildings, monuments, public and private spaces, interlocking narratives. For much of *Ulysses*, the principal scale is not that of the city but that of the city map, which locates the viewer at a Daedalian remove – the labyrinth as seen from above by its winged, departing maker.[16]

The text’s ‘obsession with mapping urban space’ is epitomised in ‘Wandering Rocks’, in which the narrative eye frequently shifts from detailed observations at street level to

[11] Brown, 57.
[12] Hart, ‘Wandering Rocks’, 89.
[13] Eric Bulson, ‘Joyce’s Geodesy’, *Journal of Modern Literature*, Vol. 25, No. 2 (Winter 2001/2002), 80-96.
[14] Frank Budgen, *James Joyce and the Making of Ulysses* (1934; repr. Oxford: Oxford University Press, 1972), 124-5.
[15] Senn, 158.
[16] Paul K. Saint-Amour, ‘Over Assemblage: *Ulysses* and the Boîte-en-Valise from Above’, *Cultural Studies of James Joyce*, ed. by R. Brandon Kershner (Amsterdam: Rodopi, 2003), 21-58, 31.

encompassing views of the city ‘as seen from above’. As Budgen puts it in *James Joyce and the Making of Ulysses*:

> The view constantly changes from a close-up to a bird’s-eye view. A character is introduced to us at close-up range, and suddenly, without warning, the movement of another character a mile distant is described. The scale suddenly changes. Bodies become small in relation to the vast space around them. The persons look like moving specks. It is a town seen from the top of a tower.[17]

The visual ‘close-ups’ in ‘Wandering Rocks’ not only consist of snapshots taken from a proximate physical location, as Budgen points out, but also include the narrative’s sporadic lapses into interior monologue and free indirect discourse, which provide a figurative proximity with its subject. Throughout the episode, these visual and conceptual close-ups alternate with renderings of Dublin as seen from above or at a distance. The various copies of the ‘large poster of Marie Kendall, charming soubrette,’ for example, are not only evoked from the perspective of passers-by, who are situated beneath the poster and gaze at it from afar (‘[Miss Dunne] stared at the large poster of Marie Kendall, charming soubrette’): they are also encapsulated from the perspective of the poster towards the medial subject from above and up-close (‘Marie Kendall, charming soubrette, smiled on [M’Coy and Lenehan] from a poster a dauby smile.’) (*U* 10.380-496).

By appropriating a bird’s-eye view at various points, the narrative presents certain ‘close-ups’—which in themselves can often appear to ‘have a lack of perceptible design’, as Senn puts it—within the context of a larger unity which possesses a coherent structure.[18] Examining the episode’s labyrinthine design within this topographical context in his ‘Bathymetric Reading of Wandering Rocks’, Leo Knuth argues the city is envisioned as ‘a circular labyrinth of streets’ circumscribed by the North and South Circular Roads (as in the opening of II.ii in *Finnegans Wake*).[19] He points out that Bloom is located ‘at the topographical center [*sic*]’ of the city as well as the centre of the episode itself.[20] With reference to his diagram, Knuth further illustrates how ‘Father Conmee and the Viceroy,

[17] Budgen, 126.
[18] Senn, 158.
[19] Leo Knuth, ‘A Bathymetric Reading of Joyce’s “Ulysses”, Chapter X’, *James Joyce Quarterly*, Vol. 9, No. 4 (Summer, 1972), 405-422, 406.
[20] Knuth, 406. Strictly speaking, however, the centre of ‘Wandering Rocks’ would be situated in between vignettes 9 and 10.

the representatives of the Church and the State, […] move in opposite directions, away from the center [*sic*], the one going towards the northeast, the other moving towards the southeast'.[21] In this way, their intersecting paths describe cross, thus mirroring the form of the episode number (X). As with the opening of the tenth chapter in the *Wake*, in which an "X" is also delineated across Dublin; 'Clay', in which a crucifix shape is formed by Maria's criss-crossing shopping trip; and Bloom's journey in 'Lestrygonians', which traces 'the alimentary tract of a sleeping giant', as John Bishop argues in *Joyce's Book of the Dark*, reading the city as a network formed by characters' paths can provide a new contexts from which to approach the narrative topographically; i.e.: considering it, like a map, from an elevated and removed visual perspective.[22] That being said, it is important to note an important difference with 'Wandering Rocks': while Joyce uses a pre-meditated form to shape the characters' journeys in 'Clay', II.ii and 'Lestrygonians', in 'Wandering Rocks' a labyrinthine form is derived from the characters' journeys and not the other way round (as with the construction of a 'crossword puzzle', as Richard Brown puts it).[23]

On the other hand, Joyce constructs a textual labyrinth in 'Wandering Rocks' which consists of interconnecting vignettes. Like many of the characters' journeys, which intersect at certain points in the city, the narrative tangents which follow them overlap or refer to each other at certain points in the text. When they are considered together with the interpolations which bind them together, a maze-like structure consisting of narrative junctures and alternative courses between vignettes becomes discernible. That is to say, the topographical nature of 'Wandering Rocks' not only derives from Joyce's extended reference to the external, historically verifiable *topos* of Dublin as it is represented on a map, but also in its construction of an internally coherent network whose branching structure mimics the conjunctive form of the urban labyrinth which it portrays. In 'Wandering Rocks', the scale not only alternates from a 'close-up range' to a 'birds-eye view' visually but also textually: through the use of interpolations, the narrative eye assumes an encompassing overview of the episode and reveals how a particular vignette fits into the larger narrative framework.[24] The interpolations thus provide connections between different points in narrative time which enable the reader to envisage the whole

[21] Knuth, 406.
[22] John Bishop, *Joyce's Book of the Dark* (Madison, WI: The University of Wisconsin Press, 1986), 164.
[23] Brown, 65.
[24] Budgen, 126.

episode as a network. This notion is acknowledged by Saint-Amour when he discusses how *Ulysses* asks the reader to ‘[situate] characters within a reticulated plane of […] interlocking narratives’ within the context of urban networks such as districts, streets and tramlines.[25] It is the interlocking nature of these narratives which facilitate a conception of them as parts of a larger unity, as interconnecting paths would appear on a map. In this way, ‘Wandering Rocks’ epitomises the internal logic of *Ulysses* whereby it would be possible, as demonstrated by Vladimir Nabokov (who drew maps of Dublin in the margins of his copy of *Ulysses* without referring to secondary texts), to form a spatial awareness of the text without ‘having recourse to maps or topographical guidance’.[26] In light of this notion that ‘Wandering Rocks’ not only re-creates the urban labyrinth of Dublin but further constitutes a textual labyrinth in itself, Linati’s added gloss to his definition of the episode’s technic—‘shifting labyrinth between two shores’—is pertinent.[27] These two dimensions, the urban and the textual, are perhaps the two ‘shores’ between which Joyce’s labyrinth unfolds; a labyrinth whose ‘rocks’—whether they be the characters who wander through the city or the vignettes which wander in different directions through the text—repeatedly clash into one another.

As we have seen, several critics have explored how ‘Wandering Rocks’ can be understood as a topographical text, which re-conceives the city as a labyrinth which the meandering narrative eye explores. Beyond very general or metaphorical discussions, however, comparatively few critics have investigated how the episode can be understood as a textual topography, and how the multi-faceted narrative can itself be considered in spatial terms. In his seminal triptychal essay ‘Spatial Form in Modern Literature’, Joseph Frank provides a conceptual basis from which to explore how Joyce emulates topographical constructs through the temporal framework of the textual narrative, and how he impels the reader to apprehend the episode ‘spatially, in a moment of time, rather than as a sequence’.[28] Frank’s inquiry builds on Gotthold Lessing’s discussion of aesthetic form in *Laocoön* (1766), which distinguishes between the spatiality of the plastic arts (which ‘can best be presented juxtaposed in an instant of time’) and the temporality of literature (which is ‘composed of a

[25] Saint-Amour, 31.
[26] Senn, 158.
[27] Carlo Linati, ‘The Linati Schemata’, in Joyce, *Ulysses: The 1922 Text*, ed. by Jeri Johnson (Oxford: Oxford University Press, 2008), 736-9, 738.
[28] Joseph Frank, ‘“Spatial Form in Modern Literature”: Part I’, *The Sewanee Review*, Vol. 53, No, 2 (Spring, 1945), 221-240, 225.

succession of words proceeding through time’).[29] Although Joyce could not have possibly read Frank’s essay, he owned a translated copy of *Laocoön* and was certainly acquainted with Lessing’s aesthetics.[30] This is indicated most explicitly in ‘Proteus’, in which Stephen contemplates Lessing’s twin notions of ‘the *Nacheinander*’ (which connotes the consecutiveness of words or musical notes, for example) and ‘the *Nebeneinander*’ (which connotes the static arts, such as painting and sculpture, in which the whole is apprehended instantaneously) (*U* 3.13-15). In his discussion of spatial form in *Ulysses*, Frank argues that Joyce disrupts ‘the time-logic of language’, or the *Nacheinander*, by ‘cutting back and forth between different actions occurring at the same time’.[31] In this way, he argues, Joyce’s urban subject has ‘the same sense of simultaneous activity occurring in different places’ as Gustave Flaubert’s Paris.[32] Joyce’s representation of Dublin, Frank argues, is thus presented as a ‘totality’ much like a plastic art object whose disparate features are ‘juxtaposed in space rather than unrolling in time’.[33]

Drawing from Wilhelm Worringer’s distinction between naturalistic and non-naturalistic art in *Abstraction and Empathy* (1907) in the third part of his essay, Frank expands on this analogy between modernist literature and visual art. Worringer discusses how ‘[d]uring periods of naturalism’, including ‘the classical age of Greek sculpture and architecture’, ‘the artist strives to represent the objective, three-dimensional world of ordinary experience’.[34] During non-naturalist periods, by contrast, ‘the artist abandons the three-dimensional world and returns to the plane, reduces organic nature, including man, to linear-geometric forms, and frequently abandons the organic world altogether for one of pure lines, forms and colors [*sic*]’.[35] Generally speaking, non-naturalistic or abstract art can therefore be understood as ‘flat’, and naturalistic art three-dimensionally ‘curved’. Applying this contrast to his discussion of spatial form in modern literature, Frank argues that:

[29] Frank, ‘“Spatial Form in Modern Literature”: Part I’, 223.
[30] Michael Patrick Gillespie (ed.), *James Joyce’s Trieste Library: A Catalogue of Materials at the Harry Ransom Humanities Research Center* (Austin, TX: The University of Texas Press, 1986), 146.
[31] Frank, ‘“Spatial Form in Modern Literature”: Part I’, 223.
[32] Frank, ‘“Spatial Form in Modern Literature”: Part I’, 223.
[33] Frank, ‘“Spatial Form in Modern Literature”: Part I’, 227.
[34] Joseph Frank, ‘Spatial Form in Modern Literature: Part III’, *The Sewanee Review*, Vol. 53, No. 4 (Autumn, 1945), 643-653, 644-5.
[35] Frank, ‘Spatial Form in Modern Literature: Part III’, 645.

> In a non-naturalistic style, […] the inherent spatiality of the plastic arts is accentuated by the effort to remove all traces of time-value; and since modern art is non-naturalistic, we can say that it is moving in the direction of increased spatiality. The significance of spatial form in modern literature now becomes clear: it is the exact complement in literature, on the plane of esthetic [*sic*] form, to the developments that have taken place in the plastic arts.[36]

Such modern 'developments' in the plastic and visual arts would include neoplasticism, for instance, which renders 'pure lines, forms and colors [*sic*]' on a planar surface. Similarly, Cubism entails a 'flattening' of three-dimensional objective reality by presenting its various features as seen from different points in space in an instant of time. Much like these avant-garde movements in visual art, which obliterated traditional notions of three-dimensional space, Joyce's *Ulysses* removes 'all traces of time-value' and disintegrates 'distinctions between past and present' by 'cutting back and forth' across different times and places. As Archie Loss argues in *Joyce's Visible Art: The Work of Joyce and the Visual Arts, 1904-1922*, several episodes in *Ulysses* including 'Aeolus' and 'Cyclops' 'represent an essentially spatial conception of form [by] employing diverse temporal elements congruent with Cubist conceptions of time and space'.[37] These 'diverse temporal elements' include intertextuality, repetition and self-reflexivity, for instance, which emulate the Cubist application of montage. Through this process, Joyce could be said to 'flatten' time much like the Cubists virtually flattened space.

In 'Joyce, Liberature and Writing of the Book', Katarzyna Bazarnik expands on these formal correspondences between *Ulysses* and modernist visual art by illustrating how Joyce destabilises Gotthold Lessing's classical understanding of 'poetry [as] a speaking picture', and of 'painting [as] dumb poetry'.[38] She argues that Joyce's *Ulysses*, like Laurence Sterne's *Tristram Shandy* and Stephane Mallarmé's poem 'Un Coup de Dés' ('A Throw of the Dice'), overturns Lessing's classification of literature as it consists of 'meaningful' formal properties which cannot necessarily be heard: for instance, should multiple columns 'be read by two readers simultaneously […]?'.[39] Bazarnik employs Zenon Fajfer's term '*liberatura*', or 'liberature' (which '[emphasises] the form of the book

[36] Frank, 'Spatial Form in Modern Literature: Part III', 650-1.
[37] Archie K. Loss, *Joyce's Visible Art: The Work of Joyce and the Visual Arts, 1904-1922* (Ann Arbor, MI: UMI Research Press, 1984), 56.
[38] Gotthold Lessing, *Laocoön*, qtd. in Katarzyna Bazarnik, *Joyce & Liberature* (Prague: Litteraria Pragensia, 2011), 6.
[39] Katarzyna Bazarnik, *Joyce & Liberature* (Prague: Litteraria Pragensia, 2011), 46; 10.

as [a] meaningful aspect’, while also suggesting a literary free play) in reference to such works.[40] Complementing Frank’s understanding of *Ulysses* as a spatial object, Bazarnik highights several ‘diagrammatic correspondences’ in the original 1922 edition of *Ulysses*: in ‘Lotus Eaters’, for example, the phrase ‘[s]eventh heaven’ appears in the seventh sentence on page seventy-seven, in a paragraph concerning Bloom’s contemplation of the holy communion.[41] Similarly, ‘[w]hen Bloom is thinking about weight, gravity, and the rate of falling bodies [towards the beginning of the episode], he recalls its value: “thirty two feet per second”, in the thirty-second sentence of the paragraph’.[42] With reference to the numerology of the text’s pagination in the 1922 edition, Bazarnik also points out that ‘the novel counts 732 pages’, which reflects ‘the number of days and nights in the leap year’, and that the sun sets around the middle, ‘on page 365’.[43] In addition, Bazarnik highlights several broader examples of the text’s diagrammatic structure: in ‘Aeolus’, for instance, Joyce ‘visually separates chunks of text with blank spaces, thereby forming “typographic” Aeolian islands’; as is similarly the case with the vignettes in ‘Wandering Rocks’.[44]

In light of Frank’s discussion of spatial form in *Ulysses* and Bazarnik’s related examination of the text’s ‘liberatic’ qualities, the labyrinthine narrative structure of ‘Wandering Rocks’—like that of *Ulysses* as a whole—can be understood as a spatial object in the sense that its various parts must be considered simultaneously if it is to be apprehended in its entirety; much like different locations around the entirety of the globe are juxtaposed on a flat plane in Mercator’s projection.[45] By frequently ‘cutting back and forth’ between different spaces and times in ‘Wandering Rocks’ and riddling the episode with interpolations, Joyce obliterates ‘distinctions between past and present’ and consequently impels the reader to conceive the episode’s vignettes simultaneously (or, to put it in spatial terms, in juxtaposition with each other). Simultaneity, a temporal concept, thus plays an important role in the construction of spatial form in *Ulysses* and ‘Wandering Rocks’ in particular. This suggests that ‘we cannot easily disentangle time from space […] as some scholars of modernism have attempted to do’, as Andrew Thacker argues in *Moving*

[40] Bazarnik, 46-47.
[41] Bazarnik, 76.
[42] Bazarnik, 76.
[43] Bazarnik, 77-78.
[44] Bazarnik, 76.
[45] Bazarnik, 48.

Through Modernity.[46] By 'spatialising' narrative time in this way, Joyce's text asks the reader to '[s]hut [their] eyes and see', as Stephen attempts to do in 'Proteus', and conceive the '[i]neluctable modality of the visible' (*Nebeneinander*) through the processes by which we discern the '[i]neluctable modality of the audible' (*Nacheinander*); or, in the case of the text, the readable (*U* 3.1).

Textual topography

By employing a multiplicity of inter-related micro-narratives and deriving a spatial narrative form in 'Wandering Rocks', Joyce incites the reader to refer to the episode as one would read a map (in the sense that, when using a map, one is usually looking for something in particular, or else trying to find a way of getting from one point to another: a map is not designed to be read, like a text, from top to bottom). In addition, he calls upon the reader to assume the role of cartographer in building their own particular visual conception of the episode's numerous inter-relations. The episode's non-linear temporal structure, as Leo Knuth argues in his 'Bathymetric Reading' of 'Wandering Rocks', frustrates a linear approach to reading it. In order to make sense of the episode's multivalent temporal structure, the reader must continually refer back and forth to other vignettes; either by re-reading or recalling. Although, as Clive Hart suggests in 'Chiastic Patterns in "Wandering Rocks"', the temporal patterns in 'Wandering Rocks' can 'be imagined as spatial', the reader cannot see them.[47] Like the blind stripling in *Ulysses*, who feels and taps his way through Dublin, the reader must use their memory and mentally retrace their steps through Joyce's textual labyrinth if they are to discern how a particular vignette fits into the episode's overarching spatio-temporal context.

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[46] Andrew Thacker, *Moving through modernity: Space and geography in modernism* (Manchester: Manchester University Press, 2003), 2-3. One exemplary critic in this regard is Wyndham Lewis who, as Thacker discusses, describes *Ulysses* as a 'time-book' with an aversion to the tangible and the spatial in *Time and Western Man.* Interestingly, however, Lewis resorts to a spatial metaphor when describing the process of apprehending Joyce's 'time-objects': '[s]upposing you could not see the statue *all at once*. Let us suppose that you were blind, and had to feel your way all over the statue, bearing in your mind all the details you had felt since you first touched it; there would be some slight analogy in that to what happens in listening to music. Certain rhythms and times unroll themselves in your brain, fixed for a brief period as the piece goes on accumulating' (Wyndham Lewis, *Time and Western Man* (1927), ed. by Paul Edwards (Santa Rosa, CA: Black Sparrow Press, 1993), 170-1).

[47] Clive Hart, 'Chiastic Patterns in "Wandering Rocks"', *European Joyce Studies 12: Joyce's "Wandering Rocks"*, ed. by Andrew Gibson & Steven Marrison (Amsterdam: Rodopi, 2002), 17-26, 22.

By constructing a temporal network in order to evoke spatial inter-relations in 'Wandering Rocks', Joyce adopts a similar conceptual framework to that set out by Henri Poincaré in his discussion of continuity, visual space and geometry in *Science and Hypothesis.* Although visual space is neither three-dimensional nor isotropic, Poincaré argues, we are nevertheless able to perceive distance and three-dimensional form due to the continuity of visual space. Through an implicit understanding of the logic by which images alter in appearance when viewed from different points in space relative to the viewer, the subject is able to perceive three-dimensional space within the limits imposed by a two-dimensional visual field; a notion which the Cubists capitalised on. With this in mind, Poincaré argues that 'geometry is only the summary of the laws by which […] images succeed each other'.[48] This is precisely what the reader is called upon to discern in 'Wandering Rocks': the laws by which images, events and vignettes succeed each other. By apprehending the episode's temporal logic, the reader is able to envisage the continuity and unity of the spaces in which they appear. Poincaré's theory is alluded to in 'Circe', in which Stephen is presented in the midst of his earlier contemplations on depth perception: '[d]istance. The eye sees all flat. (He draws the match away. It goes out.) Brain thinks. Near: far. Ineluctable modality of the visible' (*U* 15.3629-3631). While '[t]he eye sees all flat', Stephen muses, the concept of distance—and therefore three-dimensional space—is formed in our minds. By pairing the '[i]neluctable modality of the visible' with his earlier reflections on 'the ineluctable modality of the 'audible' in light of their continuous nature, Stephen's thoughts suggest that the processes by which we see are connected to the way we hear in the sense that both, according to Poincaré, involve an accumulative piecing together of distinct sensations and ideas (*U* 15.3630-3631; 3.13).

Like a network of tracings on a map, whose various interconnections would only become discernible once every tracing were complete, or the blind subject's conception of a city, which would refer to a mnemotic network of previously experienced associations, the spatio-temporal logic which dictates how the vignettes succeed each other in 'Wandering Rocks' can only become apparent once the reader finishes reading the episode and considers its vignettes simultaneously, as if they were juxtaposed on a 'reticulated plane'.[49] Discussing the interlacements between the historical and symbolic planes in 'Wandering

[48] Henri Poincaré, *Science and Hypothesis*, trans. by W. J. Greenstreet (Mineola, NY: Dover, 1952), 64.
[49] Saint-Amour, 31.

Rocks' in light of the episode's multivalent narrative structure, Leo Knuth argues that:

> Once the process of grasping the overall pattern is completed, a total picture will emerge in which all the elements are inextricably interrelated in a kind of web or network, which is more easily depicted in a diagram than in a discursive report. […] The drawback of the linear exposition is that it is a ponderous and slow verbalization of what should take place in the mind in a flash, of what Joyce, in fact, called an "epiphany."[50]

Knuth highlights an important link between the discernment of the episode's web-like structure and Thomas Aquinas's notion of epiphany, which Stephen Dedalus discusses at length in *A Portrait of the Artist as a Young Man.* In Aquinas's terms, a 'total picture' of the aesthetic object and a conception of its *quidditas*, or "whatness", can only become apparent in an epiphanic moment.[51] Epiphany, Aquinas argues, does not transpire during the initial stage for apprehending the aesthetic object, *sensus communis*, which occurs while it is being apprehended; or, in the case of 'Wandering Rocks', while the episode is being read for the first time. For Aquinas, the epiphanic act of conceiving the aesthetic object's various parts as an synthesised whole, *species intelligibilis*, occurs retrospectively. Applying this to the topographical dimension of 'Wandering Rocks' would suggest that, in order to apprehend the labyrinthine structure which holds the vignettes together, the reader must refer across to other vignettes and consider their multiple interconnections simultaneously. In doing so, the reader becomes engaged in a synthesising process, in which the episode's vignettes are related to the larger structure of which they are a part.

Although the vignettes in 'Wandering Rocks', like the characters, move through a 'giant mechanistic organism' whose overarching sense of continuity makes it is possible to plot every micro-narrative onto the meta-narrative instantaneously, the labyrinthine temporal structure which hold the vignettes together is highly complex.[52] Moreover, 'Wandering Rocks'—like most of Joyce's works—continually frustrates the notion of obtaining a 'total picture' of any image or concept. Generally speaking, the reader can at best determine the spatio-temporal interrelatedness of certain microcosms through isolated epiphanies.

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[50] Knuth, 405.

[51] A. D. Hope, 'The Esthetic Theory of James Joyce', *Joyce's Portrait: Criticisms and Critiques*, ed. by Thomas E. Connolly (New York, NY: Meredith Publising Company, 1962), 183-203, 188.

[52] Jeri Johnson, 'Explanatory Notes', *Ulysses: The 1922 Text* (Oxford: Oxford University Press 2008), 763-980, 866.

Nevertheless, Joyce’s use of interpolations makes it possible to picture a temporal web of cause and effect for the entire episode over time, due to the fact that all of the vignettes are in some way related to every other. The interpolations in ‘Wandering Rocks’ allude to events mentioned elsewhere in the narrative which occur simultaneously. Based on this, the reader can infer how one vignette relates to any other by a process of association. For example, given that: (a) the viceregal cavalcade leaves Parkgate just before Lenehan and McCoy arrive at Merchants’ Arch in vignette nine (‘[t]he gates of the drive opened wide to give egress to the viceregal cavalcade’), and (b) Simon Dedalus leaves Dillon’s auctionrooms immediately after the cavalcade leaves Parkgate in vignette eleven (‘[t]he viceregal cavalcade passed, greeted by obsequious policement, out of Parkgate’), then we can infer that (c) Simon Dedalus leaves the auctionrooms on Bachelor’s Walk as Lenehan and McCoy arrive at Merchant’s Arch (*U* 10.515-710). This could be expanded even further. For example, given that (a) ‘[a] card *Unfurnished Apartments* [reappears] on the windowsash of number 7 Eccles street’ as Lenehan and McCoy walk along Wellington Quay in vignette nine, and (b) the card is initially knocked over shortly after Conmee passes Corny Kelleher on Newcomen Bridge in vignettes one and two (‘Corny Kelleher sped a silent jet of hayjuice arching from his mouth while a generous white arm from a window in Eccles street flung forth a coin’), then Conmee’s encounter with Kelleher must necessarily occur before: (c) Lenehan and McCoy reach Wellingron Quay, (d) the viceregal cavalcade leaves Parkgate and (e) Simon Dedalus leaves Dillon’s auctionrooms (*U* 10.221-543). In light of these connections, ‘[t]he gates of the drive [opening] wide to give egress to the viceregal cavalcade’ and M’Coy’s query to Lenehan seemingly regarding the horses (‘[w]ho’s riding her?’) interlaces Molly’s public invitation into her home (by displaying the *Unfurnished Apartments* card) with further connotations of adultery (*U* 10.510-520). By this process of inference, every vignette can be connected to every other. If we continue forming associations in light of the episode’s junctural interpolations, ‘a total picture will emerge in which all the elements are inextricably interrelated in a kind of web or network, which is more easily depicted in a diagram than in a discursive report’ (such as the report above).[53] Here is an attempt to depict these temporal interrelations in a diagram overleaf (fig. 8).

[53] Knuth, 405.

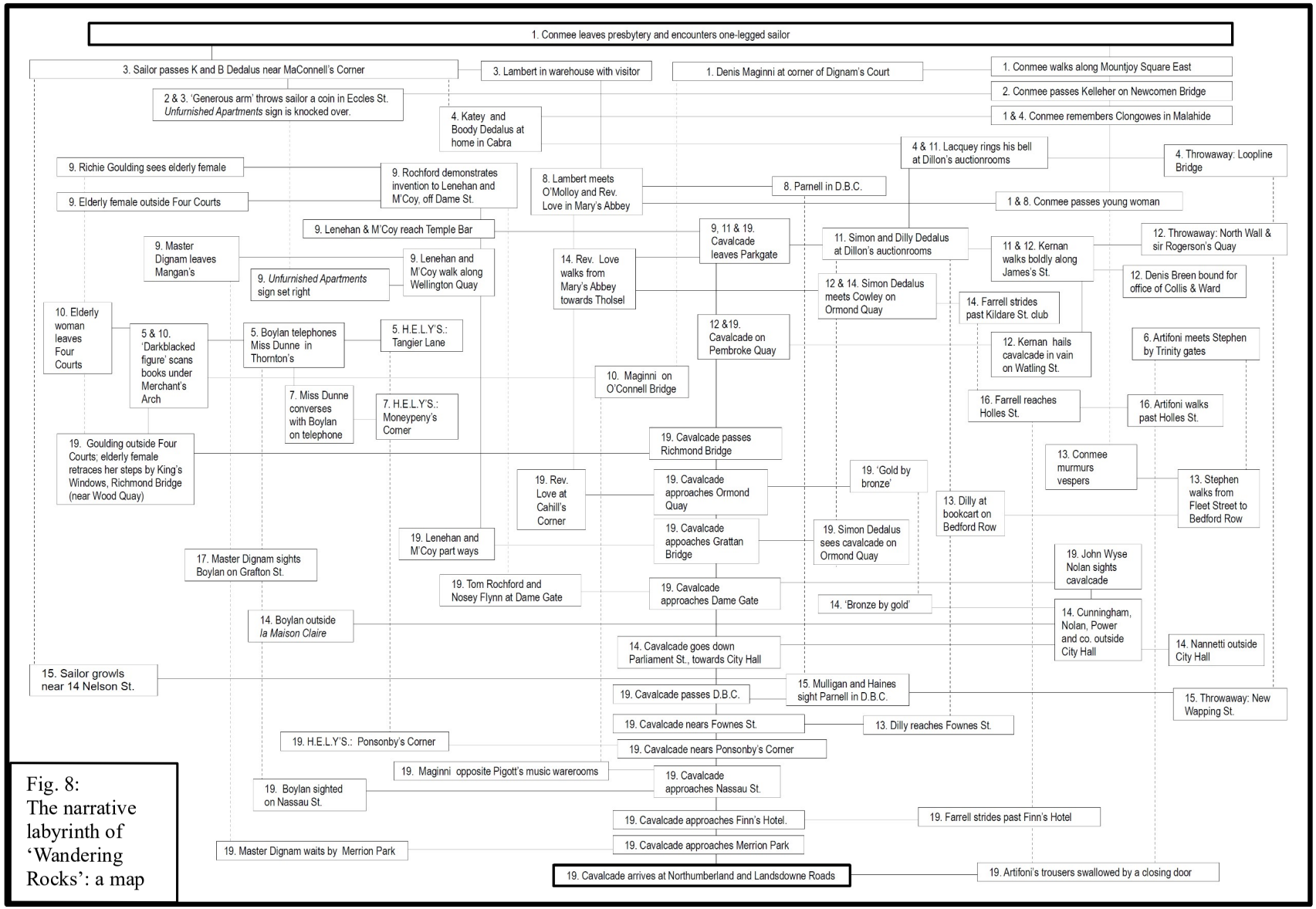

Fig. 8:
The narrative labyrinth of 'Wandering Rocks': a map

Given that, as we have seen, the narrative form in 'Wandering Rocks' can best be imagined as spatial, lines are used to connote temporal inter-relations: vertical lines indicate hierarchical relationships of cause and effect, where the event above occurs before the event below; horizontal lines connect simultaneously occurring events; and dotted lines connect events whose temporal relationship can be inferred but are not directly referred to in the episode. Where multiple horizontal lines stem from one point, the lines placed above indicate correspondences which occur before those placed below. The number in each box indicates the number of the vignette in which that particular reference or interpolation appears.

Any attempt to construct such a diagram for 'Wandering Rocks', and any attempt to use it as a guide, reveals the central role which error plays in the episode. As a number of critics have argued, the notion of error plays an important role in 'Wandering Rocks' just as it does in 'Ithaca'. Clive Hart, as we have seen, emphasises how the narrative's ambiguous phrasings and 'reader-traps' often make it impossible to ascertain for sure whether two identities or vignettes are connected. Joyce not only misleads the reader in 'Wandering Rocks' but also commits several errors himself. John Hannay explores some of the episode's apparently unintentional ambiguities and tenuous inter-relations in 'The Throwaway of "Wandering Rocks"', in which he argues that the throwaway which appears in 'Wandering Rocks' cannot be the same one which Bloom throws into the Liffey in 'Lestrygonians' given the speed of the Liffey's current according to tidal charts for 16th June 1904.[54] The thematic importance of ambiguity and error in 'Wandering Rocks' is discussed at length by Ronan Crowley and Matthew Creasy in 'Gablerizing Error: "Wandering Rocks"', in which they examine how 'the episode's transmissional lapses and chance slips, alongside its intentional errors', are treated in Hans Walter Gabler's 1984 critical edition of *Ulysses*.[55] As well as illustrating how Joyce's intentional and unintentional error-making in 'Wandering Rocks' can lead to erroneous assumptions on the part of the reader, Crowley and Creasy point out that '[e]rror lurks behind the title of

[54] John Hannay, 'The Throwaway of "Wandering Rocks"', *James Joyce Quarterly*, Vol. 17, No. 4 (Summer, 1980), 434-439.

[55] Ronan Crowley & Matthew Creasy, 'Gablerizing Error: "Wandering Rocks"', *European Joyce Studies 20: Errears and Erroriboose: Joyce and Error*, ed. by Matthew Creasy (Amsterdam: Rodopi, 2011), 89-106, 89.

“Wandering Rocks”’ as the Latin root of the word “error”, *errare*, means ‘to wander’.[56] Given that the seemingly objective narrative in ‘Wandering Rocks’, as Crowley and Creasy argue, often wanders off the course of verisimilitude, it is impossible to be sure whether somey of the linkages in fig. 8 are correct: the ‘darkbacked figure under Merchant’s arch’ may be someone other than Bloom; the ‘crumpled throwaway’ which appears near Loopline Bridge may be different from that which appears near New Wapping street; and there may be two (or even three) one-legged sailors (*U* 10.294-315). The episode’s ambiguous language also renders dubious several of the temporal relations of cause and effect implied by the diagram. For example, the event alluded to in the interpolation in vignette four concerning the lacquey ringing his bell at Dillon’s auctionrooms in vignette eleven (‘[t]he lacquey rang his bell [...]. / —Barang!’) could have occurred at any point (*U* 10.688-689). The lacquey rings his bell on numerous occasions in vignette eleven, and he may even continue intermittently ringing it after Simon Dedalus leaves or before he arrives. Based on these interconnections alone, it is therefore impossible to say for sure whether Simon and Dilly Dedalus are at Dillon’s auctionrooms while Katey and Boody Dedalus are at home in Cabra.

Although reader-traps such as these riddle the episode, apparent or suggestible interlacements must be taken at face value if we are to derive a working model of the episode’s temporal structure and begin to conceive its narrative junctures in spatial terms. By attempting to chart the episode’s temporal relations as being extended in space rather than through time, as in fig. 8, we can see how the narrative form of ‘Wandering Rocks’ evokes the spatial structure of a mannerist maze: there is only one way in (the beginning of Conmee’s journey in the first vignette), one way out (the end of the viceregal cavalcade’s progress in the last vignette), and numerous forking paths and dead ends exist in between. It shows us how Joyce’s textual labyrinth—unlike a unicursal labyrinth such as King Minos’s Cretan labyrinth, which only contains one path—is arborescent in structure. Distinguishing between the unicursal labyrinth and the mannerist maze in *Semiotics and the Philosophy of Language*, Umberto Eco argues that ‘if one unwinds a maze, one gets a particular kind of tree in which certain choices are privileged in respect to others’.[57] This is the case with our ‘unwinding’ of the narrative structure of ‘Wandering Rocks’ in fig. 8, in

[56] Crowley & Creasy, 74.
[57] Umberto Eco, *Semiotics and the Philosophy of Language* (Bloomington, IN: Indiana University Press, 1984), 81.

which every inter-relation depends upon the commencement of Father Conmee’s journey in vignette one, which acts as a root. Unlike one’s progressive movement through a unicursal labyrinth, Eco argues, moving through a mannerist maze successfully involves a trial and error process. With regard to the processes by which we read ‘Wandering Rocks’, this relates to Leo Knuth’s point that the episode’s non-linear structure encourages a multivalent mode of reading, whereby interconnections become apparent retrospectively (after previous experimentation and the upholding of false assumptions) and ‘in a flash’.[58] In ‘“Just a Flash like That”: The Pleasure of “Cruising” the Interpolations in “Wandering Rocks”’, Kathleen McCormick expands upon the relationship between the episode’s maze-like structure and the accumulatively ‘branching’ mode of reading which it demands of the reader:

> the process of reading “Wandering Rocks” is one in which the reader must wander, leaving as many interpretive options open as possible: the reader is, at times, forced to suspend interpreting and must read on, trying to become increasingly aware of relationships whose specific nature he or she does not yet know; at other times, the reader may find him- or herself making local interpretations but may still suspend judgment [*sic*] to some extent and search for further information which, in this episode, may or may not appear.[59]

Once we have unravelled the episode’s branching narrative as we have done in fig. 8, we are able to visualise how more and more ‘local interpretations’ become connected with each other as the reader follows, or ‘cruises’, the junctural interpolations to other vignettes until they reach a dead end or a progenitive narrative ‘home’. By ‘[suspending] judgment’ and reading on in this way, the reader becomes a wanderer in a figurative maze in that they must first uphold potentially false assumptions and entertain the existence of potential linkages before they can discern the narrative’s overarching structure in a retroactive epiphany. Like Stephen Dedalus, who in *A Portrait* makes ‘a skeleton map of the city in his mind’, the reader of ‘Wandering Rocks’ must imagine a skeleton map of the narrative as they are reading it if they are to navigate it successfully; and quite often this skeleton map will change when the reader faces conflicting assumptions (*P* 55). These shifts in local interpretations often occur because Joyce’s textual labyrinth is ‘a shifting labyrinth’ whose

[58] Knuth, 405.
[59] Kathleen McCormick, ‘“Just A Flash Like That”: The Pleasure of Cruising the Interpolations in “Wandering Rocks”’, *James Joyce Quarterly*, Vol. 24, No. 3 (Spring, 1987), 275-290, 286.

encapsulation of the 'world' is embodied by the verbalisation of 'words'.[60] By visualising the logic which dictates when words and vignettes succeed each other on the page, the reader follows a similar process to that by which a map reader would navigate the world, whose spatial logic is revealed over time.

Verbal geometry

Within the topographical, non-linear narrative structure of 'Wandering Rocks' Joyce impels the reader to think spatially on a linguistic level by constructing a field of inter-relations among the words through which his world his constructed. The inter-referential nature of particular words, sounds and syntactical patterns mirrors that which characterises the cross-referential vignettes in which they appear. As we have seen, numerous instances in 'Wandering Rocks' are revisited in other vignettes. By considering these repetitions retrospectively and in light of each other, the reader is able to discern the relative positions of certain points in narrative time and urban space. These structural overlaps between the interpolations and the vignettes to which they refer are indicated by cross-references and repetitions. The imagery, style, grammatical structure and words of certain phrases are echoed within different contexts, and minute differences often distort their appearance. When evoked from a different point in the narrative, coincident passages are prone to alter on a grammatical level (*Nacheinander*), much as an object would change in appearance when viewed from a different point in space (*Nebeneinander*). Indeed, these linguistic alterations are often a direct result of their spatial context, i.e., where the narrative eye is looking from at a particular point in time. By reformulating the grammatical logic by which images succeed each other in accordance with the varying spatial contexts in which they are perceived, Joyce illustrates how our interpretation of words intersects with our understanding of space insofar as they both vary according to the subject's perspective.

Parallax, as well as being a recurring theme in *Ulysses*, is appropriated as a conceptual model which underscores these distorted linguistic echoes throughout the text, in which particular phrases are transformed when evoked from different points in the text or the city. Parallax denotes, according to the O.E.D., 'the effect whereby the position or direction of

[60] Linati, 738.

an object appears to differ when viewed from different positions'.[61] In an astrological context, it constitutes the angle by which this apparent difference in position or direction (of stars or planets, for instance) is measured. In 'Joyce and Science', Sam Slote points out that the measurement of stellar parallax (stellar parallax being, as Slote puts it, 'the measurement of stellar distances using the parallax effect') 'was a burgeoning field in late nineteenth- [and] early twentieth-century astronomy'.[62] In *Ulysses*, Joyce uses the concept of parallax to illustrate how a range of phenomena alter in the eyes of the perceiving subject when they are considered from different points in time and space. The term 'parallax' is itself approached from different angles and viewpoints throughout the text: in 'Lestrygonians', Bloom abortively attempts to understand its meaning by contemplating its etymology ('[p]ar it's Greek: parallel, parallax'); in 'Oxen of the Sun', '[p]arallax stalks behind and goads' the 'ghosts of beasts' in a phantasmal vision; in 'Circe', the shades of Chris Callahan and Virag Bloom engage with Bloom on the topic of parallax on two separate occasions; and in 'Ithaca', the mathematical catechism discusses Bloom's thoughts of 'the parallax or parallactic drift of socalled fixed stars' (*U* 17.1052.1053). Each time parallax is mentioned, it is approached from a different perspective both grammatically and conceptually: in 'Lestrygonians', Bloom considers parallax himself in an interior monologue; in 'Oxen of the Sun', parallax is related in a vision focalised through Bloom; in 'Circe', notions relating to parallax are posed to Bloom; and in 'Ithaca', Bloom's meditations on parallax are indirectly related by an objectivising narrative eye. As Sam Slote argues, Bloom's thoughts on the notion of parallax in 'Lestrygonians' is itself 'rich with multiple layers of parallax' on a stylistic level: 'the perspective shifts from a third-person past tense, impersonal narrator in the first sentence to the first-person present tense of Bloom's interior monologue':[63]

> Mr Bloom moved forward, raising his troubled eyes. Think no more about that. After one. Timeball on the ballastoffice is down. Dunsink time. Fascinating little book that is of sir Robert Ball's. Parallax. I never exactly understood. There's a priest. Could ask him. Par it's Greek: parallel, parallax. Met him pike hoses she called it till I told her about the transmigration. O rocks! (*U* 8.108-113)

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61 Catherine Soanes and Angus Stevenson, eds., *Oxford Dictionary of English*, 2nd ed. (Oxford: Oxford University Press, 2005).

62 Sam Slote, 'Joyce and Science', *Palgrave Advances in James Joyce Studies*, ed. by Jean-Michel Rabaté (Hampshire: Palgrave Macmillan, 2004), 162-182, 169.

63 Slote, 'Joyce and Science', 169.

By incorporating the notion of parallax to denote these variances in conceiving a grammatical as well as a visual object from the point of view of the subject, Joyce derives a linguistic—and by extension temporal—counterpart to a spatial construct. This parallel is illustrated in ‘Circe’, when Virag Bloom exclaims ‘[p]arallax! […] Pollysyllabax!’ (*U* 15.2334-2335). Virag’s conflation of linguistically metrical with spatially metrical pluralities illustrates Joyce’s engagement with parallax within a textual context: his appropriation of parallactic concepts not only entails observing objects as they are seen from divergent points in space, but also studying phenomena as they appear to unfold—as they do in linguistic metre—in different instances of time.

Joyce’s twofold rendering of parallax in *Ulysses* plays a fundamental role in ‘Wandering Rocks’, in which various locations around Dublin are envisaged from multiple viewpoints in space and during different instances of narrative time. This allows for a wide variety of differing and complementary perspectives. As Fritz Senn argues, ‘[a]ll of “Wandering Rocks” is parallactic. Perspectives change from section to section as well as within them’.[64] Senn suggests that these changes are primarily caused by the episode’s ‘interlocations’: ‘[t]he interlocations are literally parallactic, they are beside (*para*) the compound process’.[65] By conjoining convergent perspectives through the use of these disruptions, Joyce renders particular places, objects and people from multiple sides. Like Senn, Jeff Drouin also emphasises the parallactic effect caused by interpolations in his essay ‘Early Sources for Joyce and the New Physics: the “Wandering Rocks” Manuscript, Dora Marsden, and Magazine Culture’. Parallax is a central concept in ‘Wandering Rocks’, he argues, from an etymological perspective. He points out that the Greek word *planktai*, which connotes clashing boulders and is used to denote the wandering rocks in Homer’s *Odyssey*, is related to *planetai*, which is the root of the word planet.[66] Discussing Joyce’s use of parallax in ‘Wandering Rocks’ in light of the notion that the characters represent clashing planets or boulders, Drouin examines Joyce’s early draft for the episode and considers the importance of the episode’s ‘intrusion technique’:

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64 Senn, 172.

65 Senn, 172.

66 Jeff Drouin, ‘Early Sources for Joyce and the New Physics: the “Wandering Rocks” Manuscript, Dora Marsden, and Magazine Culture’, *Genetic Joyce Studies*, Issue 9 (Spring 2009) <www.geneticjoycestudies.org/GJS9/GJS9_jdrouin.htm> [date accessed: 04/01/16].

> The intrusion technique unifies the episode’s events by mimicking the scientific observation method of parallax. When certain of the same lines appear in different sections of the episode, the reader receives slightly different data, providing a parallactic view of the distant event at the time of its occurrence.
>
> For example, in section one Father Conmee steps *onto* an outward bound tram *on* Newcomen Bridge. A few lines later we observe the same action again, where Father Conmee steps *into* the outward bound tram *at* Newcomen Bridge [...]. Then in section two, observed from the nearby location of O’Neill’s funeral home, Father Conmee steps *into* specifically the Dollymount tram *on* Newcomen Bridge. Different aspects of Father Conmee’s journey—which ground he will traverse and which tram he takes—become known from sections set in different locations in Dublin at about the same time. Also, different appearances of Father Conmee’s movements are generated by the subtle play on prepositions (into/onto the tram, at/on Newcomen Bridge), indicating that Joyce is very much interested in the grammar of time and space.[67]

As Drouin explains, Joyce eventually included a fourth derivation of this scene in the Rosenbach manuscript (cited overleaf), which directly follows the first two instances and also presents ‘slightly different data’. Drouin highlights an important relationship between subtle changes in language and slight variations in perspective. His example illustrates how, when the narrative eye revisits particular images, it does not necessarily shift to the location in which the event being alluded to occurs; nor does it necessarily render these images in the same way. Rather, Drouin suggests that during these ‘intrusions’ the narrative eye conceives the event from the point of view of the location in which it is being related. That is to say, during an interpolation the narrative eye, rather than travelling large distances in an instance of time, momentarily adopts a view of the interpolated event as seen from the current vignette’s topographical location. By viewing the same event but from a different location and in a different direction, Joyce provides a slightly different rendition of the object; and this difference is evoked through linguistic distortions.

Beyond his summary of the varying prepositions in this passage and his analysis of its genetic development, Drouin does not explain how linguistic and grammatical permutations give rise to parallactic envisionings of visual space. Joyce’s ‘subtle play on prepositions’, for instance, does not merely signal that a change in visual perception is

[67] Drouin.

taking place. Rather, the grammatical and stylistic alterations which distinguish coincident passages in ‘Wandering Rocks’ are themselves an active cause for these visual distortions. Moreover, grammatical variances are not restricted to Joyce’s choice of words: they are also syntactical. By manipulating the syntax of concurring phrases, Joyce reorients the structure by which their imagery is presented to the reader. In this way, ‘the laws by which […] images succeed each other’ are manipulated visually.[68] For instance, if we expand on Drouin’s example and study the sequential logic by which the clauses regarding the trams on Newcomen Bridge succeed one another, a displacement in movement and direction becomes apparent on a grammatical as well as a spatial level. Here are the four snapshots of the trams which appear in the final draft for ‘Wandering Rocks’, the fourth one appearing as an interpolation in vignette two:

> On Newcomen bridge the very reverend John Conmee S.J. of saint Francis Xavier's church, upper Gardiner street, stepped on to an outward bound tram.
>
> Off an inward bound tram stepped the reverend Nicholas Dudley C. C. of saint Agatha's church, north William street, on to Newcomen bridge.
>
> At Newcomen bridge Father Conmee stepped into an outward bound tram for he disliked to traverse on foot the dingy way past Mud Island. (*U* 10.107-114)

> Father John Conmee stepped into the Dollymount tram on Newcomen bridge. (*U* 10.213-214)

If we number the coincident clauses in each passage, where (1) denotes the locative clause concerning Newcomen bridge and (2) denotes the verbal clause concerning the trams, we would obtain two chiastic sequences: 1 2 2 1 1 2 2 1. By alternating these clausal types oppositionally, Joyce evokes a chiastic pattern whereby the final clause of each passage emulates the primary clause of the proceeding passage, and the ultimate clause in the last passage emulates the opening clause in the first passage. These repeating syntactical oppositions embody the parallactic differences between each coincident line of sight which the narrative eye assumes. Each passage evokes a different viewpoint, which is embodied by these alternating grammatical patterns. The first passage is related from Conmee’s point of view. This is indicated by the fact that he is referred to as ‘the very reverend John

[68] Poincaré, 64.

Conmee S.J.’: as in the opening sentence of vignette one (which also assumes Conmee’s perspective), the passage betrays Conmee’s characteristic sense of personal pride about the specificity of his title and by extension his rank. From Conmee’s point of view, the bridge he is standing on appears before the tram, onto which he steps from the bridge (fig. 9). Therefore, we get the clausal structure: 1 2. In the second passage, Nicholas Dudley is viewed from Conmee’s side of the street (although we cannot be sure whether Conmee can see him). Dudley mirrors Conmee’s movements in reverse order, first stepping off his tram and then onto the bridge. Moreover, from the easterly part of the bridge (Conmee’s side) Dudley’s tram is viewed from the opposite side (as it is travelling in the opposite direction) and Dudley is seen from behind. From this perspective, the tram would appear in front of Dudley. We therefore get the structure: 2 1. The spatial orientation of the narrative eye in the third passage, which Joyce added at a later stage, appears to be an externalised view of Conmee from his position on the easterly part of the bridge. The suggestion that it assumes an external and comparatively objective viewpoint is indicated by the fact that, unlike in the first passage, he is merely referred to as ‘Father Conmee’, and the preposition in the locative clause is generalised (he is ‘at’ rather than ‘on’ Newcomen Bridge). Moreover, Conmee’s stepping ‘into’ the tram suggests that the narrative eye does not follow him into the tram in this instance, but continues to fix its gaze at the bridge outside. In any case, the angle of sight in this passage reverts to a similar one to that in the first passage, which possesses the structure: 1 2. In the fourth passage, Conmee and his tram are conceived in an interpolation which occurs at Corny Kelleher’s funeral establishment, 164 North Strand Road. This suggests that Conmee and his tram are being viewed from the south-west. Given that the Dollymount tram is heading north-east, the tram would ascend North Strand Road before it reached Newcomen Bridge: the tram would therefore be most immediately apparent. Viewed from the south-west, we thus get the structure: 2 1. In light of this relationship between linguistically and spatially parallactic viewpoints, we begin to see how variations in language are often closely intertwined with changes in the relative positions of subject and object. By constructing these criss-crossing syntactical patterns, in which the neatness of each chiasm is frustrated slight prepositional variations (‘into’, ‘onto’), Joyce evokes the parallactic visual differences which distinguish coincident and oppositional lines of sight.

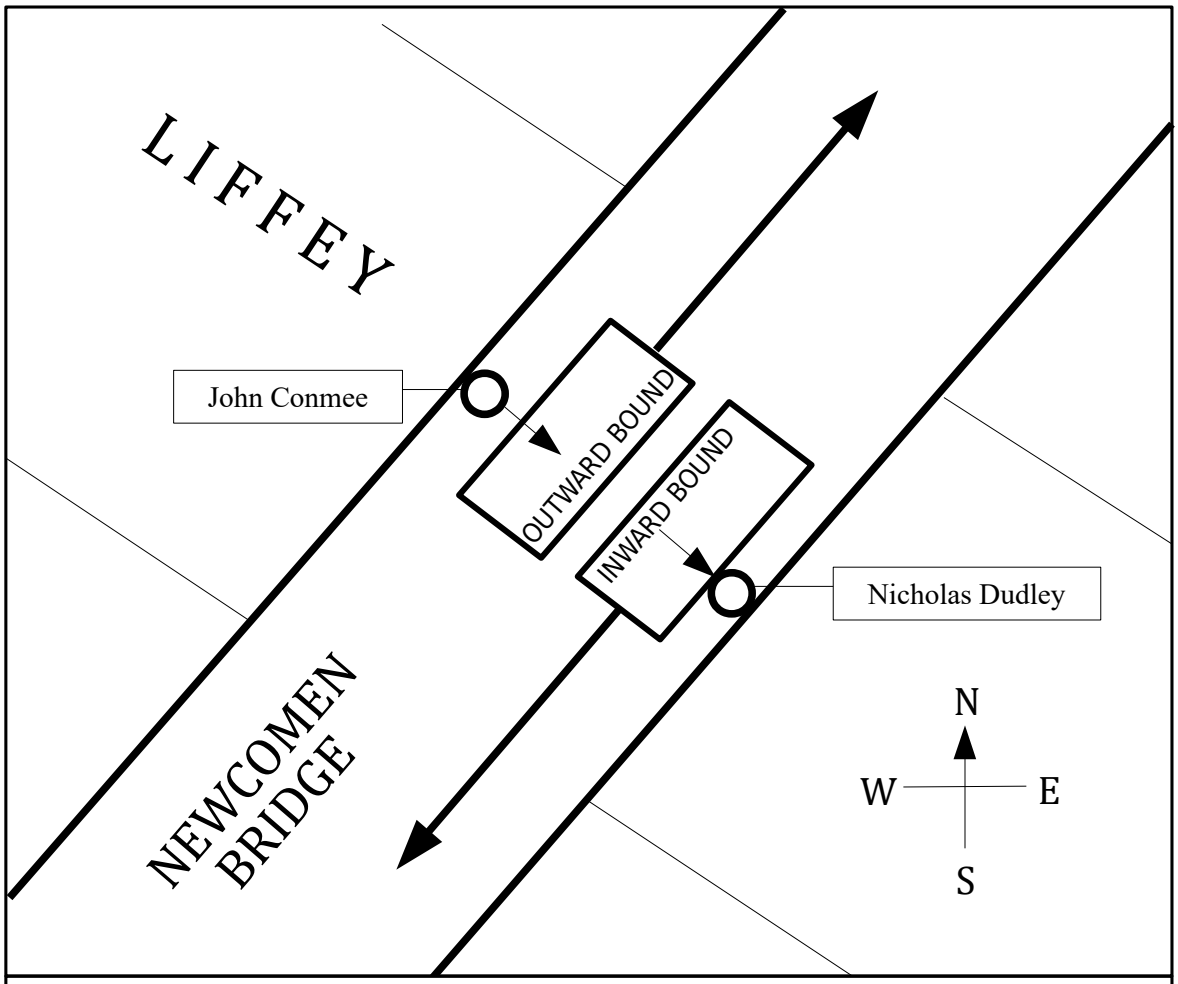

Fig. 9: Father John Conmee passes Nicholas Dudley on Newcomen Bridge

A number of similar parallactic permutations of perspective occur throughout ‘Wandering Rocks’, in which the succession of imagery in concurring passages is rearranged in order to formalise a repositioning of the narrative eye’s line of sight. The shifting order in coincident clauses embodies repeating patterns which entail a crossing over of lines, as in the chiasmus. Another chiastic pattern is evoked when Denis Maginni is sighted on three separate occasions:

> Mr Denis J Maginni, professor of dancing &c, in silk hat, slate frockcoat with silk facings, white kerchief tie, tight lavender trousers, canary gloves and pointed patent boots, walking with grave deportment most respectfully took the curbstone as he passed lady Maxwell at the corner of Dignam’s court. (*U* 10.56-59)
>
> On O’Connell bridge many persons observed the grave deportment and gay apparel of Mr Denis J Maginni, professor of dancing &c. (*U* 10.599-600)
>
> Opposite Pigott’s music warerooms Mr Denis J Maginni, professor of dancing &c, gaily apparelled, gravely walked, outpassed by a viceroy and unobserved. (*U* 10.1238-1240)

If we number the recurring clauses as we did previously, we obtain a similar repeating structure: 1 2 3, 3 2 1, 1 2 3, where (1) denotes the nominal clause concerning Denis Maginni, (2) denotes the adjectival clause concerning his apparel, and (3) denotes the clause regarding the *gravitas* of his walk. As was the case with the narrative’s discrepant images of the trams on Newcomen Bridge, these syntactical echoes evoke the variant directions in which Maginni is being observed. In spatial terms, what unites the first and the third passages as that, in both, Maginni is principally viewed from behind. Given that he does not appear to change direction in any of these snapshots, both sides to his form can only be revealed in two opposing directions.

One object which does rotate upon its own axis is the throwaway newspaper in ‘Wandering Rocks’ which we are led to assume to be the one which Bloom throws off O’Connell Bridge in ‘Lestrygonians’. In ‘Wandering Rocks’, the throwaway’s irregular movements down the Liffey are tracked in three different interpolations. As with the previous examples, each time the throwaway is sighted its features are revealed in a different order, and these visual changes are evoked through the reformulation of inter-referential clauses. In this case, however, the variance between each line of sight is concomitant with the shifting direction and permuting orientation of the object itself. The varying syntax in each interpolation reflects the varying visual angles which present themselves as the fluttering document alternates in form and changes direction. Joyce not only rearranges all of the clauses in each interpolation, but further restructures the clause regarding ‘a skiff, a crumpled throwaway’ in every instance (*U* 10.294). In this way, he creates grammatical wheels within wheels, reflecting the wheeling and whirling nature of the visual object as

well as the direction in which it travels:

> A skiff, a crumpled throwaway, Elijah is coming, rode lightly down the Liffey, under Loopline bridge, shooting the rapids where water chafed around the bridgepiers, sailing eastward past hulls and anchorchains, between the Customhouse old dock and George’s quay. (*U* 10.294-297)
>
> North wall and sir John Rogerson’s quay, with hulls and anchorchains, sailing westward, sailed by a skiff, a crumpled throwaway, rocked on the ferrywash, Elijah is coming. (*U* 10.752-754)
>
> Elijah, skiff, light crumpled throwaway, sailed eastward by flanks of ships and trawlers, amid an archipelago of corks, beyond new Wapping street past Benson’s ferry, and by the threemasted schooner *Rosevean* from Bridgwater with bricks. (*U* 10.1096-1099)

The three permutations of the sub-clause ‘A skiff, a cumpled throwaway, Elijah is coming’—which can together be considered as a nominal clause for the entire sentence—have no recurring structural logic, other than the fact that the phrase ‘Elijah is coming’ (or, in its abbreviated form, ‘Elijah’) changes position within this clause in every instance: in the first interpolation it appears third, in the second interpolation it appears last, and in the third interpolation it appears first. Joyce’s use of epanodos (i.e., the repetition of words or phrases which appear at the beginning and middle, or middle and end of a sentence) in this clause illustrates how the relative position of the throwaway’s lettering is reoriented as the ‘crumpled’ sheet upon which it is printed rotates upon its own axis. Joyce not only restructures the nominal clause to evoke the chaotic whirling of the throwaway, but also reformulates the relative positions of every clause in each instance to evince the opposing directions in which the throwaway moves. If we number the clauses, where (1) denotes the nominal clause concerning the throwaway; (2) denotes the verbal clause which reveals the direction in which it sails; (3) denotes the adjectival clause concerning the ships and trawlers which relates to the verbal clause; and (4) denotes the locative clause concerning the throwaway’s position between two locations, we get a chiastic pattern: 1 2 3 4, 4 3 2 1, 1 2 3 4. Again, the last clause in each interpolation relates to the opening clause in the following interpolation and vice versa. Through this mirroring structure Joyce renders on a grammatical level the throwaway’s easterly direction in the second interpolation, and its westerly direction in the first and the third.

As is evident from these examples, the parallactic, chiastic and triangular inter-relationships in ‘Wandering Rocks’ are facilitated by verbal (or acoustic) as well as conceptual repetitions. In the recurring allusions to the throwaway, for example, certain phrases are directly lifted (such as ‘crumpled throwaway’, ‘sailing eastward’ and ‘hulls and anchorchains’) while the sense or function of each clause is also echoed (as with the repetition of corresponding nominal, verbal, adjectival and locative clauses). Throughout ‘Wandering Rocks’, and at various points in *Ulysses*, verbal and conceptual repetitions—along with the various distortions which take place when concurring words and ideas are repeated—coincide to evoke symbiotic conceptions of space in which fluctuating sounds become entwined with deviating images. A close-knit relationship between distorting sounds and variant viewpoints is developed through the ‘bronze by gold’ motif, for example, which is introduced in ‘Wandering Rocks’ and further played upon in ‘Sirens’, the following episode. Both episodes contain repetitions and reformulations of concepts or sounds relating to ‘bronze’ and ‘gold’, the colours used to connote the brunette and blonde hair colours of Lydia Douce and Mina Kennedy respectively. Although the motif has a visual emphasis in ‘Wandering Rocks’ and an aural emphasis in ‘Sirens’, its repetition in both episodes serves to orient the observing and listening narrator in space.

In ‘Wandering Rocks’, the motif appears in two separate instances (in vignettes fifteen and nineteen) which are tied together by concurring verbal and conceptual repetitions:

> Bronze by gold, Miss Kennedy’s head by Miss Douce’s head, appeared above the crossblind of the Ormond hotel. (*U* 10.962-963)
>
> Above the crossblind of the Ormond hotel, gold by bronze, Miss Kennedy’s head by Miss Douce’s head watched and admired. (*U* 10.1197-1199)

The change from ‘Bronze by gold’ to ‘gold by bronze’ in the second passage, as well as the syntactical re-ordering, suggests a change in visual perspective. Moreover, a topographical meeting of lines is suggested through the use of a textual chiasmus in the first passage: if we number the repetitions of ‘bronze’ and ‘Miss Douce’s head’ (1); and ‘gold’ and ‘Miss Kennedy’s head’ (2), we get the chiastic sequence 1221. When both passages are considered in light of their respective narrative contexts it becomes apparent that the Ormond hotel is viewed from two different locations (fig. 10). In the first instance, the

narrative eye follows Martin Cunningham as he passes ‘out of the Castleyard gate’, and it is therefore situated south-east in relation to the Ormond Hotel (which is located on Ormond Quay Upper) (*U* 10.956-957). In the second instance, the narrative eye follows the viceregal cavalcade as it progresses east along the north bank of the Liffey. As the cavalcade approaches the Ormond Hotel on Ormond Quay the narrative eye would initially be positioned south-west in relation. From the perspectives of the women peering onto Ormond Quay from within the hotel, Miss Douce (bronze) is situated on the left with Miss Kennedy (gold) on the right. In this light, Miss Douce’s ‘bronze’ hair would be first noticeable when viewed from an easterly direction (as in the first passage) and Miss Kennedy’s ‘gold’ hair would be most directly apparent from a westerly direction (as in the second passage). Moreover, ‘the crossblind of the Ormond hotel’ appears last in the first passage, and it is first apparent in the second passage. The re-ordering of this clause suggests that in the second instance, which occurs while the cavalcade is passing by, the crossblind is first noticeable due to the crowd of onlookers and the cavalcade itself which at first obstruct the women’s heads.

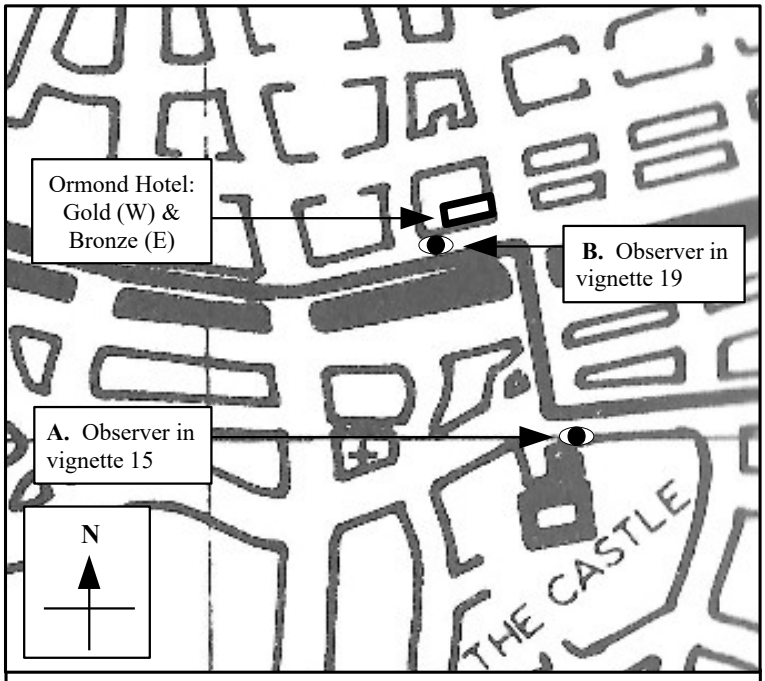

Fig. 10: Sightings of ‘bronze’ and ‘gold’ in ‘Wandering Rocks’ (map not to scale). Base map: detail from ‘Map III’, Clive Hart & Leo Knuth, *A Topographical Guide to James Joyce’s Ulysses*, Vol. 2 (Essex: A Wake Newslitter, 1975).

In ‘Sirens’, which takes place in the Ormond hotel directly after the events of ‘Wandering Rocks’, almost everything is obstructed from sight. The technic for ‘Sirens’ is music, and an emphasis is therefore on the audible rather than the visible. The distorted echoes and cacophonous cross-overs in ‘Sirens’, like syntactical reformulations and textual chiasmi in ‘Wandering Rocks’, often indicate movements through space on the part of the narrator or the narrative objects. The relative positioning of Miss Kennedy with regard to Miss Douce is unstable, and throughout ‘Sirens’ changes in their locations accompany modulations in the acoustic landscape: ‘bronze from anear, by gold from afar’ transforms into ‘gold from anear by bronze from afar’ and around these two points their ‘young goldbronze voices [blend]’ through coalescing sounds (*U* 11.112; 11.338; 11.158). Given that the narrator is one who mainly hears rather than sees, movements through space are conveyed when particular sound clusters attributed to either bronze or gold appear to switch places also. The topographical function of sound is highlighted in the pun ‘[b]ronze from anear’, which evokes a spatial proximity between the narrator and Miss Douce while also stressing how Miss Douce’s proximity is discernible from ‘an ear’. Like the various topographical and textual landmarks in ‘Wandering Rocks’, which enable the reader to situate particular characters, objects or vignettes in time and space, these sound clusters serve as acoustic landmarks for determining the relative positions of other sounds within earshot. The important role which acoustic landmarks play in constructing a spatial awareness of other audible features is illustrated when the narrator asks: ‘[w]here bronze from anear? Where gold from afar? Where hoofs?’ (*U* 11.59). By considering where the sound of travelling hoofs is emanating from in relation to bronze and gold at various points, for instance, the reader is able to infer where the two women are in relation to each other, thus forming a triangular relationship between the sounds of bronze, gold and hoofs. Here are two allusions to the locations of Miss Kennedy and Miss Douce in ‘Sirens’ between which a displacement in sound as well as movement occurs. As particular sounds pertaining to bronze and gold appear to switch places in time, so too do the women appear to switch positions in space:

> Yes, bronze from anear, by gold from afar, heard steel from anear, hoofs ring from afar, and heard steelhoofs ringhoof ringsteel. (*U* 11.112-113)

> Blazes Boylan’s smart tan shoes creaked on the barfloor where he strode. Yes, gold from anear by bronze from afar. (*U* 11.337-339)

This switching of places and blurring of identities is caused by the movement of acoustic landmarks in relation to the narrator. For example, the sound of ringing hoofs is initially attributed to Miss Douce’s position from ‘anear’, while that of steel to Miss Kennedy’s from ‘afar’. The binary and composite nature of this first passage suggests that Miss Douce, being in a more easterly direction, is situated closer to the horses while Miss Kennedy, being in a relatively westerly direction, is situated closer to the chains and carriages which trail behind. But this changes in the second passage. This displacement is evoked through the use of an aural chiasmus at the end of the first passage, in which particular sounds pertaining to ‘bronze’ and ‘gold’ cross over. If we number ‘bronze’, ‘anear’, ‘steel’ (1), and ‘gold’, ‘afar’, ‘hoofs’ and ‘ring’ (2), then in the first passage we get the sequence: 1122 1122 122221. The use of a chiasmus in the composite phrase ‘steelhoofs ringhoof ringsteel’ signals a displacement of sounds through time as well as a switching of locations in space, in which gold becomes ‘anear’ and bronze is ‘afar’. This is reflected in the mirroring form of the second passage, in which we get an opposite structure to that used at the beginning of the first passage: 2211 (‘gold from anear by bronze from afar’). The shifting and deviating nature of these sounds reflects how the women eventually depart from their original positions by the window in order to serve drinks to their customers (‘gold by the beerpull, bronze by maraschino’) and formalises the shifting nature of the narrative eye itself, which assumes Boylan’s perspective in the second passage (*U* 11.516-517). Similar to the coincident and oppositional syntactical clauses in ‘Wandering Rocks’, the merging and echoing sounds of ‘Sirens’ embody visual deviations between common objects as they would be viewed from different points in space. By reconfiguring the nature and order of common sounds throughout ‘Sirens’, Joyce thus provides an aural equivalent for the visual phenomena of parallax, whereby the perceiving subject’s changing position in Dublin’s landscape is evoked by aural as well as visual discrepancies.

Although for the most part the events of ‘Sirens’ are narrated blindly, this does not delimit Joyce’s ‘obsession with mapping urban space’ and situating his characters within ‘a reticulated plane of […] public and private spaces’, as Saint-Amour argues with regard to *Ulysses* as a whole.[69] The fluctuating textual soundscape in ‘Sirens’ behaves analogously to the shifting textual landscape in ‘Wandering Rocks’, in the sense that its aural components

[69] Saint-Amour, 31.

provide a sense of space which extends beyond the visual. In both 'Sirens' and 'Wandering Rocks', Joyce emulates the parallactic, shifting and relative nature of visual reality by constructing conceptual echoes, phonic distortions and aural chiasmi through time, whose cumulative renderings of the acoustic landscape are equally transitory and fleeting. This correspondence between Joyce's rendering of visual and aural spaces is explored by Stefan Haag, who reads 'Wandering Rocks' as a disorienting soundscape in his essay 'Listen and be Touched: Aural Space in "Wandering Rocks"'. Haag argues that Joyce presents the city in 'Wandering Rocks' as an acoustic space which 'puts us […] at the centre of our world', as opposed to a visual space which 'is peered into [...] from its margins'.[70] Haag's reading of 'Wandering Rocks' as an acoustic space centred around the subject disrupts common interpretations of the episode 'as an epitome of mechanistic determinism', and further relates to Carlo Linati's description of 'Wandering Rocks' as a 'shifting'—rather than a temporally or spatially fixed—'labyrinth'.[71] The labyrinthine dimension to sound, as we have seen, is further explored in 'Sirens', in which Joyce develops an interplay between *Nacheinander* and *Nebeneinander* through aural repetitions, and uses particular sounds as spatial indicators. Like the blind stripling, who wends his way from College Park in 'Wandering Rocks' into the Ormond Hotel in the 'Sirens' episode, the reader 'sees' nothing ('[h]e saw not bronze. He saw not gold. […] He did not see') other than the words in front of them, and must therefore use language and sound to orient themselves within a subjectively imagined or—if the reader is familiar with Dublin—remembered space (*U* 11.1281-1283). The sound of 'Blazes Boylan's smart tan shoes [creaking] on the barfloor', for example, acts as a confirmation rather than a revelation concerning the positions of bronze and gold ('[y]es, gold from anear by bronze from afar') (*U* 11.337-339). The blind stripling's tapping of his cane is echoed throughout 'Sirens' and *Ulysses*, and by drawing attention to its sound in each repetition ('[t]ap') Joyce highlights this notion of using aural signs to navigate space blindly, as Stephen attempts to do in 'Proteus':

> Signatures of all things I am here to read, seaspawn and seawrack, the nearing tide, that rusty boot. […] Shut your eyes and see.
>
> Stephen closed his eyes to hear his boots crush crackling wrack and shells. You are walking through it howsomever. […] My ash sword hangs at

[70] Stefan Haag, 'Listen and be Touched: Aural Space in "Wandering Rocks"', *European Joyce Studies 12: Joyce's "Wandering Rocks"*, ed. by Andrew Gibson & Steven Marrison (Amsterdam: Rodopi, 2002), 107-120, 108.

[71] Haag, 107-108; Linati, 738.

my side. Tap with it: they do. (*U* 3.2-16).

That is to say, whenever we hear 'tap' or sounds relating to 'tapping' at a particular point, we know that the blind stripling is nearby. As is the case with the sounds relating to the blind stripling's topographical wanderings and Stephen's blind reading of the sensory world, the text's aural landscape enables the reconstruction of its spatial logic.

By interlocking and mirroring coincident narrative tangents and sounds in order to create figurative constructs such as chiasmi, parallactic perspectives and triangular inter-relationships both conceptually and aurally, Joyce invites his reader to read the language of 'Wandering Rocks'—like its narrative form—spatially. Through this process, he derives from the narrative's sequential logic a spatial logic which is closely rooted with Dublin's topography and, as is particularly the case in 'Sirens', acoustic landscape. The figurative trope of the chiasmus is used throughout *Ulysses* to reflect the way in which multiple points of view cross over from numerous directions in both the city and the labyrinth of the text. By evoking common points where converging narrative tangents meet and varying the logic by which images succeed one another from each viewpoint, Joyce gives rise to a mappable language whose grammatical and visual subject can be considered from multiple angles and in different directions.

Conclusion

Leo Knuth argues that '[o]ne of Joyce's achievements was the creation of a literary form which has been called "mimetic," "imitative," "expressive," or "immanent" – a form expressing the *quidditas*, the "whatness" of the message'.[72] This is certainly the case with 'Wandering Rocks', whose multivalent temporal form evokes the labyrinthine topographical structure of the urban organism which it conveys. 'Wandering Rocks' can be understood as a textual topography in the sense that its formal properties are mimetic of its urban subject as perceived from multiple directions. Joyce effects this mimetic rendering of Dublin's labyrinthine topography structurally, through the construction of a 'spatial', interlocking and mappable narrative form, and verbally, through the employment of criss-crossing syntactical and aural patterns. Both macro- and micrologically, then, 'Wandering

[72] Knuth, 405.

Rocks’ impels the reader to think in numerous directions across time, and to envision the narrative’s temporal web of interconnecting moments spatially.

By considering the structure of ‘Wandering Rocks’ in light of its mutating linguistic and aural patterns, the reader assumes the role of a cartographer whose mental reconstructions of spatial inter-relationships refer to temporal correspondences. The internal spatio-temporal logic of ‘Wandering Rocks’—which dictates the order in which vignettes, images, concepts and sounds succeed each other—is so intricate that it is sometimes possible to visualise the unperceived, forming connections between various points in the narrative which are not formed by the narrative itself. For instance, although we cannot be certain whether the interpolations concerning the ‘darkbacked figure’ who ‘[scans] books’ by the hawker’s cart ‘under Merchant’s arch’ in vignettes five and nine refers to Bloom, who browses books at a cart in vignette ten, Joyce invites his reader to entertain the validity of this connection by constructing a triangular semantic relationship between the three vignettes in question (*U* 10.315-521). When the interpolations are considered in light of their respective contexts, Boylan’s buying of fruit for Molly in vignette five (in which the first interpolation to the ‘darkbacked figure’ appears) mirrors Bloom’s perusal and purchase of the *Sweets of Sin* for her in vignette ten. Moreover, in vignette nine Lenehan and M’Coy appear to discuss Bloom upon their sighting of this mysterious figure:

> —There he is, Lenehan said.
> —Wonder what he’s buying, M’Coy said, glancing behind.
> —*Leopoldo or the Bloom is on the Rye*, Lenehan said.
> —He’s dead nuts on sales, M’Coy said. I was with him one day and he bought a book from an old one in Liffey street for two bob. There were fine plates in it worth double the money, the stars and the moon and comets with long tails. Astronomy it was about. (*U* 10.522-528)

Lenehan and M’Coy go on to reminisce about the night at Val Dillon’s in which Bloom envisions Molly as a rising star, which is explored in ‘Ithaca’. As with its snapshots of Denis Maginni, the narrative eye does not elucidate the dark side of the ‘darkbacked figure’ whose back is always turned. In vignette ten, moreover, no explicit information is given as to his whereabouts. Nevertheless, it is inferable that the ‘darkbacked figure under Merchant’s arch’ is Bloom due to the contexts in which the interpolations appear. In order to shed light on the identity of this dark figure and the book he is reading, the reader must

envisage alternate perspectives which are not provided by the narrative eye, but which can be inferred.

We can further surmise that the ‘darkbacked figure’ is Bloom given that M’Coy seems to recall his sighting of him in ‘Lestrygonians’, in which Bloom considers the concept of parallax in that ‘[f]ascinating little book […] of sir Robert Ball’s’ following his meditations on the Dunsink Observatory (which was built by Ball): ‘[t]imeball on the ballastoffice is down. Dunsink time. [...] Parallax.’ (*U* 8.109-110). In ‘Joyce and Science’, Sam Slote suggests that the book to which M’Coy refers in ‘Wandering Rocks’ is Robert Ball’s *The Story of the Heavens*, a book about astronomy with ‘fine plates’ which Bloom purchases on Liffey Street in ‘Lestrygonians’. Discussing the stylistic and conceptual forms of parallax in the passage above, Slote refers to Kenner’s notion that ‘Bloom’s perspective on the time-ball (as either measuring Dublin or Greenwich time) changes relative to his own position and is thus an example of parallax’, given that, when passing Yeates and Son later on in ‘Lestrygonians’, Bloom realises a discrepancy (‘[n]ow that I come to think of it that ball falls at Greenwich time’) (*U* 8.571).[73] As Slote points out, Bloom’s repeated thoughts on parallax are themselves a means by which parallactic conceptions (of topographical locations and uncertain ideas) can be drawn.

The notion that the parallactic perspectives and triangular relationships in ‘Wandering Rocks’ enable the discernment of connections which are not directly provided relates in many ways to Giordano Bruno’s metaphor of the candlebearer. As discussed in chapters one and two, Bruno employs this metaphor in ‘The Candlebearer’ and *The Shadow of Ideas* to illustrate the idea that multiple lines of sight or figurative viewpoints are required in order to envisage phenomena which are invisible from the subject’s perspective, such as the dark side of the moon, or to deduce ideas which are not directly apparent. In ‘The Candlebearer’, Bruno parodies the circumlocutory thought processes of the archetypal candlebearer, who sees reality only from within the limits prescribed by his own perspective and selectively ignores phenomena which contradict his rectilinear mindset, through the perambulatory application of sub-sections, sub-clauses and lists. In his emblematic dialogue ‘The Heroic Frenzies’ (1585)—or, as it appears in the *Wake*, ‘*The Eroico Furioso*’—which was published three years later, Bruno also explores the limits of

[73] Slote, ‘Joyce and Science’, 169.

circumlocutory and rectilinear modes of thinking through a figurative application of various rhetorical forms. Described by Arielle Saiber as a 'textual labyrinth, full of discrete alcoves: poetry, commentary, dialogue, descriptions of emblems, mottoes, and incantations', Bruno's plurivocal and coincident approaches to his subject sit in contrast with the hero's rectilinear, tunnelling thoughts, which is solely bent on attaining the love of the goddess Diana.[74] For the frenzied hero-poet, the love-goddess Diana, like the dark side of the moon which she symbolises, is cast eternally in shadow for she inhabits a celestial and therefore ineffable realm. As Tansillo states, 'the chief lesson love teaches him is to contemplate the shadow of the divine beauty (when he cannot contemplate its direct reflection), as, for example, the suitors of Penelopy [*sic*] amused themselves with her servants when they were not permitted to converse directly with the mistress herself'.[75] The hero cannot approach Diana directly, and must therefore consider her shadow or reflection; much like Kev is left to consider the shadow, and Dolph the reflection, of ALP's pudendum in *Finnegans Wake*.[76] Arielle Saiber discusses how 'The Heroic Frenzies' is 'replete with rhetorical devices that syntactically simulate the semantic meaning of "co-incidence"', such as chiasmus, syllepsis and epanodos.[77] By disrupting the linearity of the traditional reading experience through these linguistic disruptions, Bruno impels the reader to look for inter-relationships as a means of discerning what is left unsaid or unknown.

Joyce's own construction of verbal, conceptual and topographical patterns of coincidence in 'Wandering Rocks' and *Ulysses* is, in this light, typically Brunonian. Like the frenzied hero who is fated to satisfy himself with Diana's reflection in 'The Heroic Frenzies', the reader of *Ulysses* is left to consider such ineffable figures as Molly and the 'darkbacked

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74 Arielle Saiber, *Giordano Bruno and the Geometry of Language* (Hampshire: Ashgate, 2005), 114.

75 Giordano Bruno, 'The Heroic Frenzies', trans. by Paulo Eugene Memmo Jr. (Chapel Hill, NC: The University of North Carolina Press, 1964), I. iii <http://www.esotericarchives.com/bruno/furori.htm> [date accessed: 04/01/16].

76 A further conceptual link can be drawn between 'The Heroic Frenzies' and II.ii of *Finnegans Wake* in light of the significance of triangles. Triangular inter-relationships hold both a topographical and a philosophical significance in Bruno's dialogue, in which Diana—also known as Trivia—is symbolised by the number three. As in II.ii of *Finnegans Wake*, there is the added significance of trivium (as in 'triv and quad'), which literally means 'three ways' (*FW* 306.12-13). As Saiber argues, 'the number three holds a symbolism related of the goddess Diana, whose presence is central to the frenzied hero and to the text as a whole. The goddess Trivia, as described by Dante, is Selene-Diana-Prosperine, with her triple-zoned designation of (respectively) earthly, lunar, and infernal realms. The term "trivium," used to designate the liberal arts of Rhetoric, Logic, and Grammar, originates in the idea of three roads meeting (*tri via*)' (Saiber, 104-5). In this light, Joyce's repeated allusions to Bruno throughout the *Wake*'s schoolbook on 'triv and quad' suggest that the act of learning involves a meeting of different viewpoints; much like the designation of ALP's triangle involves a piecing together of images viewed from different ends.

77 Saiber, 91.

figure’—figures whose visible features are never fully revealed—by piecing together related textual fragments indirectly (*U* 10.315). Like Diana, who ‘reveals herself only in parts, never fully, and only as a shadow of Truth’, both the subject and the form of ‘Wandering Rocks’ reveal themselves in parts, unfolding in space as the narrative moves through time.[78] Moreover, its characters are presented as wandering celestial bodies—or ‘wanderers like the stars at which they gaze’ (as Joyce described the protagonists in ‘Ithaca’)—who are only ever partially visible.[79] As explored in chapter II, Molly—Bloom’s Diana-cum-Penelope—is conceived as a star in ‘Ithaca’. Her tenebrous form, revealed only in parts, is evoked through the meeting of Bloom’s and Stephen’s coincident lines of sight. Similarly, in ‘Wandering Rocks’ Joyce reveals coincident snapshots of Molly’s ‘plump bare generous arm’ as it is ‘shone’ from different points, and various other parts of her body make sporadic appearances at other points in the novel (*U* 10.251). Like a conception of Molly’s corporeal form, which involves a piecing together of different bodily parts, Joyce’s textual topography of the city and its contents in ‘Wandering Rocks’ involves a figurative unravelling and flattening of narrative time, whereby the reader is continually engaged in a process of cross-reference and remembering. By splaying a multiplicity of visual and aural perspectives across space and time onto a ‘reticulated plane’, Joyce responds to Bruno’s notion that the subject must consider multiple viewpoints simultaneously in order to fully apprehend what is partially visible or known.[80]

[78] Saiber, 114.
[79] James Joyce, ‘Letter of February, 1921’, *Letters of James Joyce*, Vol. I of III, ed. by Stuart Gilbert (New York, NY: Viking, 1966), 164.
[80] Saint-Amour, 31.

Chapter 4. "Putting Allspace in a Notshall": Charting *Wake*an Territory

> *I hear the ruin of all space, shattered glass and toppling masonry, and time one livid final flame.*
>
> — *U* 2.9-10

Introduction

This chapter explores how Joyce *graphs* the *topoi* of *Finnegans Wake* by embodying its changing geometries, dimensions and territories formalistically, linguistically and aurally. Expanding on the previous chapter's discussion of spatial form in *Ulysses*, it also considers how the text of *Finnegans Wake* is itself presented as a spatial object, whose topographical and semiotic boundaries expand and contract in accordance with the variable fundaments of HCE's oneiric universe. The chapter is divided into two sections. The first section, '"Where are we at all? and whenabouts in the name of space?"', considers how Joyce's application of verbal geometry and labyrinthine narrative webs in *Finnegans Wake* builds on similar techniques which he uses to orientate and disorientate the reader in *Ulysses*. By exploring the relationship between the *Wake*'s world and its words, it examines how the text's transforming visual universe is governed by a figurative re-imagining of language (both written and oral), narrative structure, page-space and bodily surfaces. It further illustrates how the *Wake*'s textual, bodily and geographical landscapes are re-configured in accordance with a variety of geometries and models for describing the universe including Einstein's Lobachevskian (hyperbolic), four-dimensional model of space-time. By focusing on Shaun's transformation into Yawn in Book III, it discusses how these non-Euclidean concepts are evoked through the distortion of sounds and images which are associated with the movements of those bodily and planetary surfaces upon which the *Wake*'s topographies are projected. In light of the heterodox geometric phenomena which describe the interior bodily spaces of the *Wake*'s Rabelaisean giant in III.iii, this section also considers the multi-dimensional nature of *Finnegans Wake* itself, whose narrative strands branch off into

different spatial, temporal and semiotic realms.

The second section, ‘“The roomwhorld beyond the worldroom”’, considers how Joyce’s response to contemporary articulations of four-dimensional space-time in III.iii is reflected within the confines of Mr and Mrs Porter’s bedroom in the following chapter, III.iv. Mr and Mrs Porter are plotted onto a spectrum of different topographical locations across various times, they are described with reference to a range of geometric languages and they appear within both closed and open spaces: the interior space of the bedroom contracts into the corporeal cavities of its occupants, while also expanding to encompass the surfaces of larger exterior places and celestial objects. In the dwelling spaces of III.iv, as is the case with 7 Eccles Street in ‘Ithaca’, ‘the universe comes to inhabit the house’, as Gaston Bachelard argues with regard to the infinitely extending houses represented by Georges Spyridaki in his topoanalytical study *The Poetics of Space.*[1] This section focusses on how Mamalujo’s cosmic extrapolations and sonic amplifications of Mr and Mrs Porters’ sexual positions to larger topographical contexts are invoked by an inter-medial overlap between images and sounds in space and time, evoking chiastic patterns similar to those found in ‘Wandering Rocks’ and ‘Sirens’. In light of the parallactic viewpoints which the sounds of the bedroom and its narrative produce, it concludes by considering how the four old men’s endeavours to map the *Wake*’s shifting territories from four criss-crossing perspectives and in ‘fourdimmansions’ sheds light on Joyce’s preoccupation with the impossible feat of squaring the circle throughout the *Wake*, as well as his polymedial play with the concept of time constituting the fourth dimension of space (*FW* 367.27).

‘Where are we at all? and whenabouts in the name of space?’

Determining where and when the events of *Finnegans Wake* occur (either in relation to each other or to real-world locations) is rarely a straightforward task. On one level, the narrative revolves around a family who live in a pub in Chapelizod. As the narrative is filtered through the dreams of its paternal publican, however, the spatial boundaries which would normally demarcate Dublin, Chapelizod, the pub and the human bodies contained inside are repeatedly broken apart and re-aligned. In *Finnegans Wake*, places, landmarks and bodies such as these frequently become indistinguishable from a multitude of other

[1] Gaston Bachelard, *The Poetics of Space* (1958), trans. by Maria Jolas (London: Penguin, 2014), 51.

types which are located around the world and beyond. As Marcel Proust illustrates in the overture to *Swann's Way*, our conception of where we are currently situated in space and time becomes confused when in a liminal conscious state between sleep and wakefulness. Joyce explores a similar idea in *Finnegans Wake* by overlaying the narrative's topographical snapshots of 'Howth Castle and Environs' with phantom exposures pertaining to foreign counterparts (*FW* 003.03). Evoking a similar sense of confusion as Marcel's, in which he struggles to ascertain whether he is in Paris during the present or Combray during the past, the diverse topographical references in *Finnegans Wake* are usually temporally as well as spatially distant from the local references which they underlie. Louis Mink acknowledges this notion in his introduction to *A Finnegans Wake Gazetteer*:

> The word-world of *Finnegans Wake* has its own geography, and a very queer geography it is too, since it violates the geographical postulate of identification by fixed coordinates. Not only do the boundaries of Dublin expand to include the rest of the terrestrial globe and the indefinite loci of fiction and mythology, but the very dimensions of space itself become uncertainly elastic, and sometimes transform themselves into one or more dimensions of time.[2]

The geography of *Finnegans Wake* proves difficult to tabulate, Mink suggests, not only because Dublin's defining topographical features become encompassed by a multitude of historical, mythical and hybrid locales—which resist tabulation by fixed Cartesian co-ordinates—but also because 'the boundaries of Dublin expand' to include topographical features which originate from different 'dimensions of time'. As well as expanding its borders to contain regions of Scandinavia, for instance, modern Dublin is further overlayed with conceptions of Eblana during the Viking invasions which the Hill of Howth oversaw over one thousand years earlier. There are many 'persins sin this Eyrawyggla saga', which takes place in both Eire and across the North and Irish Seas (the Eyrbyggía Saga recounting Thórodd's journey to the west of Ireland) (*FW* 048.16-7). Watching and listening to all of Dublin's—and the universe's—various mutations through history is, of course, the infamous ear wiggler in his aspect as Finn the sleeping giant, whose dormant head constitutes that of Howth. If HCE's dream is a nightmare which haunts the consciousness of everybody then it can be understood as what Stephen Dedalus refers to as

[2] Louis Mink, *A Finnegans Wake Gazetteer* (Bloomington, IN: Indiana University Press, 1978), xi.

the 'nightmare' of 'history' (*U* 2.376). In *Finnegans Wake*, sounds and images from the temporally and spatially present dissolve into the sensory rubbish from previous, future or imagined versions of Dublin; much like the refuse from archaic and defunct branches of scientific discourse filters into contemporary scientific notions of ideal objectivity in II.ii and 'Ithaca'. Therefore, 'getting a howlth' on the *Wake*'s 'bayrings' becomes an archaeological as well as a topographical enterprise: to determine where a particular event is occurring, the reader must begin by considering when the 'objects', 'places' and 'forces' which drive the event derive from in narrative and historical time (*FW* 287.09-10).[3]

As we can see, ascertaining the whereabouts of the *Wake*'s places often depends on an understanding of their 'whenabouts' (*FW* 558.33). HCE's wandering mind 'deploys and appears to move elsewhere without difficulty; into other times, and on different planes of dream and memory', as Gaston Bachelard argues with regard to poetic representations of the house as a space 'unwilling to be closed' in *The Poetics of Space*.[4] In this sense, the interconnectedness of space and time which underpins the geography of *Finnegans Wake* builds on the way in which Joyce exploits the narrative's temporal structure to evoke Dublin's topographical form in *Ulysses.* The previous chapter explored how both the sense of disorientation and the means of orienting oneself in *Ulysses*, particularly in 'Wandering Rocks', are facilitated by narrative junctures in (urban and textual) space and (historical and narrative) time. As in *Ulysses*, the narrative eye in *Finnegans Wake* frequently wanders off-course, revisits other parts of the narrative and it contains numerous cross-referential interruptions, which refer to spatially and temporally distant locations.[5] In the *Wake*, this disruptive process occurs microcosmically, in terms of syntax:

> Earwicker, that patternmind, that paradigmatic ear, receptoretentive as his of Dionysius, longsuffering although whitening under restraint in his sititout corner of his conservatory, behind faminebuilt walls, his thermos flask and ripidian flabel by his side and a walrus whiskerbristle for a tuskpick, compiled, while he mourned the flight of his wild guineese, a long list (now feared in part lost) to be kept on file of all abusive names he was called […] (*FW* 070.35-

[3] Carlo Linati, 'The Linati Schema', James Joyce, *Ulysses: The 1922 Text*, ed. by Jeri Johnson (Oxford: Oxford University Press, 2008), 735-739, 738.

[4] Bachelard, 53.

[5] In 'Charting Elsewhereness', Fritz Senn discusses how Joyce evokes topographical dislocations through linguistic disruptions in *Ulysses*, as the case with the 'interlocations' in 'Wandering Rocks'. This can equally be applied to *Finnegans Wake*, in which disruptions in language often confuse the narrative's articulations of its geographical contexts.

071.06)

and through a typically medievalist (and Brunonian) application of long lists, which diverts the reader from the conclusion of particular narrative strands in equal measure (such as the one-hundred-and-twelve ‘abusive names’ for Earwicker which follow the passage above, for instance (*FW* 71.05-71.06; 71.10-72.16). As is the case in *Ulysses*, this diverting process also functions macrocosmically, in terms of narrative form: II.ii, as we have seen, contains a six page intermission during the first stage for solving Euclid’s problem (*FW* 287.18-292.32). While the interpolations in ‘Wandering Rocks’ and many of the cross-referential interruptions in *Ulysses* appear out of context (they are inserted, or interpolated), the narrative dislocations (or, as Fritz Senn calls them, ‘interlocations’) in *Finnegans Wake* are usually extrapolated in clauses which are syntactically embedded within the dominant narrative strand.[6] For instance, when HCE is reported to have been ‘attracted by the norse of guns playing Delandy is cartager on the raglar rock to Dulyn’, the clauses regarding Norse imagery (‘the norse of guns’, ‘raglar rock’ [Ragnarok]) encroach upon the boundaries of those regarding Dublin (or *Dulyin*) and the locations of the rocky roads which lead to it (*FW* 064.02-03). This is effected aurally as well as visually: the sounds of Napoleonic warfare, Ragnarok and Irish ballads become interwoven as a result of this syntactical overlap. The effect which this extrapolating process creates overturns the sense of a roving narrative eye which is evoked by the interpolated narrative of ‘Wandering Rocks’, whose scope appropriates multiple points of view instantaneously across space and time: in *Finnegans Wake*, by contrast, the ‘monetone’ comes to ‘maomette’ and the narrative eye absorbs all places, parallactic viewpoints and sounds into the singular context of a dreaming mind’s scope (*FW* 312.20-21). That is to say, the multiple perspectives and voices which are provided in *Finnegans Wake* are all imagined or assumed perspectives, which ultimately originate from HCE’s consciousness.

In terms of the text’s overall branching structure, the other key difference between the narrative labyrinth of *Ulysses* and the divergent narrative structure of *Finnegans Wake* is that the latter can be understood as having a rhizomatic structure, in the sense that it possesses neither a root or a narrative home. Umberto Eco discusses this notion in

[6] Fritz Senn, ‘Charting Elsewhereness: Erratic Interlocations’, *European Joyce Studies 12: Joyce’s “Wandering Rocks”*, ed. by Andrew Gibson & Steven Marrison (Amsterdam: Rodopi, 2002), 155-185, 179.

Semiotics and the Philosophy of Language. Unlike the unicursal labyrinth (a labyrinth 'of the first kind', whose path leads to a principle source); and the mannerist maze (a labyrinth 'of the second kind', whose structure is arborescent), the rhizomatic labyrinth (a labyrinth 'of the third kind') is anti-genealogical and the points within it are positioned non-hierarchically.[7] To retrace one's steps using Ariadne's thread or to rely on trial and error would be futile, for the labyrinth of the third kind has neither a 'centre nor an outside', neither 'beginning nor end'.[8] This, by contrast, is the case with the mannerist narrative labyrinth in 'Wandering Rocks'—a labyrinth 'of the second kind'—which begins with Conmee's journey and ends with the disappearance of Artifoni's foot; and with *Ulysses* as a whole which, although evocative of an Everyman's cyclical existence, begins and ends in two different places (especially when considered in light of its Homeric subtext). The circular, self-enveloping and non-hierarchical narrative structure which Joyce employs in *Finnegans Wake* builds on his earlier attempts to frustrate the objective ideal of eternal fixedness in time and space; and to frustrate the notion of a 'horizon' to which knowledge teleologically progresses.[9]

Joyce's construction of the *Wake*'s spatio-temporal word-world also builds on the way in which he uses verbal motifs to indicate shifting perspectives and movements through space in *Ulysses*. Similar to the repeating aural patterns in 'Sirens', Joyce employs particular sounds as figurative landmarks throughout *Finnegans Wake.* For instance, the Magazine Wall motif consists of acoustic derivations of words which sound like '[z]inzin. Zinzin' ('zimzim, zimzim'; '[c]hin, chin! Chin, chin!'; 'Zijnzijn Zijnzijn', etc.), which signal a concern with the origin of HCE's physical and figurative fall in Phoenix Park (*FW* 500.09; 048.16; 058.14; 075.08). When alluded to at the end of a prayer which is delivered 'on this mounden of Delude, and in the high places of Delude of Isreal, which is Haraharem and the diublin's owld mounden over against Vikens' in II.iii—'(in imageascene all: whimwhim whimwhim)'—it is apparent that the narrative eye is looking from east to west, regardless of whether the 'mound' belongs to Howth, Israel, or if it 'Isreal' at all (*FW*

[7] Umberto Eco, *Semiotics and the Philosophy of Language* (Bloomington, IN: Indiana University Press, 1984), 81-82.

[8] Eco, 81; Gilles Deleuze and Felix Guattari, 'Introduction: Rhizome', *A Thousand Plateaus*, trans. by Brian Massumi (London: Continuum, 2004), 3-28, 23.

[9] Edmund Husserl, 'The Origin of Geometry' (1936), trans. by David Carr; repr. in Jacques Derrida, *Edmund Husserl's 'Origin of Geometry': An Introduction*, ed. & trans. by John P. Leavey (Lincoln, NE: University of Nebraska Press, 1989), 155-180, 159.

331.18-30). Mount Ararat (Deluge), Mount Horeb (the Mount of God), Haram, the Russian General (to whom this prayer forms a prelude), Oslo Fjord, (*Viken*), the mouth of the Liffey, the invading Vikings and Howth Head (‘diublin’s owld mounden’) are all situated East in relation to the Magazine Wall in Phoenix Park: what varies is the scale. Although the Magazine Wall appears within the context of images from a variety of scenes and imaginations (‘imageascene all’), its appearance in this passage highlights a particular angle on HCE’s fall: most notably, its sexual dimension. This is further suggested in the allusion to quims (‘whimwhim’) and sexual fluids: ‘Big Bil Brine Borumoter first took his gage at lil lolly lavvander waader […] and was it […] the feint of her smell made the seomen assalt of her’ (*FW* 331.26-27). The sexual nature of HCE’s fall is also evoked topographically through the image of aquatic ‘seomen’ encroaching on fertile bodies of land; and (if we interpret Howth Head as the head of Finn and the mouth of the Liffey as Finn’s ‘munden’ (Norwegian for ‘mouth’)) the image of the prone giant looking at his genitals, which lie in the west. More generally, verbal motifs, sound clusters and repeating speech rhythms are used to indicate shifts between the different narrative voices through which the *Wake*’s contents are mediated. These patterns include, most notably, the flowing rhythms of ALP (‘[b]eside the rivering waters of, hitherandthithering waters of’) and the stuttering speech of HCE (‘I am woowoo willing to take my stand, sir, upon the monument, that sign of our ruru redemption’) (*FW* 216.04-05; 036.23-25). HCE and ALP are also repeatedly alluded to through the iteration of their three respective letters within tripartite phrases (‘Haroun Childeric Eggeberth’; ‘addle liddle phifie’), which represent the geometric points of their ideal vitruvian forms (as in II.ii) and structure the tones which accompany their appearance (*FW* 004.28-32). As in ‘Sirens’, the *Wake*’s sounds often indicate the perspectives from which particular images and ideas are being evoked, or to which they are being applied.

Perhaps one of the most advanced developments between the soundscapes of *Ulysses* and *Finnegans Wake*—and their inter-medial overlap with the landscapes from which their sounds draw—is the heightened polysemy which characterises the *Wake*’s defining landmarks. Similar to the elusive descriptions and indirect viewpoints which occlude the identities of particular characters, objects or places in *Ulysses* (such as the ‘darkbacked figure under Merchant’s Arch’, Molly’s disembodied members and the disguised figures which roam the phantasmal locales of ‘Circe’, for example) *Finnegans Wake* is filled with

'doubleviewed' depictions of personas and places whose common identities wander between a multiplicity of guises (*U* 10.315; *FW* 296.01). The key difference with *Finnegans Wake* is that it constitutes a linguistic system (or 'a textual machine', as Umberto Eco argues) in which the text's language, as well as the imagery associated with its world, assume a variety of possible contexts depending on the figurative angle or line of enunciation which underscores their interpretation.[10] Taking the passage above as an example, if we identify the 'mounden of Delude' as the Mount of God, then HCE becomes Moses, who leads an invaded people in Egypt; and if we identify it as Mount Ararat then HCE becomes Noah. Alternatively, if we interpret the mount as Howth, then HCE overlooks Viking invaders who enter Dublin from Oslo Fjord. There is no discernible hierarchy between these contexts: *Finnegans Wake* is many-sighted just as it is many-voiced. In the prayer delivered on 'diublin's owld mounden', this notion is suggested through the repetition of 'and' ('on this mounden of Delude, *and* in the high places of Delude of Isreal, which is Haraharem *and* the diublin's owld mounden' (my emphasis)): the 'mounden' is simultaneously all of these places (*FW* 331.18-20). The branching lines of enunciation and reader-traps in *Ulysses* often derive from the concealment of information or the occlusion of defining visual features (as with the concealment of Molly's entire body, for instance). In *Finnegans Wake*, by contrast, the instability of the narrative's focus derives from an abundance of information. As we can see from the example above, the *Wake*'s hybrid words and notions disrupt the topographical fixedness of landmarks such as Howth Head and Dublin, as well as larger geological features including land masses and bodies of water. In *lieu* of a geography that can be visually represented on a map, Joyce evokes the shifting images of HCE's dream space through the construction of semiotically unstable utterances. As Valérie Bénéjam argues in her introduction to *Making Space in the Works of James Joyce*, the 'link between the organization of space and the post-Babelian multiplicity of world languages' is a distinctive feature of Joyce's later works, and this is particularly the case in *Finnegans Wake*.[11] *Finnegans Wake* can be understood as a '[g]eoglyphy': that is, a polysemic geography composed of ciphers or hieroglyphs, which charts not a landscape but a 'langscape', whose various features are produced by the babbling of tongues (595.04-07). In short, the Protean boundaries and landmarks of the *Wake*'s wandering landscape move in accordance with the overlapping sounds and

[10] Eco, 25.

[11] Valérie Bénéjam, 'Introduction', *Making Space in the Works of James Joyce*, ed. by Bénéjam & John Bishop (London: Routledge, 2011), 1-19, 2.

significations of its exotic ‘cellelleneteutoslavzendlatinsoundscript’ (*FW* 219.17).

Joyce’s representations of space in *Finnegans Wake* imply a far greater emphasis on the materiality of sound and script as base elements in the *graphing* of *topoi*. While his figurative use of sound and narrative form in *Ulysses* emulates the parallactic and labyrinthine phenomena of its mapped spaces, the verbal geometry of *Finnegans Wake* dictates the changing spatial laws and geometric languages in which its universe is written. In *Finnegans Wake*, ‘the very dimensions of space itself become uncertainly elastic’ through the phonetic elasticity of its sounds and the related semantic elasticity which renders their connotations uncertain.[12] This relationship between the mutability of the *Wake*’s sounds and its spaces is particularly noticeable in the opening of I.i, for example, in which sounds modulate in accordance with the differing sizes and dimensions of particular locales:

> Sir Tristram, violer d’amores, fr’over the short sea, had passencore rearrived from North Armorica on this side of the scraggy isthmus of Europe Minor to wielderfight his penisolate war: nor had topsawyer’s rocks by the stream Oconee exaggerated themselse to Laurens County’s gorgios while they went doublin their mumper all the time […]. (*FW* 003.04-09)

The sounds which accompany names, places, events and objects relating to Sir Tristram’s existence in North America entail a figurative inflation of host words through extended assonance: the soft contours in *violeur d’amours* are obliterated in ‘violer d’amores’, and the boundaries of North America are stretched out of shape in ‘North Armorica’, as are its vowel sounds. These ‘o’ sounds are repeated in ‘fr’over’, ‘passencore’, ‘topsawyer’s rocks’ and ‘Oconee’, whose phonetic elongations echo the New World’s vast expanses. Sounds relating to Sir Tristram’s forthcoming arrival ‘on this side of the scraggy isthmus’, on the other hand, become reduced through ‘i’ sounds, the pronunciation of which entails a contraction of the lips; as in ‘this side’, ‘isthmus’, ‘wielderfight’, ‘penisolate’. Unlike the ‘o’ sounds, these sounds result in a contraction of host words: the regular ‘ə’ in ‘Dublin’ is softened in ‘doublin’ (which contains the small ‘ou’ sound missing in sounds like ‘violer d’amores’). These contracted vowel sounds also echo those of a Dublin accent, while the large vowel sounds imitate words pronounced in an accent like Tom Sawyer’s. As the

[12] Mink, xi.

projection of geometric objects onto a plane of different dimensions would distort the figures plotted upon it, so too do their sounds and significations swell with size and import when tabulated within the vast boundaries of America; and contract when conceived in a hypothetical future state within a space of smaller boundaries.

This figurative contraction and expansion of sound is developed throughout *Finnegans Wake* and, as with the previous example, it is used to formalise a perceived distortion of space and its contents. This is particularly the case with the growth of ∧ (of whom Sir Tristram is an aspect) throughout Book III. Destined to fill the shoes of his fallen father Finn the Giant, Shaun (∧) undergoes a process of exponential inflation which culminates in him becoming a giant himself by the end of Book III (‘gracious helpings, at this rate of growing our cotted child of yestereve will soon fill space and burst in systems, so speeds the instant!’): he is Pantagruel to HCE’s Gargantua (*FW* 429.11-13). As with the passage above, ‘larger’ sounds are used to evoke Shaun’s formal enlargement: Shaun (the smallest) transforms into Jaun in III.i (the large), who transforms into Haun in III.ii (the larger); who transforms into to Yawn in III.iii (the largest), the final name describing a wide opening of the mouth. The gargantuan aspect of Shaun’s final manifestation is heightened, again, through extended assonance: ‘[l]owly, longly a way went forth. Pure Yawn lay low’; ‘Yawn in a semiswoon lay awailing and (hooh!) what helpings of honeyful swoothead (phew!)’; ‘[h]woah!’ (*FW* 474.01-15). By increasing the assonance of the nomencluratal ∧ sound in each instance, as well as the accompanying breathy tones of exhalation which are associated with the act of inflation, Joyce embodies the increasing size of ∧ as well as the dimensions of space in relation to him.

By employing the *Wake*’s mutable sounds to evoke the variable dimensions of its visual universe, Joyce establishes what is in many ways an aesthetic response to Wyndham Lewis’s attack on *Ulysses* as a time-book, and his personal attack on Joyce as an obsessive proponent of the ‘time-mind’, in *Time and Western Man*.[13] *Finnegans Wake* contains several direct engagements with Lewis’s argument too: most notably in the self-mocking fable of the Ondt and the Gracehoper, in which the hard-working ant of Aesop’s fable represents Lewis the spatialist (∧) and the lazy grasshopper represents Joyce the

[13] Wyndham Lewis, *Time and Western Man* (1927), ed. by Paul Edwards (Santa Rosa, CA: Black Sparrow Press, 1993), xix.

temporalist (⊏)); and the fable of the Mookse and the Gripes, in which the pro-active fox represents the spatialist and the waiting grape the temporalist. Lewis’s critique is also directly alluded to in Professor Jones’s satirical speech in I.vi, in which he denounces Shem. Like the ant and the fox, Professor Jones is also an aspect of ⋀, an ‘eminent […] spatialist’ (specialist of space), whose bombastic mode of address appropriates a similar rhetorical style and ideology to Lewis’s in *Time and Western Man* (*FW* 149.18-19). The crux of Lewis’s critique of Joyce and *Ulysses* is, as Professor Jones puts it, that ‘[t]he speechform is a mere sorrogate’ for spatial form (*FW* 149.29). In *Time and Western Man*, Lewis argues that Joyce aspires to spatial form in *Ulysses* and (contrary to Joseph Frank’s argument) fails, for although ‘[t]here is a shape, an organic completion [in the narrative], […] it is a pure creation of *time*. It cannot spatialize itself. The representation goes on inside your mind, making use of your memory. Its concreteness is not objective but subjective’.[14] One of Lewis’s main issues with *Ulysses* and its production of ‘time-objects’ is the idea that the text provides a sense of space which is rooted in the subjective experience of time, as is the case in the ‘where’s hairs theorics of Winestain’ and ‘the sophology of Bitchson’ (*FW* 149.20-28).[15] Indeed, Lewis’s critique of Joyce is in many ways a critique of ‘the school of Bergson-Einstein’, whose conception of space-time Lewis found irreconcilable in art and science.[16] As explored in the previous chapter, Joyce’s construction of temporal networks (or ‘time-objects’) as a means of emulating spatial phenomena in *Ulysses* not only illustrates the interdependence of space and time which forms the basis of Einstein’s general theory of relativity, but also reflects Poincaré’s discussion of geometry and visual space in *Science and Hypothesis*, in which Poincaré argues that geometry constitutes the logic by which images appear through time; a process which would indeed ‘[make] use of your memory’.[17] By using sounds and narrative overlaps as topographical landmarks in *Ulysses*, Joyce illustrates how any conception of space is fundamentally linked with the subjective experience of time given the relative motions of spatial and temporal phenomena in relation to a mobile subject. In *Finnegans Wake*, worlds and words are further entwined by the linguistic ‘etyms’ which constitute the base elements of the text’s world-building (*FW* 353.22). The semiotic instability of the

[14] Lewis, 171.
[15] Lewis, 171.
[16] Lewis, 87.
[17] Lewis, 171; Henri Poincaré, *Science and Hypothesis*, trans. by W. J. Greenstreet (Mineola, NY: Dover, 1952), 64.

features which define HCE's dreamscape illustrates how any perceived concreteness in visual space is subjectively imposed, for—as Bruno's reductive cosmology demonstrates—the monadic universe is in a perpetual state of flux, like sound. Indeed, the *Wake* takes place in 'nolansland': both a no-man's land and a Nolan realm (*FW* 391.15). By using the expanding and contracting dimensions of the *Wake*'s sounds to embody related expansions and contractions of their engendered spaces, Joyce responds to Lewis on the level of language as well as form. The 'speechform' of *Finnegans Wake* is no apologetic surrogate for spatial concepts for, as Joyce demonstrates, the production of sound is linked with the creation and distortion of space.

Like its sounds, the textual spaces of *Finnegans Wake*—along with the page space upon which its 'scriptsigns' are marked—are also presented as being subject to the expandable and contractable fabric of space-time (*FW* 118.28). Bénéjam argues that Joyce's 'invitation to play with the space of the printed page' is a distinctive feature of his later works.[18] Katarzyna Bazarnik also stresses the 'liberatic' qualities of Joyce's later works in *Joyce & Liberature*, as discussed in the previous chapter.[19] She considers how the pockets of space which form borders between the micro-biotic parts of 'Aeolus', 'Wandering Rocks' and 'Ithaca' contribute to the 'concretisation of the literary work', and how Joyce develops this concept in *Finnegans Wake* by constructing 'iconic relations between the book's content and its (material) form'.[20] In II.ii, for instance, entire worlds and world-views founded on the ideal of rectitude are condensed into the space described by the page (which appropriates the form of an annotated, four-sided schoolbook; *un cahier carré*) and within the boundaries imposed by idealistic geometric figures, as discussed in chapter one. The overlap which Joyce evokes between the *Wake*'s visual universe and its page space functions similarly to the way in which the corporeal forms of its principal characters assume the double role of mappable celestial bodies. As examined previously, HCE appears as a giant who forms the geography of Howth Castle and Environs, and ALP represents the two hemispheres as well as various bodies of water. Joyce's re-conception of certain characters as planetary surfaces in *Finnegans Wake* results in their mythification; or hyperbolic representation, in the sense that they appear to be larger than life (although, as we shall see, the *Wake*'s giants are always brought down to size eventually). This is the

[18] Valérie Bénéjam, 'Introduction', *Making Space in the Works of James Joyce*, 3.
[19] Katarzyna Bazarnik, *Joyce & Liberature* (Prague: Litteraria Pragensia, 2011), 48.
[20] Bazarnik, 10; 124.

case with the narrative’s envisioning of Molly as a celestial object in ‘Ithaca’, for example, in which Molly is imagined as Venus; and ALP, who is presented as the ‘eternal geomater’ to the twins in II.ii (*FW* 296.31-297.01). In ‘Ithaca’ and II.ii, Joyce illustrates the technicalities of this mystifying process through the concept of map projection: as Mercator’s projection involves a figurative skinning, flattening and distortion of three-dimensional forms in two dimensions, so do the bodily movements of gigantic characters and the subsequent distortions of their bodily surfaces result in the disfigurement of forms which are plotted upon them, as well as the distortion and mythification of the stories which they symbolise. In light of this combined geometric and mythical understanding of hyperbole, such stories and depictions are ‘mythametical’ (*FW* 286.23). A similar idea—whereby the contents of *Finnegans Wake*, like its geographical landmarks, are transcribed onto bodily surfaces—is explored in I.vii. In an attempt to reconcile the paper space of the Letter (and by extension the *Wake*’s narrative) with the visual, corporeal and terrestrial spaces through which it is delivered by his brother Shaun the Post, Shem the Penman writes the contents of the Letter on his body. The narrative describes how ‘the first till last alshemist’, using ‘a no uncertain quantity of obscene matter’ from his ‘unheavenly body’, ‘wrote over every square inch of the only foolscap available, his own body, till by its corrosive sublimation one continuous present tense integument slowly unfolded all marryvoising moodmoulded cyclewheeling history’ (*FW* 185.29-186.02). The suggestion that the Letter (and by extension the waste of *Finnegans Wake*) are smeared or inked upon Shem’s body—like the way in which many of the *Wake*’s places are charted onto HCE’s body—provides an alternative account for the mutable nature of the text’s geometries and spatial laws. Given that any line of text, geometric line or series of square inches graphed onto Shem’s body would eventually loop around to end where it began, the narrative which he inscribes is essentially circular in terms of form and content. Like the ‘cyclewheeling history’ which it records, Shem’s physical body-writing gives rise to a cyclical script, or a ‘psychical chirography’ (*FW* 482.17-18). Through this image, Joyce also highlights the *Wake*’s semiotically distortive features. Like Murphy’s presentation of his tattoo as an article of proof validating his tall tales in ‘Eumaeus’, which he stretches out of shape in order to evoke Antonio’s characterising smile, the textual space of *Finnegans Wake* plays host to a figurative stretching of signs, i.e.: a distortion of host words and images to the extent that they are capable of appropriating multiple contexts. The distortive effects which Shaun’s body-writing has on the maps, tattoos and other graphic signs of the *Wake* is

reflected in the illustrative aspects of the fallen HCE (Π). Given that the dormant giant is a sleeping ‘stigmataphoron’ ((Greek) meaning something bearing tattoo marks), HCE is as much a version of future Shem as he is a version of future Shaun (*FW* 606.27). Like the topographical spaces created by his father the sleeping giant, whose breath defines his varying breadth (‘he was recovering breadth’; ‘Length Withought Breath’), the spaces created by Shem’s narrative distort in accordance with the growth, movement, stretching and breathing of his marked body (*FW* 344.19; 261.13).

In *Joyce’s Book of the Dark*, John Bishop expands on this relationship between the *Wake*’s ‘universe of radically strange spatialities’ and the dimensions of the giant who enters into it. In doing so, he touches on the idea that the *Wake*’s spaces fluctuate in accordance with the variable spatialities of a moving, breathing body. Discussing the distinction between the day-world upon which the world of *Finnegans Wake* is modelled (which can be represented on a map) and its night-world (which cannot, due to its elusion of the day-world’s spatial logic), Bishop explores how HCE functions as a physical and semiotic vacuum:

> As “Mr Makeall Gone” (220.24), our hero operates like a “vacuum cleaner” (309.21, 362.25, 364.33-34): as soon as he falls asleep and “makes all gone,” the entire earth gets swept “off the face of the erse” (178.6-7, 50.8-12). Through this process of “subtractional betterment” (150.33-34), he is “reassured by ratio that the cube of [his] volumes is to the surfaces of their subjects as the sphericity of these globes . . . is to the feracity of Fairynelly’s vacuum” (151.1-7). In other words, as the heady glue that holds it all together and dissolves in sleep’s vacuum (“subjects,” capable of “ratio” and “rationality”), all geometrically constructed space disintegrates too (“cubes”, “volumes,” “surfaces,” “spheres,” “globes”). As space vanishes, our hero passes out of dimension into an aspatial “nolandsland” situated “*In Nowhere*,” “*By Nowhere*” (391.15, 175.7, 9). “Where are we at all? and whenabouts in the name of space?” (558.33).[21]

In a cosmic context, HCE assumes the role of a black hole. By presenting HCE as an enlarging chasm in space-time which sucks any proximate matter outwith the universe, Joyce implies that the geometric laws which describe these disappearing spaces become warped before they are infinitely compressed and ‘[made all] gone’ (*FW* 220.24). Determining when or ‘where [we are] at all’ becomes difficult due to the fact that those

[21] John Bishop, *Joyce’s Book of the Dark* (Madison, WI: The University of Wisconsin Press, 1986), 146-7.

very laws which enable the understanding of concepts like ‘where’ and ‘when’ also become warped and compressed, as in a black hole (*FW* 558.33). This densification in space-time is evoked through a concurrent compression of verbal signs: in this case, for instance, the concepts of when and where become engulfed by the double-fold concept of ‘whenabouts’ (*FW* 558.33). Discussing this notion of spatial and semiotic engulfment, Bishop argues that ‘the *Wake*’s sleeping giant will necessarily absorb and engulf any place or any thing which acts as a landmark in the world (just as his cypher, HCE, will absorb any context)’.[22] The falling HCE’s growing self-destruction and consequent ‘abnihilisation’ of every ‘etym’ (and atom) which forms his immediate universe involves an engulfment of the entire visual and semiotic landscape with his vacating corpse (*FW* 353.22). Like the *Wake*’s Protean ‘geoglyphy’, HCE’s developing demise accommodates the implosion of multiple places within the singular context of his body’s soon-to-be absent space (or coffin) (*FW* 595.07). With regard to HCE’s role as a cosmic and typological black hole (like the *point carré* at the end of ‘Ithaca’), this is caused ‘by pùnct! ingh oles (sic) in iSpace?!’ (*FW* 124.11-12).

If the disappearing aspect of HCE is ‘Mr Makeall Gone’ then Shaun, by contrast, can be understood as his returning aspect; or the ‘Finn, again!’ in Finnegan (*FW* 220.24; 628.14). While HCE represents a dying star (⊏) which eventually turns into a black hole (⊓), ⋀ represents a new star rising in the east which gains mass at a correlative rate. In his final aspect as Yawn in III.iii, Shaun becomes both a Messianic prince (the four old men—in their aspect as the magi (‘three suits and a crowner’)—‘cooched down […] by his cubical crib’) as well as the star in the east whose ‘amber way’ the magi follow in order to find him (*FW* 474.20-476.32). He is not only destined to ‘fill space’ but also ‘burst in systems’, producing entirely different spaces as a result of his outgrowth (*FW* 429.12). By opposing the divergent spatialities of ∏ and ⋀ in this way, Joyce suggests that the compression of space and time in one dimension (i.e.: the dimension of HCE’s black hole) gives rise to a correlative expansion of space-time in another (i.e.: the spaces created by ⋀). This further complicates the geometric language of the *Wake*’s universe for it evokes a space of constant curvature (as implied by a hyperboloid, for example which creates negative space as it expands into a space of constant negative curvature (fig. 11)). In a four-dimensional, hyperbolic model of the universe such as that conceived by Einstein, the curvature of space-time implies the mutation of space in different dimensions. Einstein’s general theory

[22] Bishop, *Joyce’s Book of the Dark*, 158.

of relativity further accounts for the existence of black holes, which were believed to condense the fabric of space-time hyperbolically, funneling the spaghettified matter of one space into another (fig. 11). Within this context, the ‘cubical crib’ which Mamalujo peer into in III.iii represents not only the cot of the growing baby Yawn, but also the coffin of the shrinking father HCE: indeed, the three magi are accompanied by ‘a crowner’, or coroner (*FW* 474.19). In the following chapter, moreover, the four evangelists who peer into the Messiah’s crib and his father’s coffin simultaneously examine the contents of a cube described by Mr and Mrs Porter’s four poster bed (the site of consummation). In III.iii, the spaces inhabited by the growing baby Yawn and the dying HCE seem to hang around a common cubical container or gateway which is suspiciously evocative of the ‘cubehouse’ in which the *Wake*’s events are said to unfold; and whose dimensions, Margaret Solomon argues, evoke those of a tesseract (‘the four [old men] are “cooched [...] down a mamalujo by his cubical crib”’ in the formation of a tetrahedron, rather than as points of a two-dimensional square’) (*FW* 005.14).[23] Given that the contracting spaces of ⩛ and the expanding spaces of ⩓ appear to operate within the same continuum (the dreamscape of HCE) Joyce explores the concept of a universe consisting of inner and outer spaces which contain and are contained by each other. Bishop sheds light on this concept with reference to HCE’s body and mind: ‘[b]ecause *Finnegans Wake* shows the world reformed in this man’s body and memory, it necessarily shuffles the “untired world” through a complex set of topological “inns and ouses” (7.5) whereby all ordinary surroundings (like “inns and houses”) now lie simultaneously both “inside and outside” him’.[24] By developing this non-Euclidean conception of space through the added notion that Shaun’s expanding spaces are simultaneously embedded within and extant outwith the spaces of his father, Joyce evokes a similar image to the non-Euclidean fantasy presented by François Rabelais at the end of Book III of *Gargantua and Pantagruel.*[25] Having climbed into Pantagruel’s cavernous mouth, the narrator discovers an entirely different world inside—complete with its own continents, oceans, civilizations, cultures, solar system and universe—whose spaces expand the deeper he travels into the giant’s body. Upon returning to the outer world through Pantagruel’s mouth months later, the narrator discovers that he hadn’t been gone for as long as he thought:

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[23] Margaret C. Solomon, *Eternal Geomater: The Sexual Universe of* Finnegans Wake (Carbondale, IL: Southern Illinois University Press, 1969), 119.

[24] Bishop, *Joyce’s Book of the Dark*, 153.

> At last I was willing to return, and, passing by his beard, I cast myself upon his shoulders, and from thence slid down to the ground, and fell before him: assoon [*sic.*] as I was perceived by him, he asked me, Whence comest thou, *Alcofribas*? I answered him, Out of your mouth, *my Lord*: and how long hast thou been there? said he. Since the time (said I) that you went against the *Almirods*; That is about six moneths [*sic.*] ago, said he: and wherewith didst thou live? what didst thou drink? I answered, My Lord, of the same that you did, and of the daintiest morsels that passed through your throat I took toll: Yea but, said he, where didst thou shite? In your throat (my lord) said I. Ha ha, thou art a merry fellow, said he.[26]

By suggesting that entire cultures, histories and galaxies could be formed within the seemingly finite spaces of Pantagruel's body and lifetime, Rabelais evokes a hyperbolic conception of space-time. As Andrea Frisch argues in her essay 'Testimony, Narrative Agency and the World in Pantagruel's Mouth', '[t]he itinerary that takes Alcofribas from Pantagruel's heroic world to the *autre monde* inside the giant's mouth describes a multileveled narrative space that is beyond the domain of a narrator who is physically present before his audience'.[27] Like 'the *autre monde* inside the giant's mouth', the *Wake*'s spaces appear within the context of outer spaces as well as inner spaces, whereby the shrinking of space gives rise to a correlative densification of time.

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[25] Joyce possessed a copy of François Rabelais's *Les cinq livres* (Paris: Ernest Flammarion, 1906) in his Trieste library, which comprises the five books of *Garguantua and Pantagruel* in the original French (Michael Patrick Gillespie, *James Joyce's Trieste Library: A Catalogue of Materials at the Harry Ransom Humanities Research Center* (Austin, TX: The University of Texas Press, 1986), 192). He also possessed a rare copy of Gustave Doré's English translation of *The Works of Rabelais* (Nottingham: Printed for Private Circulation, n. d.) in his personal library (Thomas E. Connolly (ed.), *The Personal Library of James Joyce: A Descriptive Bibliography* (Buffalo, NY: University of Buffalo, 1955), 32). Although it is uncertain whether he owned a copy of Thomas Urquhart's illustrious English translation, it is clear that Joyce was familiar with Urquhart's translation given the extended allusions to his neologisms in *Finnegans Wake:* '[n]o chare of beagles, frantling of peacocks, no muzzing of the camel, smuttering of apes' corresponds with Urquhart's 'nuzzing of Camels [...] frantling of Peacocks [...] charming of Beagles [...] guerieting of Apes, snuttering of Monkies', for instance (*FW* 245.03-04; François Rabelais, 'The Third Book', *Gargantua and Pantagruel*, trans. by Thomas Urquhart (1653; repr. in London: Everyman's Library Classics, 1994), 288-506, 345.

[26] François Rabelais, 'The Second Book', *Gargantua and Pantagruel*, trans. by Thomas Urquhart (London: Everyman's Library Classics, 1994), 163-287, 284.

[27] Andrea Frisch, 'Quod vidimus testamur: Testimony, Narrative Agency and the World in Pantagruel's Mouth', *French Forum*, Vol. 24, No. 3 (September 1999), 261-283, 279.

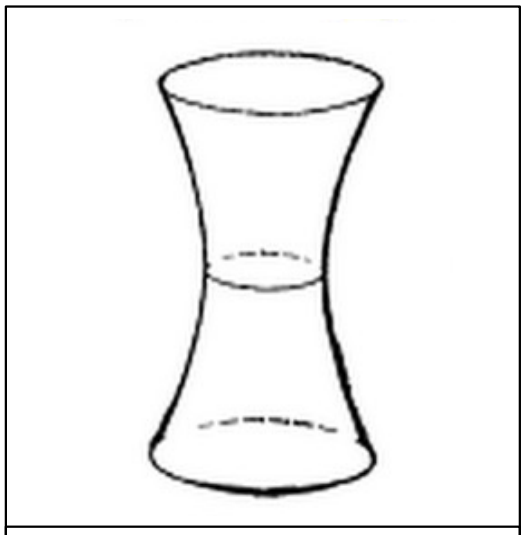

Fig. 11. A one-sheet hyperboloid. N. V. Efimov, ‘Fig. 1A’, ‘Surface of Negative Curvature’, *Encyclopedia of Mathematics*, Vol. 4, ed. M. Hazewinkel (Berlin: Springer-Verlag, 1995), 76-83, 76.

The Pantagruelian aspects of the *Wake*’s universe (or multiverse) are illustrated in the opening of III.iii, by which point ⋀ has transformed into Yawn the giant. Like his father Finn, the sleeping Yawn lies ‘dormant mid shadowed landshape’ and his body assumes gargantuan proportions (*FW* 474.02-03). On one level, it seems to cover the whole of Ireland: there are ‘ells upon ells of him, making so many square yards of him, one half of him in Conn’s half but the whole of him nevertheless in Owenmore’s five quarters’ (*FW* 475.05-07). Joyce evokes an archaic topography of Ireland (which appears to be a massive topographical representation printed on ells and ells of textiles) which was anciently divided into ‘Conn’s half’ and ‘Owen’s half’, and suggests that Yawn’s body encroaches on both sides. The four old men are said to travel from their four respective provinces in Ireland and climb ‘the esker ridge’ in order ‘to hold their sworn starchamber quiry on him’ (*FW* 475.18-22). The Esker ridge, or *Eiscir Riada*, is ‘an East-West route from Dublin to Galway following an almost continuous chain of eskers (and dividing Ireland into the Northern “Conn’s half” and the Southern “Owen’s half”)’.[28] A viewpoint atop the Esker ridge would thus enable the four old men to see as much of Yawn (whose bodily shape constitutes the ‘landshape’ of Ireland) as possible (*FW* 474.02-03). Finally, the hill which

[28] Raphael Slepon (ed.), *The Finnegans Wake Extensible Elucidation Treasury* <http://www.fweet.org>, elucidatory note for *FW* 475.22 [date accessed: 04/01/16].

they climb is referred to as 'Brosna's Furzy', which refers to the Hill of Usnach, near the River Brosna (*FW* 474.20). Like the centre of the 'X' described by Mamalujo's siglum, it was regarded as the centre of Ireland as it sat at the junction of its four provinces. On another level, Yawn's body seems to extend from Ireland into outer space, given that Mamalujo's interrogation is a 'starchamber quiry' which involves gazing into a void of 'nebulose' (*FW* 475.14-19). It is therefore difficult to ascertain whether the four old men must look up or down (or where 'up' and 'down' are relative to Yawn) due to this process of magnification, where the act of peering into Jesus's crib transforms into the double process of reading a map and the stars: '[the four old men] could not rightly tell their heels from their stools as they cooched down a mamlujo by [Yawn's] cubical crib, as question time drew nighing and the map of the souls' groupography rose in relief within their quarterings' (*FW* 476.30-34).

Evoking a non-Euclidean model for space, the vast terrestrial and cosmic expanses produced by Yawn lie simultaneously inside his body and in outer space. Eco argues that '[i]n a structure without outside, the describers can look at it only by the inside', which is certainly the case here.[29] The astronomical imagery which describes the interior of Yawn's body suggests that the cosmos which the four old men conceive lies within a hyperbolic universe contained by the giant's bodily cavities, as is the case with Pantagruel's insides:

> When, […] from the westborders of the eastmidlands, three kings of three suits and a crowner, from all their cardinal parts, along the amber way where Brosna's furzy. To lift them they did, senators four, by the first quaint skreek of the gloaming and they hopped it up the mountainy molehill, traversing climes of old times gone by of the days not worth remembering; inventing some excusethems, any sort, having a sevenply sweat of night blues moist upon them. Feefee! Phopho!! foorchtha!!! aggala!!!! jeeshee!!!!! paloola!!!!!! ooridiminy!!!!!!! Afeared themselves were to wonder at the class of a crossroads puzzler he would likely be, length by breadth nonplussing his thickness, ells upon ells of him, making so many square yards of him, one half of him in Conn's half but the whole of hum nevertheless in Owenmore's five quarters. There would he lay till they would him descry, spancelled down upon a blossomy bed, at one foule stretch, amongst the daffydowndillies, the flowers of narcosis fourfettering his footlights, a halohedge of wild spuds hovering over him, epicures waltzing with gardenfillers, puritan shoots advancing to Aran chiefs. Phopho!! The meteor pulp of him, the seamless rainbowpeel. Aggala!!!! His bellyvoid of nebylose with his neverstop navel. Paloola!!!!!!

[29] Eco, 82.

> And his veins shooting melanite phosphor, his creamtocustard cometshair and his asteroid knuckles, ribs and members. Ooridiminy!!!!!!! His electrolatiginous twisted entrails belt. (*FW* 474.16-475.17)

The inflation of Yawn's size is either a result of the old men's initial fear and confusion (their ejaculations—'[f]eefee! […] ooridiminy!!!!!!!'; '[p]hopho!! […] [o]oridiminy!!!!!!! —are all variations on words for "fear" in different languages), an accurate rendition of Yawn's perceived size, or a combination of both (*FW* 475.01-16). In other words, by ascending 'the mountainy molehill' to view Yawn, the four old men simultaneously ascend a mountain (which to Yawn would appear to be a molehill) and making mountains out of molehills. In any case, the contents of the cosmos are assimilated as components of Yawn's body: his seamless, fleshly pulp is borne of meteors; his belly is a void of nebulae; his infinitely extended, 'neverstop' navel constitutes the *axis mundi*, the mythical centre of the world which conjoins Heaven and Earth (the centre of Shaun's body therefore constitutes the centre of the universe as well as of Ireland); his veins course with shooting stars and minerals from Venus (Phosphor denoting the morning star); his hair is made of comets (a play on the Greek *kometes*, as in 'Ithaca', meaning 'having long hair'); his 'knuckles, ribs and members' are composed of asteroids; and his entrails are stellar belts which lie twisted through the heavens.[30] By illustrating how Yawn's body is both replete with and consists of entire galactic systems, Joyce presents a world which is both contained by and extant outside of Yawn, who is so large that he '[bursts] in systems' (*FW* 429.12). This notion that the spaces contained by (and containing) Yawn are located within a self-enveloping universe evokes a Lobachevskian conception of space, which assumes total negative curvature. As would be the case with, for instance, the most convenient geometry for the inhabitants of a giant's mouth, Lobachevsky's hyperbolic geometry space assumes 'that several parallels may be drawn through a point to a given straight line'.[31] The axioms implied by hyperbolic geometry could equally be applied to measure the contents of our universe including positively curved planetary surfaces such as the Earth's, given that visual space is not definitively Euclidean. As Poincaré argues, '[o]ne geometry cannot be more true than another; it can only be more convenient'.[32] This phenomenon was illustrated

[30] Don Gifford & Robert J. Seidman, *Ulysses Annotated: Notes for James Joyce's Ulysses*, 2nd ed. (Berkeley, CA: University of California Press, 1988), 584.
[31] Henri Poincaré, *Science and Hypothesis*, trans. by W. J. Greenstreet (Mineola, NY: Dover, 1952), 37. See figures 2.1 and 12.
[32] Poincaré, 50.

concretely in James Wylde’s ‘Great Globe’, which was exhibited in Leicester Square between 1851 and 1862. The Great Globe consisted of a giant hollow globe with a scale map (10 miles to the inch) projected onto the surface of its interior, and it demonstrated how the Earth’s positively curved surface could be accurately translated elliptically. By projecting a ‘starey [starry or ocular] sphere’ which is enclosed in Yawn’s body, as in Book III of Rabelais’s *Gargantua and Pantagruel*, Joyce evokes a plurivocal sense of space where both positively and negatively curved geometries coincide (*FW* 503.05). Moreover, his corporeal re-imagining of interstellar space through Yawn’s bodily organs and members evokes a universe which expands in accordance with a bodily container, whose outward form grows into (or eats into) the space of another dimension.

The fear which the four old men express derives not merely from Yawn’s size, but also from the alien nature of his proportions: how can one half of his body be located in one half of Ireland, and yet ‘the whole of him nevertheless’ in five-quarters of the other half (*FW* 475.06-07)? Both Yawn and the ‘landshape’ which he forms elude the four old men’s topographical and geometric knowledge concerning their respective provinces and how they fit together. As Margaret Solomon argues, this chapter ‘is a “drama parapolylogic” (*FW* 474.5), indicating that the real figure to be contemplated may be polyhedral’.[33] Moreover, Yawn’s ‘length by breadth nonplussing his thickness’—like HCE’s ‘Length Withought Breath’ (which describes a Euclidean line)—highlights the apparent absence of one dimension’s relation to others (*FW* 475.04-05; 216.13). These images echo Poincaré’s illustration of Riemann’s geometry through the hypothetical idea of ‘infinitely flat’ beings, and their conception of three-dimensional phenomena: ‘[l]et us imagine to ourselves a world only peopled with beings of no thickness [...]’.[34] Discussing the fourth dimension and the tesseract, Margaret Solomon argues that ‘[t]he difficulty is that we have no other visually perceptible dimensions than the three of length, breadth, and thickness. So we are unable to imagine the direction that any cube could take at right angles to itself—in a direction perpendicular to its three dimensions’.[35] In this light, the confusion of Mamalujo —who converge upon Yawn ‘from severalled their fourdimmansions’—echoes that of the Square in *Flatlanders*, who struggles to conceive the way in which the unseen third dimension alluded to by the invisible Sphere would relate to the spatial laws of his own

[33] Solomon, 119.
[34] Poincaré, 37.
[35] Solomon, 121-2.

(fig. 5) (*FW* 367.27). ‘Afeared themselves were to wonder at the class of a crossroads puzzler he would likely be,’ the four old men—like Trinculo and Stefano who question what kind of a ‘strange beast’ Caliban is, and whether he be ‘man’ or ‘fish’, upon discovering his sleeping body on Prospero’s island in ‘The Tempest’—can make neither head nor tail of the ‘class’ of Yawn’s form, which branches off into numerous directions like a crossword puzzle (‘crossroads puzzler’) or a crossroads (*FW* 475.03-04).[36]

Cast onto the spatio-temporal lining of Yawn’s cosmic bodily interior, subterranean phenomena are—bizarrely—revealed when the four old men look to the heavens. This mirrors the way in which their ‘starchamber quiry’, conversely, involves looking down from their hill into Yawn’s crib (*FW* 475.18-19). By reversing upward and downward directions in III.iii, Joyce highlights the unusual dimensions of the bodily sphere which Mamalujo examine. This disorienting reversal of up and down is illustrated more specifically through the employment of uncanny imagery relating to fruits and root vegetables. Surveying Yawn’s body as it is sprawled ‘amongst the daffydowndillies’, Mamalujo witness ‘a halohedge of wild spuds hovering over him’ (*FW* 475.09-11). Potatoes, of course, do not grow in hedges, and if they are ‘hovering over’ Yawn like a halo then he—and the four men observing him—must be either underground or upside down. Conversely, the four old men also see ‘Orania epples playing hopptociel bommptaterre’: oranges and apples (such as the one which fell onto Newton’s head) hop to the sky (thus disproving Newtonian physics), before falling with a bump on the ground (*FW* 504.24). The double function of ‘apples’ as a euphemism adds further insult to injury in light of its scatological connotations. A range of similar allusions to root vegetables (‘such sprouts on him’, ‘no friend of carrots’) within this context of a self-enclosed universe further illustrate the inverted spatio-temporal laws of Yawn’s ‘bellyvoid of nebylose’ (*FW* 475.13-476.17). As would be the case for the space enclosed by Pantagruel’s mouth, or the visitors of Wylde’s Great Globe, surface phenomena appear on the outer extremities of this bounded universe, whereas ‘outer space’ is located towards the centre.

In III.iii, Joyce demonstrates the intense variability of the *Wake*’s spatial dimensions and inter-relationships. Common distinctions between inner and outer space are dismantled, evoking a relative sense of space which is dependent on the location and visual reality

[36] William Shakespeare, ‘The Tempest’ (Oxford: Oxford University Press, 2008), II.ii.27-30.

experienced by the observer. Through his confounding depiction of Yawn's bodily dimensions, Joyce also highlights the plurivocity of the *Wake*'s geometric spaces and the 'changing pattern' of its 'mappamund' (*FW* 253.05-06). The plurivocal geometric languages which he uses to describe the shifting world of the *Wake* presents space as something elastic, transitory and—like those languages and sounds which originate from the mouth (*mund*)—bound up with the passage of time. Moreover, these geometric languages are conceived as conventions which originate from subjective experiences of the visual worlds in which they happen to be produced (the idea of a straight line, for instance, is partly predicated on the ideal of infinity). Countering Wyndham Lewis's idea of spatial 'concreteness', Joyce presents an Einsteinian conception of space-time which is variable, relative, and whose defining features can become warped; in a black hole, for instance.[37] By constructing conceptual and visual overlaps between the interior and exterior spaces of Yawn's body in III.iii, Joyce not only implies a four-dimensional model of the universe but further explores the idea of a multiverse: a *Weltraum* in which entirely new worlds and universes can be condensed into a single 'pùnct!', and where the smallest details can reveal gaping rips in space-time which lead to another dimension completely (*FW* 124.11).

'A worldroom beyond the roomwhorld'

Within the context of scholarly attempts at establishing a relationship between the night-world of *Finnegans Wake* and the day-world from which it draws (as John Bishop attempts to do topographically in *Joyce's Book of the Dark* with his construction of a map, 'Map A: Dublin By Daylight'), several critics have referred to III.iv as a means of explicating who, what and where the *Wake*'s waking equivalents are.[38] Like HCE and ALP, Mr and Mrs Porter—the central protagonists of III.iv—live above a pub in Chapelizod with their three 'little Porter babes': twin boys (Jerry and Kevin) and a girl (Isobel) (*FW* 561.03). Stylistically, the opening of III.iv lends itself to the suggestion that the narrative eye rises from the depths of HCE's dreams and begins to envision phenomena which are tied more closely to the waking world:

[37] Lewis, 158.
[38] Bishop, *Joyce's Book of the Dark*, 160-1.

> What was thaas? Fog was whaas? Too mult sleepth. Let sleepth.
> But really now whenabouts. Expatiate then how much times we live in.
> Yes? (*FW* 555.01-04)

The narrative voice's semi-articulated tones evoke the utterances of someone mumbling in their sleep after being disturbed by a noise.[39] 'Expatiate' further suggests that the narrative is about to talk at length about the spaces and times which its subjects are 'really' living in. The relative lucidity and continuity of the imagery which follows suggests that HCE's semi-conscious mind is envisioning more defined versions, if not the day-world equivalents, of himself and ALP. This notion is present in the earliest drafts of the chapter which, as Finn Fordham points out, 'originally began with Shem waking from a nightmare about his giant father, then his mother reassuring him back to sleep'.[40] Following the noise which wakes her and her husband, Mrs Porter rises to investigate its source and discovers that little Jerry was disturbed by a nightmare of his father: '[y]ou were dreamend, dear. The pawdrag? The fawthrig? Shoe! Here are no phanthares in the room at all, avikkeen. No bad bold faathern, dear one' (*FW* 565.18-20). By suggesting that HCE is partly manifest as Jerry Porter's nightmare, which his alter-ego Shem records in writing, Joyce reinforces this parallel between HCE's dream-world and the Porter household.

However close to the waking world (as conceived by HCE's waking mind) this chapter may seem in comparison with the others, however, its articulations of space are as much distortive parodies of established visual laws as the *Wake*'s more disorienting scenes, including those involving the mutation of Shaun and the spaces around him in the previous chapters. III.iv was originally referred to in Joyce's notebooks as 'Shaun d', in which III.i-iv were originally Shaun a-d; and in a letter to Harriet Shaw Weaver, he referred to it as 'the last watch of Shaun'.[41] As the original naming of the chapter implies, Joyce continues to explore similar ideas concerning the mutability of geometric spaces and topographical boundaries associated with the growth of ⋀. Overlayed with the fantasies of HCE's

[39] Generally speaking, the narrative's movement between states of deep sleep and near-wakefulness throughout *Finnegans Wake* is reflected by an alternation between states of linguistic complexity, whereby Books II and III (being situated halfway through HCE's dream cycle) encompass the period of rapid eye movement and constitute the eye of the storm.

[40] Finn Fordham, *Lots of Fun at Finnegans Wake: Unravelling Universals* (Oxford: Oxford University Press, 2007), 15.

[41] James Joyce, 'Letter to Harriet Shaw Weaver, 10th October 1925', *Letters of James Joyce*, Vol. I of III, ed. by Stuart Gilbert (New York, NY: Viking Press, 1966), 234-235, 234.

lingering dreams, the interior and exterior spaces of the bedroom are projected with the variable spatial laws which these dreams continue to imply. As we shall see, the geometry of the bedroom is highly unstable: its borders engulf entire regions of Dublin and the globe, while also condensing ‘allspice’ [all space] into a ‘notshall’ [nutshell] (*FW* 455.29).

Throughout III.iv, amidst numerous digressions and interruptions (including the crying ‘[c]allboy’, for instance), Mr and Mrs Porter assume a variety of sexual positions in bed (*FW* 559.30). Their diverse sexual activities are observed and recorded by the four old men, who are embodied by the four bedposts. Mamalujo, or the deliberating narrator, demand to know what each bedpost can see from their point of view as the couple change positions. As in II.ii, in which Dolph and Kev must work together in order to picture images which they are denied, the four old men are asked about particular details which are provided by their respective viewpoints, which are unavailable to the interrogator: ‘what is the view which now takes up a second position of discordance, tell it please?’; ‘[i]s it not that we are commanding from fullback, woman permitting, a profusely fine birdseye view from beauhind this park?’ (*FW* 564.01-08). As Daniel Ferrer argues in ‘Wondrous Devices in the Dark: Chapter III.4’, the result ‘is less a kind of Kama-sutra than a voyeur’s handbook: the emphasis is not on the sexual experience of the participants but on the visual opportunities offered by each position’.[42] Less like the pornographic images offered by the mutoscope in ‘Nausicaa’, the images offered in III.iv are more akin to the textual topographies of ‘Wandering Rocks’, in which Joyce emphasises the parallactic discrepancies which arise between variant viewpoints in visual and narrative space.

As usual, Matthew is situated in the north, Mark in the south, Luke in the east and John in the west. The chapter is loosely divided into four sections (the fourth appearing as a short afterthought on the last page), and each section concerns a particular viewpoint. By observing Mr and Mrs Porter’s different sexual positions on the bed in this order (north, south, east, west) the narrative eye’s progressive movement between the bedposts marks out the sign of the cross, like Maria’s shopping trip in ‘Clay’, which frames the four apostles’ blessing of the marital bed. Narrative shifts between the bedposts’ viewpoints are indicated by the narrator’s interrogations, which are accompanied by the repetition of three

[42] Daniel Ferrer, ‘Wondrous Devices in the Dark: Chapter III.4’, *How Joyce Wrote Finnegans Wake: A Chapter-by-Chapter Genetic Guide*, ed. by Luca Crispi & Sam Slote (Madison, WI: The University of Wisconsin Press, 2007), 410-435, 433.

musical notes (C, E and the German "H"; or do, mi and si):

> [Matthew's post] Man with nightcap, in bed, fore. Woman, with curlpins, hind. Discovered. Side point of view. First position of harmony. Say! Eh? Ha! Check action. Matt. Male partly masking female. Man looking round, beastly expression, fishy eyes, paralleliped homoplatts, ghazometron pondus, exhibits rage. (*FW* 559.20-24)
>
> [Mark's post] Jeminy, what is the view which now takes up a second position of discordance, tell it please? Mark! You notice it in that rereway because the male entail partially eclipses the femecovert. It is so called for its discord the meseedo. (*FW* 564.01-04)
>
> [Luke's post] Third position of concord! Excellent view from front. Sidome. Female imperfectly masking male. (*FW* 582.29-31)
>
> [John's post] Fourth position of solution. How johnny! Finest view from horizon. Tableau final. Two me see. Male and female unmask we hem. (*FW* 590.23-24)

Although the four old men's tabulation of Mr and Mrs Porter's movements assumes their existence within a singular spatio-temporal continuum, the bedroom expands to include a variety of different spaces and times. Joyce disrupts a sense of teleology—as well as the order in which the bedroom's images would logically appear in geometric terms—by interspersing the bedposts' conceptions of the bedroom with micro-narratives relating to past and future versions of its copulating occupants. The '[c]hamber scene', which is said to occur in '[a] time', occupies a range of different times partly due to the way in which it, like HCE, absorbs multiple contexts (*FW* 559.01-17). As Philip Kitcher argues in *Joyce's Kaleidoscope*:

> We are offered a kaleidoscope of scenes, some apparently set in the bedroom and in this bed, some in the rooms above, and some in quite other locations. The time, too, is variable. HCE and ALP appear as young parents, calming the night fears of young children, and as much older, "wedded now evermore" (585:22), even on "their diamond wedding tour" (*FW* 578:32-3).[43]

Like the labyrinth, the kaleidoscope functions as a useful analogy for describing the *Wake*'s mutable spaces, and the way in which its scenes shift into one another through time. In

[43] Philip Kitcher, *Joyce's Kaleidoscope: An Invitation to Finnegans Wake* (Oxford: Oxford University Press, 2007), 233.

III.iv specifically, the properties of the kaleidoscope—or ‘collideorscape’—are manifested much more literally in the sense that the narrative eye is visually circumscribed within a field of mirror images, in which variant angles of light modulate in accordance the narrative eye’s act of wheeling around the bed as it assumes each bedpost’s viewpoint (*FW* 143.28). More generally, the kaleidoscope symbolises how the *Wake*’s spaces are recycled as they proceed through a Viconian wheel of time. Hanging around the interruption in which Mrs Porter consoles Jerry, there are a number of other similar instances in which present spaces merge into spaces of the future and the past. For example, the second sexual position (which is viewed by Mark in the south) is assumed after Mrs Porter leaves her bed to console her son (as described by Matthew) and yet before she enters Jerry’s bedroom. Mrs Porter’s period of sexual intercourse with Mr Porter, who initially appears to await alone in bed, must *a priori* happen either before she leaves her bedroom or after she returns, but it is not presented in this order. By merging Mark’s description of Mr Porter’s sexual activities with a digression concerning a parent consoling a frightened child, Joyce uses the room’s multiple spatio-temporal contexts to highlight the suggestions of incest and paedophilia which are associated with HCE (‘[w]hervolk dorst ttou begin to tremble by our moving pictures at this moment when I am to place my hand of our true friendshapes upon thee knee to mark well what I say?’), whereby Mr Porter’s consoling of Issy overlaps with ALP’s consoling of Jerry (‘[y]ou are tremblotting, you retchad, like a verry jerry!’) (*FW* 565.06-10). These apparent ruptures in the narrative sequence suggest that the variant sexual positions which the four old men record may have been undertaken over the course of a lifetime, as the parents developed from a young couple to ‘diamond wedding’ oldsters (*FW* 578.32-33).

The scene’s visual setting is equally fragmentary: the narrative eye travels between floors, through walls and beyond. It moves fluidly from Mr and Mrs Porter’s bedroom to other rooms including the children’s upstairs (‘[h]ere are two rooms on the upstairs, at forkflank and at knifekanter’), while also providing several sweeping, bird’s eye views of Dublin and environs (*FW* 561.01-02). The chamber scene is described as a ‘[s]hifting scene’ whose theatrical overtones highlight its spectacular nature: ‘[w]all flats: sink and fly. […] Room to sink: stairs to sink behind room’ (*FW* 560.04-06). Like theatrical wall flats, the interior of the bedroom is presented as an illusory structure which temporarily boxes out larger spaces. Joyce develops many of the ideas associated with the inflation of Yawn in the

previous chapter by presenting the geometric space of the bedroom as one which appears to change in size depending on the spatial context in which it is perceived. Like Stephen Dedalus’s extrapolation of his position in the universe through an incremental process of generalisation in *A Portrait of the Artist as a Young Man* (‘Stephen Dedalus / Class of Elements / Clongowes Wood College / Sallins / County Kildare / Ireland / Europe / The World / The Universe’)—or Bloom’s bed, whose positions of latitude and longitude are falsely recorded in ‘Ithaca’—, the bedroom expands to include larger spaces due to the four old men’s attempts at conceiving it within the context of more encompassing spatial boundaries (*P* 12). As a result, the bedroom consists of a series of worlds within worlds, or ‘odd’s without ends’ (worlds without end) (*FW* 455.17-18). As well as assuming the role of four bedposts, the four old men represent the four corners of a map which refers to a range of other territories; and Mr Porter, in his aspect as ⊓, plays the double role of Finn the Giant lying stretched from Howth Head to Phoenix Park, splayed from the eastern to the western horizons.

One example of this enlargening process occurs during Mark’s testimony. Looking from his southern post to the north, Mark describes what he can see during Mr and Mrs Porter’s second sexual position while simultaneously providing a topographical tour guide for Phoenix Park:

> Jeminy, what is the view which now takes up a second position of discordance, tell it please? Mark! You notice it in that rereway because the male entail partially eclipses the femecovert. It is so called for its discord the meseedo. Do you ever heard the story about Helius Croesus, that white and gold elephant in our zoopark? You astonish me by it. Is it not that we are commanding from fullback, woman permitting, a profusely fine birdseye view from beauhind his park? Finn his park has been much the admiration of all the stranger ones, grekish and romanos, who arrive to here. The straight road down the centre (see relief map) bisexes the park which is said to be the largest of his kind in the world. On the right prominence confronts you the handsome vinesregent’s lodge while, turning to the other supreme piece of cheeks, exactly opposite, you are confounded by the equally handsome chief sacristary’s residence. (*FW* 564.01-15)

Mark describes how Phoenix Park is bisected by Chesterfield Road, the ‘straight road down the centre’. Viewed from the south, the Viceregal (‘vinesregent’) Lodge would appear on its right and the Chief Secretary’s (‘sacristary’s) Residence on its left. Mark’s topographical guide to Phoenix Park is overlayed with a simultaneous account of HCE’s

‘beauhind’, as an ‘all frisko’ Mr Porter assumes what appears to be the missionary position with his wife (*FW* 564.17). If viewed from Mark’s southern bedpost, his behind—‘the largest of his kind in the world’—would be most prominent and appear above all else. Dividing HCE’s ‘supreme piece of cheeks’, the ‘straight road down the centre’ of Phoenix Park also forms the crack between his buttocks as well as a line which bisects (‘bisexes’) his and Mrs Porter’s sexual organs. Geographical and geological imagery is used to add particular details concerning HCE’s sexual encounters (‘’[t]is a tree story. How olave, that firile, was aplantad in her liveside’) as well as the marks on his backside which these encounters have left behind: ‘[t]he black and blue marks athwart the weald, which now barely is so stripped, indicate the presence of sylvious beltings. Therewithal shady rides lend themselves out to rustic cavalries’ (*FW* 564.21-26). The inked marks on the ‘weald’ as it is represented in an atlas are at once the bruises on HCE’s backside, which have undergone serious beatings. As is the case with Murphy’s tattoos and scars in ‘Eumaeus’, these epidermal markings are presented as proof that Mark’s tall tale is ‘a tree [true] story’. The added notion of lending oneself out ‘to rustic cavalries’ and undergoing ‘shady rides’ in the park suggests that these sexual beatings are related to HCE’s scandalous encounter with the three soldiers and the two women in Phoenix Park, as well as the fact that his ‘park’ has been visited by all sorts of strangers (‘stranger ones, grekish and romanos’). Mark also refers to a ‘relief map’ to illustrate his description of HCE’s park-like buttocks. As a representation of, amongst other things, ALP’s buttocks and the two hemispheres, the geometric diagram depicted in II.ii (fig. 4) would fit as a possible model for this ‘relief map’ of HCE’s behind, which also represents Phoenix Park’s two halves. The fact that a ‘relief map’, in the sense of a three-dimensional topographical model as well a map with shaded contours, is required suggests that HCE’s buttocks (like ALP’s in II.ii, which appear within the context of references to Yeatsian gyres, eggs, and other objects which are curved in three dimensions) protrude to such an extent that their mountainous elevations and depressions are depicted three-dimensionally, bursting out of and caving into frame. Further overlaps between the topographical features of Phoenix Park and HCE’s ‘bottomsside’ are developed after an interruption concerning the disturbed Porter children and a summary of the cast of *Finnegans Wake* (*FW* 565.23):

> O, pluxty suddly, the sight entrancing! Hummels! That crag! Those hullocks! O Sire! […] Lord of ladders, what for lungitube! Can you read the verst legend hereon? I am hather of the missed. Areed! To the dunleary obelisk via the rock

> vhat myles knox furlongs; to the general’s postoffice howsands of patience; to the Wellington memorial half a league wrongwards; to Sara’s bridge good hunter and nine to meet her: to the point, one yeoman’s yard. (*FW* 566.28-567.04)

HCE’s penis—‘a buntingcap of so pimky on the point’—becomes the Dunleary Obelisk which can be seen for furlongs; his buttocks appear as ‘hummels’; the crack in between constitutes a ‘crag’; his bollocks are identified as ‘hullocks’; and his expanding lungs appear to be the source of Phoenix Park’s shocking longitude. In his reading of the map of Phoenix Park, therefore, Mark simultaneously provides a topographical reading of HCE’s body as well as an interpretation of the stories suggested by its signs.

The four old men’s desire to extrapolate their subjects’ bodily features to wider, more encompassing contexts is highlighted more generally when they focus their attentions on phenomena which emanate from beyond the bedroom’s walls. For instance, as he looks and listens from the east, Luke notices ‘the dullakeykongsbyogblagroggerswagginline’: the Kingstown (Danish: *kongsby*) and Dalkey railway which travels east to Blackrock (*FW* 582.32). John, on the other hand, who looks from west to east, expands the contents of his testimony to include the movement of planets and stars. Sighting ‘[d]awn!’ as the sun rises through the bedroom’s eastern window towards the end of the chapter, John proceeds to describe his ‘[f]inest view from horizon’ (*FW* 590.23). Luke’s scope is equally astronomical. Gazing above and further into the Western night sky, he describes the arcs (‘arx’) of HCE’s heaving arse with reference to the curves described by celestial orbits and bodies: ‘by the lee of his hulk upright on her orbits, and the heave of his juniper arx in action, he’s naval I see’ (*FW* 583.01-03). ALP, in this context, becomes a ‘fairy setalite’ which is ‘[c]asting’ (cast in) HCE’s ‘shadows’: ‘O, O, her fairy setalite! Casting such shadows to Persia’s blind!’ (*FW* 583.14-15). ALP’s orbits, along with the dawning illuminations symbolised by the sun rising ‘up in the east’, combine to evoke the increasingly widespread rumours concerning HCE’s alleged sexual crimes: ‘[p]hotoflashing it far too wide. It will be known through all Urania soon. Like jealousjoy titaning fear; like rumour rhean round the planets; like china’s dragon snapping japets; like rhodagrey up in the east’ (*FW* 583.15-18).

Conversely, the space of the bedroom also contracts into deeper interior cavities, thus

inverting the relationship between inner and outer space in a similar way to those associated with Yawn's body in III.iii. The fleshly tones of the bedchamber's 'salmonpapered walls' evoke those of a vaginal chamber, as do the bedroom's contents which include the 'strawberry bedspread' (which further locates Mrs Porter's body within the larger context of Strawberry Fields in Chapelizod) and a 'man's gummy article, pink' (*FW* 559.02-16). The four old men, in this context, become ALP's four 'pussycorners' as in the rhomboid described by AλPπ in the diagram on page 293 (*FW* 555.11). If '[a]llspace' is condensed into a '[n]otshall' in this '[c]hamber scene', then it seems to converge into Mrs Porter's 'chambrette' (*FW* 455.29; 559.01; 561.35). In this light, the varying chords which accompany the four old men's visualisations can be understood as an example of 'chambermade music' (chamber music) in multiple senses; as is the case in 'Penelope', in which it refers to Molly's urine tinkling in her chamber pot (*FW* 184.04). This corporeal dimension to the bedroom is illustrated by the 'blackout', for example, which occurs after Mrs Porter leaves to console her crying child. Given the absence of the chamber in which the scene takes place, it temporarily sinks away and shrinks from sight: '[r]oom to sink: stairs to sink behind room' (*FW* 560.05-06).

If the cubical bedroom is '[b]oxed', as are the cubes described by the four-poster bed and ALP's 'box' which are contained inside, then it is essentially a box within a box; or a series of boxes within boxes (*FW* 559.01). In light of the bedroom's overlapping inner and outer spaces, this image evokes a similar structure to that of a tesseract, or four-dimensional hypercube, which contains eight cubes whose corners are connected by fourth-dimensional axes (fig. 12). Margaret Solomon argues that *Finnegans Wake* contains a number of other allusions to four-dimensional hypercubes—particularly those which are envisaged by the four old men and the box which their quadratic siglum (X) describes—such as the 'cubehouse' and '*The Coach With The Six Insides*' (which contains further connotations of interior bodily spaces, with 'sex insides').[44] In *Joyce's Book of the Dark*, John Bishop also sheds light on Joyce's direct allusion to the 'tesseract' in I.iv (*FW* 100.35):

[44] Solomon, 113-129.

> when bed, walls, and “room whorled” away and vanished in sleep, a dimensionless “worldroom beyond the roomwhorld” opened up (100.29), there to reveal “the canonicity of his existences as a tesseract (100.34-5). Since “a tesseract is a four-dimensional hypercube that cannot be graphically represented in three-dimensional space,” the phrase advises us that the *Wake*, because sleep does, necessarily takes place in a spatiality that has little in common with the three dimensions everywhere evident in the masonry of the Daily World. Sustained parts of the book unfold in the “fourdimmansions” of a “newwhere” (367/27, 155.12; 467.23) whose “space-element” is one of “Length Withought Breath, of him, a chump of the evums” (164.33, 261.13-14).[45]

Joyce not only suggests a fourth dimension to HCE’s form in this passage concerning ‘the worldroom beyond the roomwhorld’, but further suggests that its spaces are created by the body’s breathing and venting of language, whereby linguistic distortions evoke spatial distortions and inversions (as in the echoing phrase ‘bauchspeech in backwords’) (*FW* 100.28-29). By presenting the walls of the bedroom and of Mrs Porter’s roomy bodily interiors as containers of other spaces in III.iv, Joyce develops this notion by evoking a room whose theatrical façades and fleshly linings conceal ‘a worldroom beyond the roomwhorld’; i.e.: another space (*Ge. Weltraum*) or world within a room beyond a (syntactically and visually) mirroring equivalent (or Looking-glass world). The extent to which the concept of the fourth dimension influenced the composition of the *Wake* more generally is suggested in the fact that, as S. B. Purdy points out in ‘*Finnegans Wake* and the Gnosis of Science’, Joyce told Eugene Jolas that his *Work in Progress* involved a ‘pansymbolic panlinguistic synthesis in the conception of a 4D universe’.[46]

[45] Bishop, *Joyce’s Book of the Dark*, 147.

[46] S. B. Purdy, ‘Let’s Hear What Science Has to Say: *Finnegans Wake* and the Gnosis of Science’, *The Seventh of Joyce*, ed. by Bernard Benstock (Bloomington, IN: Indiana University Press, 1982), 207-218, 214.

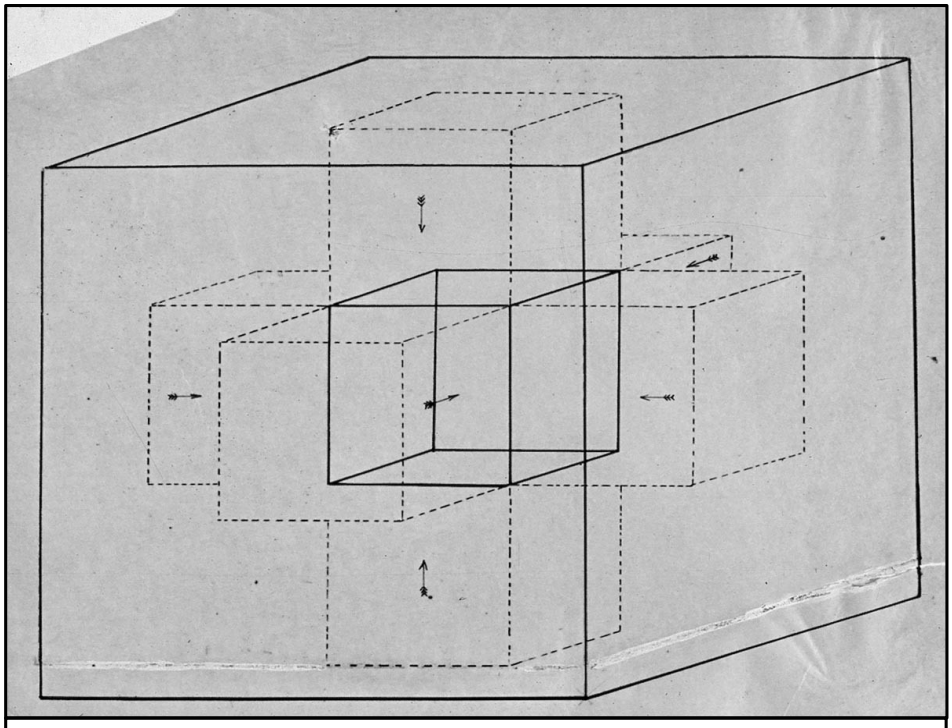

Fig. 12: Theo van Doesburg, *Tesseract With Arrows Pointing Inward*, c. 1824-1825. Indian ink, red ink and gouache on transparent paper. Photo: Netherlands Architecture Institute, Rotterdam.

Joyce thus invokes a ‘myrioscope’ of alternating visual concepts within the bedroom’s shifting regions, and throughout the chapter he demonstrates how the mobile subject’s visual perspective can become enhanced or complicated as it modulates between four criss-crossing viewpoints (or when space is viewed in ‘fourdimmansions’) (*FW* 127.35; 367.27). By mediating the scene’s fluctuating spatio-temporal dimensions through the apparently fixed viewpoints of the four bedposts, which remain fixed in their original positions as Mr and Mrs Porter assume different sexual positions across many years, Joyce also explores the notion of parallactic shift. Particular corporeal, topographical and celestial features relating to the Porter parents’ bodies only become available when a shift in viewpoint occurs, or when their bodies move in relation to a bedpost’s relatively fixed viewpoint. As discussed above, for example, ‘a profusely fine birdseye view’ of Mr Porter’s buttocks and the two sides of Phoenix Park is unavailable to the narrative eye as it is fixed to Matthew’s viewpoint, which lies closer to Mr Porter’s face (*FW* 564.07-08). This viewpoint later becomes available, however, when the narrative shifts its focus to Mark’s perspective and as Mr Porter moves to the ‘second position of discordance’ (*FW* 564.01-03).

Beyond Joyce’s evident preoccupation with the visual in III.iv, the bedroom’s diverse spatial dimensions are accompanied by an equally rich aural dimension. In ‘Wondrous Devices’, Daniel Ferrer argues that the ‘dense vocal polyphony’ of ‘Shaun d’ functions on an even more complex level than ‘Sirens’.[47] Discussing the genetic development of ‘Shaun d’, Ferrer demonstrates how the chapter’s overbearing visual dimension was initially absent from early drafts, and how an emphasis on the visual was introduced gradually as the chapter developed:

> On the first page of the first draft there is absolutely no visual element. We simply hear a succession of voices in the deep of the night: the sleepers, the crying child, the consoling mother. Then, abruptly, a very different voice intrudes: a travel guide, a kind of Baedeker, describing the amenities of Chapelizod/Lucan […].
>
> What is immediately noticeable is the progressive expansion and hypertrophy of the optic dimension. On the draft pages immediately following there is a proliferation of the words “see,” “look,” “watch,” “leer,” [...].[48]

Although the four old men’s visualisations of Mr and Mrs Porter were, by extension, introduced in later drafts of the chapter, the idea of having them as bedposts associated with the musical notes C, E and H (or do, mi and si) was conceived much earlier. This terpsichorean system formed a foundational part of the chapter’s dense polyphonic soundscape, while its association with Mamalujo’s variant viewpoints was introduced at a later stage. This musical element to the four bedpost’s conceptualisations is explored at the end of the preceding chapter (‘Shaun c’) and it initially appeared in ‘Haveth Childers Everywhere’, which was published before Joyce completed the final drafts for ‘Shaun d’. Speaking through the medium of Yawn, HCE’s spectre discusses ALP, his ‘bestpreserved wholewife’, and how:

> I introduced her (Frankfurters, numborines, why drive fear?) to our fourposter tunies chantreying under Castrucci Sinior and De Mellos, those whapping oldsteirs, with sycamode euphonium in either notation in our altogether cagehaused duckyheim on Goosna Greene, that cabinteeny homesweetened through affection’s hoardpayns (First Murkiss, or so they sankeyed. Dodo! O Clearly! And Gregorio at front with Johannes far in back. Aw, aw!), gleeglom there’s gnome sweepplaces like theresweep Nowhergs. (*FW* 533.04-23)

[47] Ferrer, 421.
[48] Ferrer, 421-2.

HCE forecasts (or recalls) how the four old men (*eins, zwei, drei, vier*; 'Myrkiss […] O Clearly […] Gregorio […] Johannes') become 'fourposter tunies': tunes emanating from the four 'chantreying' posters of a bed, which are all singing in key ('sankeyed'). According to McHugh, chantries (the singing of Mass) were traditionally sung by four priests in sixteenth-century Dublin.[49] As the four singing bedposts-cum-priests, they are described as 'whapping oldsteirs': whopping oldsters who are made of old stairs, and who are as old as Whapping Old Stairs. The type of wood with which they are made, 'sycamode euphonium', is also unique: a composition of sycamore and musical modes. Moreover, the bed which the four posts describe is a boxed, caged or cage-worked ('cagehaused') 'duckyheim', i.e.: an Ibsenian doll's house *(Et Dukkehjem*) or timber house. As a doll's house, the house which cages the bed is one in which a roving eye is able to move through walls and between floors. Joyce's early allusions to III.iv are thus indicative of the ever-present role which the production of sound and music plays in the four bedposts' visualisations of Mr and Mrs Porter's sexual positions as they are rendered in the chapter's final draft.

Whenever the narrative voice in III.iv shifts its focus to a different bedpost and sexual position, three musical notes, as we have seen, appear in a different order: "H" or "si" (as in 'Ha!', 'see' and 'si'); "C" or "do" (as in 'Say!', 'do' and 'to'); and "E" or "mi" (as in 'Eh?' and 'me') (*FW* 559.21-590.24). Joyce refers to both the fixed do system of solmisation as well as German musical nomenclature, where H would equate to B natural (and A to B flat). By referring to both systems, Joyce disrupts the regularity of the signs which are attributed to each note. 'H', for instance, denotes a different note to what is originally A, whereas sounds like 'see' and 'si' are referrable to both C and to H (si). The different 'positions'—of 'harmony', 'discordance', 'concord' and 'solution'—signify the couple's changing sexual positions in bed as well as the progressive movements of these notes along a C scale (*FW* 590.23-599.21). The chord EHC, for instance, is discordant, while the initial and final chords CEH are harmonic. The overall structure of this progression is CEH (Matthew), EHC (Mark), HCE (Luke), CEH (John), in which the first note appears last in each following instance. These letters, of course, spell out the different permutations of the letters in HCE; much like the musical notes "H" and "E" or "mi" constitute the letters of SHEMUS in I.iv (*FW* 124.21-27). H, C and E are spelled out

[49] McHugh, *Annotations to Finnegans Wake*, 533.

‘bauchwords’, in the sense that they appear in different orders—‘back to bach’—and employ the German musical nomenclature to spell out the letters of a name, as Johannes Bach is accredited to have done with his signatory use of criss-crossing clefs to signify keys in B, A, C and H (*FW* 287.06).[50] In this light, the four old men become the choristers of *Passions.* The notes H, C and E also indicate the changing positions of HCE’s body if we regard HCE in light of his aspect as a geometric object, as with the triangle ‘hce che ech’ in II.ii (*FW* 284.01). Daniel Ferrer argues that ‘[e]ach of the literal (and musical) permutations of the initials will be associated with a numbered position, referring not to the Terpsichorean classification but to a repertoire of erotic postures’.[51] Although these musical permutations do relate to the shifting position of HCE’s body in relation to ALP’s, they also partially refer to the positions of the onlooking bedposts. As Joyce illustrates in the passage above, Mamalujo are ‘chantreying […] oldsteirs’ (*FW* 533.16-17). This implies that the musical accompaniments to the changing sexual positions and viewpoints in III.iv are partly produced by the singing of the bedposts, as well as the sounds created by Mr and Mrs Porter. By using the musical permutations of the notes H, C and E to describe the Porters’ changing sexual positions, as well as the positions of the bedposts which view them, Joyce modulates the narrative’s variant lines of sight through the movement of notes along lines in a bar of music. Similar to the overlapping soundscape and landscape of ‘Sirens’, the order in which particular sounds unfold embodies the geometry of its images, as well as the topographical viewpoints from which its deviant images are recorded.

The different permutations of the notes H, C and E are accompanied by repeating syntactical patterns within the bedposts’ opening sentences concerning the relative positions of ‘male’ and ‘female’. Apart from Luke’s testimony, these references to ‘male’ and ‘female’ are preceded by a naming of the relevant bedpost: ‘Matt.’, ‘Mark!’ ‘johnny!’ (*FW* 599.22; 564.02; 590.23).[52] By echoing the varying structures of the chord progression HCE within these opening references to male, female and their observer, Joyce uses the order in which its individual notes appear to evoke a particular visual angle or line of sight, in which the first note is associated with the bedpost in question (although in Luke’s case this is unclear). Matthew’s ‘First position of harmony’, which is viewed from the North, is

[50] Axel Englund, *Still Songs: Music In and Around the Poetry of Paul Celan* (Surrey: Ashgate, 2012), 43-44.
[51] Ferrer, 433.
[52] This discrepancy is highlighted in *FWEET*: ‘erroneously missing 'Luke!' equivalent, similar to [559.22] [564.02] [590.23]’ (Raphael Slepon (ed.), *The Finnegans Wake Extensible Elucidation Treasury* <http://www.fweet.org>, elucidatory note for *FW* 582.30 [date accessed: 04/01/16]).

accompanied by the chord CEH (‘Say! Eh? Ha!’), or do-mi-si :

> Man with nightcap, in bed, fore. Woman, with curlpins, hind. Discovered. Side point of view. First position of harmony. Say! Eh? Ha! Check action. Matt. Male partly masking female. Man looking round, beastly expression, fishy eyes, paralleliped homoplatts, ghazometron pondus, exhibits rage. (*FW* 559.20-24).

In this case, the first note, C, lies closest (syntactically, aurally and visually) to ‘Matt’; the second note, E, relates to the position of the ‘male’; and the final note, H, to that of the partially occluded female. Joyce illustrates the proximity of Matthew’s bedpost to Mr Porter’s head (rather than his bottom, as is the case with Mark in the South) by focusing on details concerning the male’s upper body and facial expressions, including his geometrically perfect, parallel lips and parallelepiped shoulder blades. The female is partly masked for she lies on the south-western side of the bed, and the male—who lies on the north-eastern side—partially blocks Matthew’s line of sight. From Mark’s northern point, Mrs Porter would be partially occluded by her apparently huge husband, who possesses a ‘ghazometron pondus’, or weight. The visual ‘masking’ of the female is illustrated through the image of her ‘curlpins’, which are her only noticeable features in this initial lying position. Her facial expression only becomes discernible once she sits upright after hearing Jerry’s cry from afar: ‘[w]oman, sitting, looks at ceiling, haggish expression, peaky nose, trekant mouth, fither wight, exhibits fear’ (*FW* 559.26-28). The opening passage thus evokes the image of the couple initially lying side to side with their heads pointing north-west.

Mark’s ‘second position of discordance’ (which is viewed from the South), is accompanied by the chord EHC, or mi-si-do (‘meseedo’):

> Jeminy, what is the view which now takes up a second position of discordance, tell it please? Mark! You notice it in that rereway because the male entail partially eclipses the femecovert. It is so called for its discord the meseedo. (*FW* 564.01-04)

As Joyce illustrates in the extended description of HCE’s ‘beauhind’ and Phoenix Park which follows, male and female assume the missionary position. The first note, E, is syntactically associated with Mark’s ‘rereway’ point of view in the south; the second note,

H, is associated with the ‘male entail’ while the final note, C, coincides with the ‘femecovert’, or covered female. Given that the body of the ‘female’ is covered by that of the male, whose buttocks engulf Mark’s point of view, the male’s features appear above and before the female’s.

Luke’s ‘[t]hird position of concord’, (which is viewed from the East) is accompanied by the chord HCE, or si-do-me (‘[s]idome’):

> Third position of concord! Excellent view from front. Sidome. Female imperfectly masking male. (*FW* 582.29-31)

Luke’s ‘[e]xcellent view from front’ approaches the Porter parents side on—‘[s]idome’—as they prepare to engage in a sodomitic cricket match: ‘[t]he game old merrimynn, square to leg, with his lolleywide towelhat […], treading her hump and hambledown like a maiden wellheld, ovalled over, with her crease where the pads of her punishments ought to be by womanish rights’ (*FW* 584.14-20). The female is either sitting on top of the male, or else the male approaches her ‘side on’. In any case, the female is ‘imperfectly masking’ the male. If we attribute the first note, H, to Luke’s post, then the middle ‘C’ would emanate from the female who initially occludes the male at point ‘E’.

John’s ‘[f]ourth position of solution’, which is viewed from the west, is accompanied by the CEH, or do-mi-si (‘Two me see’), which mirrors the chord of the ‘first position’:

> But Jumbluffer, bagdad, sir, yond would be for a once our all honoured christmastyde easteredman. Fourth position of solution. How johnny! Finest view from horizon. Tableau final. Two me see. Male and female unmask we hem.’ (*FW* 590.20-24)

As the final position of ‘solution’, John’s scene implies both a musical solution to a chord progression as it has passed through different phases of discord and concord, as well as a chemical solution of bodily fluids. It also denotes the action of separating or breaking away, which occurs visually as male and female return to their original positions at the end. As the mirroring CEH chord implies, ‘male and female’ have resumed a similar position to the ‘[f]irst position of harmony’ in which they lie side to side, with their heads pointing north-west and their feet pointing south-east (*FW* 559.21). In this case, however, the note

“C” is attributed to John’s post in West, “E” to the male and “H” to the female.

Despite its cumulative endeavour to ‘unmask’ the couple, to ‘discover’ (or uncover) their entire bodies and to visualise them from all sides, the narrative’s referral to Mamalujo’s criss-crossing viewpoints occludes certain choice images, or prevents them from being revealed at all (*FW* 590.24; 559.21). This is partly due to the unreliability of their testimonies. Each bedpost’s narrative, to a certain degree, entails a figurative inflation and mythification of what it can actually see; and the others—as well as the roving narrative eye—can do little else but take what they are told for ‘grant it’ (566.32). Mark, for instance, proclaims the gargantuan size of HCE’s ‘hullocks’ and other lower-body features, yet the perceived immensity of their proportions stems partly from a sense of shock or fear (as is the case with Mamalujo’s description of Yawn in the opening of III.iii): ‘[f]ear you the donkers [dark (Du., *donker*)]? Of roovers [Or robbers (Du.)]? I fear lest we have lost ours (non grant it!) respecting these wildy parts. How is hit finister! How shagsome all and beastful!’ (*FW* 566.29-33). Luke, on the other hand, seems to be boasting: although he proclaims to have an ‘[e]xcellent view’, the male is ‘imperfectly [masked]’ (*FW* 582.31). John, too, asserts that he has the ‘finest view from horizon’, in which he can see both of them (‘[t]wo me see’) (*FW* 590.23-24). However, the musical nomenclature associated with John’s perspective suggests that, although ‘male and female’ are lying side by side as they do in Matthew’s testimony, they have switched positions. In both John’s and Matthew’s perspectives, ‘E’ is attributed aurally and syntactically to the male, who lies closer to the bedpost in question, and ‘H’ to the female, who lies further away. If John is situated in the west and the couple are lying, as they did originally, with their heads resting in the north-west and their feet pointing south-east, then the male would be situated closest to John. The female, moreover, would be situated ‘hind’ the male and ‘partly [masked]’ by him (*FW* 559.20-22). This is further indicated in the particular attention which John pays to the details of HCE’s upper-body features (at the expense of ALP’s), which also characterises Matthew’s opening description, including his breath (‘[w]ho now broothes oldbrawn’), the nape of his neck and his scalp (‘[t]he nape of his name-shielder’s scalp. Halp!’) (*FW* 590.25-26). On a geological level, HCE’s scalp represents the Scalp (a pass in Barnaslingan, south of Dublin) which contains, partially conceals or leads to the Alps of ALP. Therefore, the female remains partially occluded by the male from all perspectives due to the narrative’s insistence on shifting to another compass bearing as the copulating

couple change position. Ironically, the narrative interrogator would have a better chance of conceiving ALP's 'discovered' features if it were to remain fixed to any of the four bedposts for the duration of the sexual cycle (*FW* 559.21). Indeed, in Matthew's viewpoint the female's facial expression is momentarily revealed due to the fact that the couples change position while the narrative eye remains fixed to Matthew's post. This relates to Bruno's discussion of the idea that the surfaces of certain celestial bodies, like the moon, can never be viewed in their entirety directly from the Earth given the relative motions of both orbs in relation to each other. This concept is further illustrated when the couple are initially 'discovered', in which Joyce alludes simultaneously to the uncovering of the bedsheets ('male and female unmask we hem') and 'discovered check' in chess ('[d]iscovered. […] Check action') (*FW* 559.21-24). Discovered check arises when the movement of a covering piece would put the King in check. Like a covering chess piece or planet, HCE thus eclipses ALP in the first and the final positions, CEH.

The concept of '[d]iscovered […] [c]heck' forms part of the larger chess motif which Joyce develops in Matthew's testimony, alongside the Terpsischorean chord motif (*FW* 559.21-22). The chessboard provides a symbolic framework within which the narrative's inter-medial mapping of the bedroom's sounds and images are harmonised. During the 'first position of harmony', Mr and Mrs Porter are described as chess pieces or players, and their sexual movements are translated into corresponding movements on a chessboard: '[c]heck […] Matt. (checkmate); 'her move'; '[h]uff!' (the removal of a piece in chess or checkers); 'hopped a nanny's gambit'; '[h]is move. [b]lackout' (black out); '[s]pill playing rake and bridges' (still / *spiel* playing rooks and bishops); 'two pieces'; 'it will pawn up a fine head of porter'; '[t]he castle arkwright put in a chequered staircase'; 'are they stalemating' (*FW* 559.21-560.11). Joyce's use of chess imagery to describe Mr and Mrs Porter's musically accompanied sexual play alludes to a Pythagorean sense of mathematical harmony between the structure of music and the orchestration of the cosmos. As Frank Blick puts it in 'Renaissance Aesthetics and the Harmony of Discord', a game of chess can be understood as a symbol of the octave as it 'takes place on a Pythagorean, harmonically based ground of 64 (the squares), 32 (the total pieces), 16 (the pieces per side), 8 (the pieces in each row), 4 (4 rows of pieces) and 2 (the opposing armies)'.[53] In III.iv, this ratio

[53] Frank Blick, 'Renaissance Aesthetics and the Harmony of Discord: Pythagorean Symbolism in Chess and the Octave' <https://www.academia.edu/2050380/Renaissance_aesthetics_and_the_harmony_of_discord> [date accessed: 04/01/16].

is alluded to during ALP's 'move', in which she leaves to climb the 'chequered staircase' and console Jerry: 'in eight and eight sixtyfour she was off, door, knightlamp with her, billy's largelimbs prodgering after to queen's lead' (*FW* 559.35-560.01). Convinced that an ontological similitude existed between the mathematical composition of music and the solar system, Pythagoras applied the octave's 'eight and eight sixtyfour' ratio to the relative positions and orbits of celestial bodies, in which the spaces 'betune the spheres' are arranged in accordance with these ratios (*FW* 426.25). Pythagoras's idealistic conception of a universal harmony between the languages of geometry, mathematics, music and the cosmos is also reflected within the four old men's attempts at extrapolating HCE's and ALP's every feature and motion in light of ever-expanding contexts. The process of expansion which the bedroom and its contents undergo—in which buttocks transform into parks, scalps into mountain passes and bodies into planets—relates to an expansion in methodological terms. As Pythagoras applied mathematical and musical practice to unproven cosmological theory, so too do the four old men proceed 'energetically' from 'the unknown to the known' in their mystifying documentations of Mr and Mrs Porter's sexual activities (*U* 17.1012-1020).

By evoking the visible motions of Mr and Mrs Porter through a series of chord progressions; translating their bodily motions into the precise movements of chess pieces; and highlighting a Pythagorean cosmic unity between the movement of heavenly bodies and phonic vibrations, Joyce forms a looping chain of inter-related spatial and temporal constructs whose intermediality is such that the question of '[w]here [we] are' cannot be answered without first knowing one's '[w]henabouts' (*FW* 558.33). Joyce's verbal and visual play with the sense of various playful activities—including theatrical play, musical play and sexual play—opens up entirely new spaces for representing the sensible world polymedially. In her introduction to *Making Space in the Works of James Joyce*, Bénéjam elaborates on the relationship between play—more specifically, joking—and the creation of spaces in *Finnegans Wake.* She points out that '[i]n the "Ondt and Gracehoper" fable of *Finnegans Wake*, Joyce reverts several times to the phrase "making spaces," eventually letting us hear the "making spass" from which it evolves (from the German *Spaß machen*, to joke, to make fun of'.[54] Bénéjam also draws attention to the fact that, '[r]evealingly, the space (or *Spaß*, fun) made is always plural ("making spaces" as one would make faces

[54] Bénéjam, 3.

[...])’.[55] In III.iii, as we have seen, Joyce’s play with visual and aural signs engenders the expansion of ‘doubleviewed’ spaces within the bedroom and beyond (*FW* 296.01). In the geometry section of II.ii, moreover, Joyce explores how the mathematical games and free play of geometric axioms practised by the children—which leads to their discovery of humankind’s progenital geometric origins at ALP’s source—can engender entire traditions and civilizations. Johan Huizinga explores the crucial impact which playing has had on the course of western civilization in *Homo Ludens*, in which he asserts his belief ‘that civilization arises and unfolds in and as play’; and ‘that next to *Homo Faber*, and perhaps on the same level as *Homo Sapiens*, *Homo Ludens*, Man the Player, deserves a place in our nomenclature’.[56] This notion is especially prevalent in II.ii and ‘Ithaca’, in which Joyce explores how the subjective free play with original geometric assumptions (or, as Derrida puts it, the objectivist treatment of science as ‘a skill or game’) can result in the proliferation of geometric traditions—and, by extension, tools for building, mapping and civilizing our world—which are founded on buried uncertainties. Joyce’s own play with geometric signs in *Finnegans Wake* enters into his more encompassing play with figurative language as a means of representing the sensible world polymedially. In III.iv, his representation of the visual world through related non-visual systems invokes the common diegetic ground between the sounds of musical play, the workings of Pythagorian ‘trigamies’ (trigonomical games), the playing of chess, as well as the tactile motions of human bodies which are at play in a theatrical performance involving larger cosmic forces (*FW* 300.26).

Although Pythagoras’s ideals are very much in tune with Mamalujo’s attempts at incorporating multiple aspects of the bedroom and the universe (both aural and visual) within their expansive tabulations, the visual distortions and aural cacophonies which describe the bedroom often disrupt the very idea of a universe. The bedroom, as we have seen, contains other dimensions and spaces (an idea illustrated in the image of ‘a worldroom beyond the roomwhorld’), and it is often impossible to draw the line between what occurs in the bedroom and the spaces which are aroused by its sleeping protagonist’s mind (*FW* 100.29). As the interrupting narrator in II.ii states, ‘you must, how, in undivided reawlity draw the line somewhawre’, yet the reality of the *Wake* is spliced across numerous

[55] Bénéjam, 3.
[56] Johan Huizinga, ‘Foreword’, *Homo Ludens: A Study of the Play-Element in Culture* (1944; repr. London: Routledge, 1949), ix-x, ix.

times and spaces (*FW* 292.31-32). The line between the world of waking and of sleeping reality in *Finnegans Wake* is uncertain, as is the act of drawing a straight line in the first place given the many geometries which the *Wake* contains. While Pythagoras argued that the structures of sound and of planetary orbits combine to provide a universal harmony in the cosmos, Joyce, by contrast, presents a cacophony of sounds and a 'collideorscape' of jarring images which combine to evoke an unstable conception of the sensible world both micro- and macrocosmically (*FW* 143.28). While the mathematical laws of sound and space are as much intertwined in the *Wake* as they are in Pythagoras's conception of a universally harmonised cosmos, the *Wake*'s deviant sounds and images project a chaosmos in which one finds oneself constantly 'lusosing the harmonical balance' between previously established points in time and space (*FW* 426.28). This is one of the conclusions drawn by the decipherer of the letter in I.v who, after cursing in multiple tongues and musical notes ('Soferim Bebel'), concludes 'that […] every person, place and thing in the chaosmos of Alle anyway connected with the gobblydumped turkery was moving and changing every part of the time' (*FW* 118.18-23). Umberto Eco discusses this notion in relation to the rhizome, arguing that '[n]o one can provide a global description of the whole rhizome; not only because the rhizome is multidimensionally complicated, but also because its structure changes through the time'.[57] The spatial and temporal relationships between the *Wake*'s characters, places and objects are 'moving and changing every part of the time', in abeyance with the 'fluxion' of the text's linguistic and monadic 'Adams', and in III.iv this confounds the four singing bedposts' attempted tabulations of the Porters' moving body parts onto a stable timeline or topography. (*FW* 313.12; 297.29). Mamalujo's confused voices appear within and create a variety of spatio-temporal contexts, contributing to the production of a 'melomap', that is, a map of music and limbs (Gr.: *melos*) (*FW* 042.15). Similar to the textual topographies of *Ulysses*, in which the city and the body are seen and heard only in parts (as is particularly the case with Molly, for instance, whose 'mellow yellow smellow melons', 'melonous [hemispheres]' and other curves are only ever partially revealed), the melodious mappings of bodies and larger realms which Joyce provides in III.iv involve a fragmentation of spatial and temporal coherence, whereby the Porters' three-dimensional bodily members must be literally remembered by going backwards or forwards through time (*U* 17.2241-2). In this sense, Joyce presents time (which is no mere 'sorrogate' for spatial form in literature, as discussed

[57] Eco, 81-82.

in see chapter three) as the fourth dimension of space in the *Wake*'s 'multidimensionally complicated' multiverse (*FW* 149.29).[58] By moving backwards and forwards through the *Wake*'s different times, we uncover new perspectives for understanding the spaces in which their points are drawn.

Conclusion

In response to the Letter's Penman, who is said to return from exile after 'his last public misappearance, circling the square', the four interpreters of the Letter—who 'rede […] its world' by appropriating quadrilinear perspectives and deriving quadratic forms—endeavour to square the circle (*FW* 186.11-12; 018.18-19). While Shem's body-writing involves transcribing the geometrics of textual matter (lines of text; quadrilinear page space; the quadrivium of title, footnotes, and oppositional margin notes) onto the 'cyclewheeling' surface of his skin, Mamalujo's endeavours to tabulate the *Wake*'s history like the Four Masters and to derive a topography of its locales involve an inverse process of projecting variably curved phenomena onto the virtual dimensions of the Euclidean plane, the Cartesian grid and the page (*FW* 186.02). In 'Space in *Finnegans Wake*: An Archeology', John Bishop discusses the tabulation of the *Wake*'s page space with regard to the project of the four old men. He argues that Mamalujo represent 'not only orthogony and quadrature (and the demiurgic mathematicization of space), but also the quadratic structure of the page itself (the Four Old Men [...] bear textual history, law, and Word), and so the space of writing and inscription, culture and building'.[59] As explored in chapter one, Mamalujo's textbook on trivium and quadrivium in II.ii is rectilinear not only in form but also in content: it teaches Dolph and Kev to geometrise space through the senseless application of Euclidean figures, and implies such unidirectional and corrective modes of thought as those satirised by Bruno in his dialogues and plays. As with Dolph and Kev's attempts to map ALP in II.ii, Mamalujo's attempts to impose the quadrilinear boundaries of the page and the Cartesian grid described by their siglum (X) throughout *Finnegans Wake* are at odds with the variably curved dimensions of their corporeal and topographical subjects.

[58] Eco, 82.
[59] John Bishop, 'Space in *Finnegans Wake*: An Archaeology', *Making Space in the Works of James Joyce*, ed. by Valérie Bénéjam & John Bishop, 20-37, 27.

The combined ideals of squaring the circle and circling the square recur throughout *Finnegans Wake* and, as Joyce endeavoured to have Harriet Shaw Weaver believe, they inform the *Wake*'s overarching structure: 'I am making an engine with only one wheel. No spokes of course. The wheel is a perfect square. […] so you must not think it is a silly story about the mouse and the grapes. No, it's a wheel, I tell the world. *And* it's all *square*'.[60] The four-part Viconian structure of the *Wake* describes a square or a box such as that represented in the siglum for *Finnegans Wake* (□) as well as a historical wheel. Images associated with the squaring of the circle are evoked in III.iv, in which the narrative eye is fixated with Mamalujo's four corners of the bed as well as its circular rotation around them (*FW* 296.01). The circularity of the narrative's criss-crossing viewpoints in III.iv is highlighted at the end of the chapter, which implies a Viconian cycle and a cyclical call for orders within the essential structure of its quadratic structure: '[t]iers, tiers and tiers. Rounds' (*FW* 590.30). In the following and final chapter of *Finnegans Wake*, the *Wake* is described as '[o]ur wholemole millwheeling vicociclometer, a tetradomational gazebocroticon (the "Mamma Lujah" known to every schoolboy scandaller, be he Matty, Marky, Lukey or John-a-Donk)' (*FW* 614.27-30). In this passage, the *Wake*'s cycling, Viconian structure is described as being simultaneously four-sided, four-dimensional and conceived from the perspectives of four priests of different denominations and dominions ('tetradomational') (*FW* 614.27-28). The reference to 'scribings scrawled on eggs' which follows the narrative's preparations for reading the Letter ('as sure as herself pits hen to paper and there's scribings scrawled on eggs') alludes to Kev's circumscription of 'a cyclone' which appears to be 'as round as the calf [half] of an egg' during the second stage of their geometric problem in II.ii (*FW* 615.09-10; 294.10-11). In II.ii, this phenomenon appears within the context of other allusions to non-Euclidean and four-dimensional space. For the twins, who struggle to awake from a historical nightmare in which Euclidean geometry is taken to be a transcendental system, irregular shapes such as the ovoid appear to display Euclidean symbols of perfection including the straight line and the circle. By echoing this notion within the context of reading the 'millwheeling vicociclometer' of the Letter and the *Wake*, Joyce suggests that the textual fabric upon which its signs are etched curves in accordance with the variable motions of bodies in another dimension. Semiotically, the sense of the *Wake*'s scriptsigns also modulates in accordance with the

[60] Joyce, 'Letter to Harriet Shaw Weaver, 16 April 1927', *Letters of James Joyce*, Vol. I of III, ed. by Stuart Gilbert (New York, NY: Viking Press, 1966), 251.

variable laws of another dimension. At the source of the narrative’s polysemic diversions and junctural extrapolations lies the delirious logic of HCE’s sleeping mind, which impels the meandering narrative’s trajectories into different directions as it deals with the apparition of particular impressions deriving from its subconscious; or as it encounters signs which emanate from outer space, beyond the Wake's ‘polyhedron of scripture’ (*FW* 107.08). As we have seen, however, binary distinctions between relative figurative concepts like inner and outer space dissolve as they enter *Wake*an space-time, or as HCE begins ‘thinking himself into the fourth dimension’, as do distinctions between past, present and future: all of which are combined within the image of the *Wake*’s simultaneously cyclical and tetrahedral narrative structure (*FW* 467.22-23). By shaping the unstable contours and plural dimensions of the *Wake*’s corporeal, geographical and heavenly terrains through a figurative shaping of his textual *meter*, Joyce not only enables the reader to ‘[s]hut [their] eyes and see’ these polytropical *topoi* but further makes it possible to ‘hear the ruin of all space’ as their shattered media trickle through interconnecting layers of consciousness and history (*U* 3.9; 2.9-10).

Conclusion

What's left us then?

— *U* 2.10

The *Wake*'s 'original hen' (△), who pecks, scratches and rummages through the *Wake*an 'midden', is presented as the discoverer ('[t]he bird in case […] was scratching at the hour of klokking twelve looked for all this zogzag world like a goodish-sized sheet of letterpaper originating by transhipt from Boston (Mass.)') as well as the creator ('as sure as herself pits hen to paper and there's scribings scrawled on eggs') of the Letter (*FW* 110.22-111.10; 615.09-10). It is therefore difficult to tell whether the chicken came before the egg which forms the bases of the Letter's ovular 'scribings', 'Humpty Dumpty' and the whole 'humpty daum earth' (*FW* 615.10; 045.01; 455.24). These uncertainties regarding the Letter's originality and authorship extend to the dubious origins of the 'maps', 'bloodstaned breeks' and other forms of imprinted matter which the hen puts 'into her nabsack' (*FW* 011.19-22). They also concern the myths and irreconcilable notions which are sedimented within the origins of linguistic waste given the Letter's foundational iteration of the claybook's primordial signs, which include the letters of the 'allaphbed' and geometric points (*FW* 018.18). Fragments from the Letter's purported narration of HCE's crimes become repossessed by a plurality of spaces, places, times and dimensions (often simultaneously) as they are 'retaled'; and the territories which these snapshots evoke concurrently transform as each retelling is tailored to fit the pages, maps, bodies and other material surfaces which record them (*FW* 003.17). Like the ill-fitting suit which the humpbacked Norwegian Captain tries to stretch across the abnormally elliptic dimensions of his body in II.iii, locales associated with Humphrey's 'mistridden past' become further mystified as their debased visual laws conform to the twisted obliquities of his unutterable deviances in thought and language (*FW* 110.31). In their recurrent aberrations from univocal forms of expression which would enable the articulation of the original sense of his '[*b*]*ibelous hicstory*' and the contents of the Letter, Eggeberth's projected thoughts grow to encroach upon larger '*Shadows of Ideas*' including the 'mistridden' traditions of

the very geometric and verbal languages in which his figure is obscured (*FW* 280.L01).[1] The uncertainties underlying the full extent of the hen's role as originator of the Letter, and thereby every letter in the *Wake*, are equally weighed with broader concerns regarding the origin of geometric and linguistic ideal objectivities; and the possibility of them having always existed, like the 'checkinlossegg', in a transcendental pre-history (*FW* 129.14). In both *Ulysses* and *Finnegans Wake*, Joyce holds this Kantian concept to question by illustrating how the archetypal candlebearer's measurements, maps and readings of his dim world—which are founded on a senseless belief in boundless conceptual and geometric rectitude—become contorted when they are used to embody the 'humpty daum earth' and other variably shaped territories which are as 'round' and as ineffable as a 'roc's auk's egg' (*FW* 455.24; *U* 18.2328-9). In doing so, Joyce undermines Galileo's famous assertion that 'this grand book, the universe' is written in a transcendental mathematical language, and that without a comprehension of the 'triangles, circles and other geometric figures' which are set out in Euclid's *Elements* 'one wanders about it in a dark labyrinth'.[2] In *Ulysses* and *Finnegans Wake*, Joyce demonstrates how the 'grand book' of the universe can be re-written in a plurality of languages all of which were created, as le Corbusier argues, 'by ourselves'; and he illustrates how we can indeed find ourselves to be the unwitting wanderers of 'a dark labyrinth' who are guided by echoes which we know not to be our own.[3]

Joyce's polymedial play with the plurality of geometric languages in his topographical writing of place—along with his invocation of the mythical constructs which underlie their origins—do not, as some critics have argued with regard to *Ulysses* and *Finnegans Wake* more generally, enact a mere celebration of indeterminacy. Phillip F. Herring acknowledges the defeatism of reading the *Wake*an universe as such in *Joyce's Uncertainty Principle*, arguing that 'one gains nothing by adopting a defeatist attitude toward textual meaning in the *Wake*. The reader was meant to live with uncertainty, not surrender'.[4] However, Herring's added notion that one 'narrows the range of possibility' by referring to

1 Giordano Bruno, 'The Candlebearer', trans. by Gino Moliterno, in Moliterno, 'The Candlebearer at the *Wake*: Bruno's *Candelaio* in Joyce's Book of the Dark', *Comparative Literature Studies*, Vol. 30, No. 3 (1993), 269-294, 279.

2 Galileo Galilei, 'The Assayer' (1623), trans. by Stillman Drake, *Discoveries and Opinions of Galileo*, ed. by Stillman Drake (New York, NY: Anchor Books, 1957), 229-280, 237-8.

3 Le Corbusier, *The City of Tomorrow and its Planning*, trans. by Frederick Etchells (Mineola, NY: Dover, 1987), xxi.

4 Phillip F. Herring, *Joyce's Uncertainty Principle* (Princeton, NJ: Princeton University Press, 1987), 200.

'dictionaries, criticism, intelligence, knowledge, imagination, and manuscripts' is problematic.[5] Attempts at '[narrowing] the range of possibility' imply the existence of an infinitely straight-and-narrow reading which underscores every imperfect derivation, as well as a clear-cut set of coordinates in the waking world to which the variant dimensions of the *Wake*an 'whorl' refer (*FW* 006.24).[6] Rather than deriving from a narrowing of the range of possibility, it is from a broadening of possibility that Joyce equips his readers with means to 'live with uncertainty' and form a working understanding of his transient topographical subjects. Like the places alluded to in the story of how Buckley shot the Russian General in which, as Finn Fordham argues, 'a single event' is '[stretched] out and 'serially [transformed] […] until that event disappears, swallowed in allusions, as humanity is destined to be swallowed in the eternity of the universe', the topographical bodies which contextualise the original narrative events of *Ulysses* and *Finnegans Wake* are stretched to accommodate multiple contexts both literally and semantically, to the extent that they become 'swallowed in allusions', as Finn Fordham argues, by the broadening spaces in which they are 'retaled' (as is the case with the widening mouth of ⋀) (*FW* 003.17).[7] The possible boundaries which delineate Bloom's wanderings through Dublin in 'Wandering Rocks' and ALP's geometric 'whome' in II.ii, for example, are both expanded to accommodate a multiplicity of realms and dimensions, making it impossible to rely on any one context as a means of '[narrowing] the range of possibility' sufficiently to singularise the narrative's overlapping spaces and congruous perspectives (*FW* 296.31).[8] Joyce's technique of filling the semantic fields of his topographical subjects to bursting point and stretching their possible boundaries 'in the broadest way immarginable', rather than moving the text 'away from "meaning"' as Hugh Kenner and Margot Norris argue with regard to the *Wake*, offers more varied contexts in which their particular identities can be constructed (*FW* 004.19; 003.13).[9]

By invoking the visual misconceptions and mythical constructs which develop in accordance with this cross-contextual growth of different languages for measuring and mapping the sensible universe, Joyce transposes a twentieth-century concern regarding the

5 Herring, 200.
6 Herring, 200.
7 Finn Fordham, *Lots of Fun at Finnegans Wake: Unravelling Universals* (Oxford: University of Oxford Press, 2007), 92.
8 Herring, 200.
9 Hugh Kenner, *Dublin's Joyce* (Boston, MA: Beacon Press, 1956), 304.

a priori application of geometric axioms (whereby the free association of geometric ideal objectivities can give rise to measurements which deviate from the dimensions of this world) to a linguistic context (in the sense that linguistic ideal objectivities refer to subjectively imagined ideals which extend 'beyond the logic of this world', as Margaret Solomon argues with regard to the dimensions associated with Yawn's polyhedral figure).[10] As is notably the case in Yawn's 'drama parapolylogic', Joyce explores how geometric and linguistic polylogy gives rise to paralogisms; and how, as discussed in chapter one, these paralogisms extend to the parabolic geometry of Euclid (*FW* 474.05). Husserl expands on this common problematic between the free association of geometric and linguistic objectivities in *The Origin of Geometry*, arguing that:

> in [ordinary] human life, and […] in every individual life from childhood up to maturity, the originally intuitive life which creates its originally self-evident structures through the activities on the basis of sense-experience very quickly and in increasing measure falls victim to the *seduction of language*. Greater and greater segments of this life lapse into a kind of talking and reading that is dominated purely by association, and, often enough, in respect to the validities arrived at in this way. It is disappointed by subsequent experience.[11]

The 'free play of associative constructions' is a concern in science, Husserl argues, '[i]n view of the unavoidable sedimentation of mental products in the form of persisting linguistic acquisitions, which can be taken up again at first merely passively and be taken over by anyone else'.[12] This also applies to the acquisition, transmission and development of language, which is itself subject to 'the unavoidable sedimentation of mental products'. As Bruno demonstrates, the senseless 'free play of associative constructions' within language and rhetoric (as exhibited by the doctrine-chewing, maxim-spitting, quotation-pissing pedant Mamfurio in 'The Candlebearer', for instance) germinates the production of paralogisms in a similar way to the senseless 'free play of associative constructions' within geometric discourse, whose Euclidean practitioners Bruno believed to be pursuing 'vain inquiries' divorced from 'things abiding and sure'.[13]

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[10] Margaret C. Solomon, *Eternal Geomater: The Sexual Universe of Finnegans Wake* (Carbondale, IL: Southern Illinois University Press, 1969), 119.

[11] Edmund Husserl, 'The Origin of Geometry' (1936), trans. by David Carr; repr. in Jacques Derrida, *Edmund Husserl's 'Origin of Geometry': An Introduction*, ed. by John P. Leavey (Lincoln, NE: University of Nebraska Press, 1989), 155-180, 165.

[12] Husserl, 165.

[13] James Lewis McIntyre, *Giordano Bruno* (London: MacMillan & Co., 1903), 119.

Joyce expands on this notion throughout *Ulysses* and *Finnegans Wake*, which both display 'a kind of talking' and encourage 'a kind of […] reading that is dominated purely by association'.[14] His coincident concern with paralogisms borne from the senseless association of linguistic (particularly aural) signs, moreover, is developed throughout his *œuvre*. In the opening of *Dubliners*, as we have seen, the narrator grapples with the means of pronouncing and applying words like 'paralysis' and 'gnomon' in *lieu* of being able to picture their original significations (*D* 3). In *A Portrait*, moreover, Stephen becomes what can be understood as an '[apprentice] to signs', as Gilles Deleuze argues with regard to Marcel in Proust's *In Search of Lost Time*, whose 'movement of disappointments and revelations' in each chapter are closely tied with his developing familiarity with a world of interconnected signs as he proceeds from childhood to maturity.[15] By developing a world of signs which encompasses geometric as well as linguistic ideal objectivities in *Ulysses* and *Finnegans Wake*, Joyce demonstrates how a similar process of 'disappointments and revelations' accompanies the 'free play' of 'associative [geometric] constructions' and their application to visual objects from the sensible world.[16] The audible, tactile and visible phenomena of this sensory world provide the raw materials for Joyce's polymorphic topographies, in which geometric objects—the straight line, the point, the circle—are presented as conceptions which can be applied to our understanding of both visual and non-visual worlds.

In response to the problems posed by 'the *seduction of language*' and the inviting means by which *a priori* geometric and linguistic concepts can be freely associated beyond sense, Husserl proposes a '*Rückfrage*' (return inquiry) to the origins of particular ideals which have their basis in sense-experience. Bruno, similarly, responded to the 'vain inquiries' of his Euclidean contemporaries and endeavoured to 'fix their contemplation on things abiding and sure' by constructing a reductive geometric system based on 'real or "immanent"' principles.[17] In *Ulysses* and *Finnegans Wake*, Joyce develops a similar idea by enacting various returns to the original material embodiments of those ideals to which his

[14] Husserl, 165.
[15] Gilles Deleuze, *Proust and Signs*, trans. by Richard Howard (London: Continuum, 2008), 3-4; Husserl, 165.
[16] Husserl, 165.
[17] Husserl, 165; Jacques Derrida, *Edmund Husserl's 'Origin of Geometry': An Introduction*, ed. & trans. by John P. Leavey (Lincoln, NE: University of Nebraska Press, 1989), 50; McIntyre, 119-121.

topographical narratives refer. His geometric and topographical representations of the body, in particular, reflect a movement beyond 'those symbols which represent to us perfection and the divine' and a return to the imperfect origins from which these symbols were created.[18] The human body—especially in light of its visual, aural, tactile and other sensibly apparent features—is reconfigured as both a progenitor of maps and a mappable object: the human skin provides the grounds for constructing geometric planes, cities, planetary surfaces and universes, as well as the paper surfaces onto which their representations can be mapped and written; the lungs and the breathing of the body formalise the expansion, contraction and related transformations of lived spaces; the body's production of accompanying sounds establish aural landmarks within the spaces which they inhabit and embody; the movements of wandering bodies through space not only give rise to a variety of geometric planes and objects as their corporeal surfaces contort—or (as is particularly the case with Mr and Mrs Porter's sexual positions in III.iv) as their members are repositioned—but also form landmarks as their component parts are heard, seen, felt and remembered at different points in space and time; and the body's unique contours circumscribe entire landscapes whose variable geometric laws and topographical contexts form the basis for re-thinking the nature of linearity and rectitude. If '[g]eometry is the means [...] whereby we perceive the external world and express the world within us' (as le Corbusier puts it), the body is presented as the material basis from which geometric and linguistic means of articulating these worlds can be produced.[19] In their fleshly, misshapen re-tailoring of geometric symbols representing 'perfection and the divine', the human bodies which move through *Ulysses* and *Finnegans Work* incarnate the imperfect sensible origins from which these symbols of perfection once arose.[20]

[18] Le Corbusier, *The City of Tomorrow and its Planning* (1929), trans. by Frederick Etchells (Mineola, NY: Dover, 1987), xxi.
[19] Le Corbusier, xxi.
[20] Le Corbusier, xxi.

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