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"A Mobility of Illusory Forms Immobilized in Space." James Joyce and the Pre-Einsteinian Universe

Abstract: In *"A mobility of illusory forms immobilized in space." James Joyce and the Pre-Einsteinian Universe* James Joyce's *Ulysses* is discussed as an ironic farewell to the pre-Einsteinian worldview. This paper aims at examining the "world picture" Joyce is sketching by reconstructing and juxtaposing the models of the Universe that his characters, Stephen and Bloom imagine. Joyce's protagonists need to conceptualize the Universe; they crave to be able to mentally grasp every facet of external reality and the human place in it. The two protagonists in two diverse ways – the "scientific" and the "artistic" – visualize the earth among the stars and try to understand the nature of time. The pre-Einsteinian "scientific" way of Bloom fails him. Stephen is also accustomed to pre-Einsteinian physics but thanks to his "artistic" temperament he is able to add to his divagations an element of creative speculation.

Keywords: *Ulysses*, physics, models of the Universe, space-time

Abstrakt: *„A mobility of illusory forms immobilized in space." James Joyce and the Pre-Einsteinian Universe* odczytuje *Ulissesa* Jamesa Joyce'a jako pełne ironii pożegnanie newtonowskiej wizji Wszechświata. Artykuł rekonstruuje i przeciwstawia sobie nawzajem wyobrażenia kosmosu, jakimi – mniej lub bardziej świadomie – posługują się bohaterowie Joyce'a. Zarówno Stephen, jak i Bloom odczuwają potrzebę konceptualizacji Wszechświata, chcieliby wyobrazić sobie czas i przestrzeń oraz pojąć, jakie miejsce zajmuje w nich rasa ludzka. Na dwa odmienne sposoby Stephen „artysta" i Bloom „naukowiec" wizualizują Ziemię wśród gwiazd i dywagują na temat istoty czasu. Newtonowska wizja Wszechświata, którą wyznaje Bloom, okazuje się zawodna. Stephen również posługuje się fizyką newtonowską, ale dzięki „artystycznemu" temperamentowi dodaje element twórczy do swych dywagacji na temat czasu i przestrzeni.

Słowa kluczowe: *Ulisses*, fizyka, modele Wszechświata, czasoprzestrzeń

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Carl Sagan, in his Introduction to Stephen Hawking's *A Brief History of Time* notices that only very few people in the entire world ask fundamental questions:

> We go about our daily lives understanding almost nothing of the world. We give little thought to the machinery that generates the sunlight that makes life possible, to the gravity that glues us to an Earth that would otherwise send us spinning off into space, or to the atoms of which we are made and on whose stability we fundamentally depend. (Hawking 1988, ix)

And yet, in every generation, such questions are asked by some who diligently seek the answers. Hawking's book traces the history of human attempts at answering them – starting with Aristotle's belief that the earth was stationary and that the sun, the moon and the stars move around it in circular orbits (2) and ending with recent attempts to formulate a theory of everything. In the "Conclusion" to *A Brief History of Time*, Stephen Hawking writes:

> We find ourselves in a bewildering world. We want to make sense of what we see around us and to ask: What is the nature of the universe? What is our place in it and where did it and we come from? Why is it the way it is?
>
> To try to answer these questions we adopt some "world picture". Just as an infinite tower of tortoises supporting the flat earth is such a picture, so is the theory of superstrings. Both are theories of the universe, though the latter is much more mathematical and precise. (Hawking 1988, 181)

These "world pictures" present what the science of a given epoch believes about the cosmos, and by devising models we try to visualize them. In the popular survey *101 Quantum Questions. What You Need to Know About the World You Can't See*, Kenneth W. Ford, constructs a number of such models. His short and simple stories allow the reader to grasp sophisticated concepts such as entanglement or the uncertainty principle through visualisation. Hawking and Ford are by no means the first scientists to use imagination to explain anti-intuitive physics—as far back as the 19th century, James Clerk Maxwell conducted a thought experiment to challenge the second law of thermodynamics by asking us to imagine a very tiny demon in a box. Einstein's theories were explained by creating models—stories involving trains going at the speed of light or clocks sent to space in extremely fast starships, and in the early 20th century Erwin Schrödinger followed suit by devising (to ridicule his opponent's theories) the story everybody knows about the imagined cat in the box.

Taking into account the many differences between science and literature, in James Joyce's *Ulysses* similar models abound, and the novel offers a similar universality in its attempt to create a "world picture" of the turn of the 20th century and tell all possible stories – by telling one particular story, the blueprint of everybody's adventures. In '*Ulysses' on the Liffey*, Ellmann discusses the novel's attempts to encompass all reality in a mythic, allegoric form. Describing the structure of the novel, he claims:

> […] if one chapter is external, the next is internal, and the third is a mixture; similarly, if one episode centres on land, the second will be watery, and the third amphibious; if one is

> solar, the second will be lunar, and the third will envisage an alchemical marriage of sun and moon; if the first is body, the second is soul, the third is their tentative unity. (Ellmann 1982b, 2)

He demonstrates that Joyce's subsequent chapters disturb the solidity of the space-time continuum (Ellmann 1982b, 101), and he employs Gilbert-Gorman and Linati schemata showing how the episodes of the novel might be discussed when taking into account the correspondences for time, colour, persons, techniques, science, art, bodily organs and symbols. He also refers to schemata created by Joyce – starting with the well-known Gorman-Gilbert plan. Additionally, Joyce's novel is known for how it constructs models in an attempt to encompass the universe. Stuart Gilbert says: "This must not be taken to mean merely that the artist is justified in fixing an arbitrary set of symbols to give life to his cosmogony; it implies that... the smallest particle of creation bears within it the secret of the whole" (Gilbert 1958, 48).

Significantly, both protagonists of the novel, Stephen Dedalus and Leopold Bloom think in terms of models and systems, and both have shown some interest in physics. Bloom also recollects bits and pieces of his science lessons from school in his interior monologues. Yet he only remembers some optics, some astronomy, some thermodynamics, and some Newton: "32 feet per second, per second. Law of falling bodies, per second, per second... It's the force of gravity of the Earth is the weight" (Joyce 1992, 87); Stephen's ideas concerning the workings of the Universe are influenced by an education based on Aristotle. He is aware of the recent progress in science but the way his imagination works is shaped by the philosophers he studied at Jesuit schools. In 1904, both Bloom and Stephen are still informed by the pre-Einsteinian concepts of space and time, the respective images of the universe: the earth, the laws of physics, and their impact on human history and culture. In the 'Ithaca' episode of *Ulysses*, their approaches to the universe and to human attempts at understanding its workings are contrasted, and it is indicated that neither of them is versed in complex theoretical issues. While Stephen's mind is concerned with artistic transformation, Bloom is chiefly interested in practical aspects and technology. In terms of the obsolete 19th century psychology their "temperaments" are described as follows:

> What two temperaments did they individually represent?
> The scientific. The artistic.
>
> What proofs did Bloom adduce to prove that his tendency was towards applied, rather than towards pure, science?
> Certain possible inventions of which he had cogitated. (Joyce 1992, 798)

In this passage the narrator ironically reduces the full complexity of Stephen and Bloom's subjective characters and then tries to "objectively" classify them into categories with labels. The irony in these questions and answers (Bloom's inventions are absurd, there is always a subjective agenda that shapes every objective classification) subverts the very nature of science as objective. Moreover, as Ciaran McMorran notices in *Geometry and Topography in James Joyce's Ulysses*

and Finnegans Wake, the first question-answer pair in the quoted passage is ambiguous:

> 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. (McMorran 2016)

This paper aims at examining the "world pictures" Joyce is sketching by reconstructing and juxtaposing the models of the Universe Stephen and Bloom imagine. Joyce's protagonists need to conceptualize the universe; they crave the ability to mentally grasp every facet of external reality and the human place in it. The two protagonists, in two seemingly diverse ways, visualize the earth among the stars and try to understand the nature of time. The pre-Einsteinian "scientific" way of Bloom is to visualize the model of the universe borrowed from his science teachers, which should be perfectly valid at least on a macrocosmic level. Yet it fails him – Bloom remembers too little from his school days to be able to really understand how it works. Stephen, who is also accustomed to pre-Einsteinian physics, is able to add to his divagations an element of creative speculation, which makes him akin to thinkers who use imagination to explain anti-intuitive physics.

In his youth, James Joyce did not enjoy the sciences. According to Richard Ellmann's seminal biography, he had some problems with that part of his education, and throughout his life, he found some of the physical concepts baffling. Although it was in his lifetime that the new physics emerged and became widely spread he only read about it after publishing *Ulysses*. In *Fiction Refracts Science: Modernist Writers from Proust to Borges*, in the chapter "James Joyce and the Laws of Everything" Allen Thiher claims that:

> Joyce did not know anything about Heisenberg or quantum theory when he was writing *Ulysses*. In fact, quantum mechanics didn't exist yet when he was writing *Ulysses*, and Joyce probably knew little at that time about Einstein and relativity. It is dubious that Joyce knew much of anything about the new physics until after publishing *Ulysses.* (Thiher 2005, 173)

Thus, in 1904, Joyce's protagonists in *Ulysses*, who acquired their education in the 19th century, still think in terms of Newtonian science. In *Principia Mathematica* Newton writes that absolute space "in its own nature, without regard to anything external, remains always similar and immovable. Relative space is some movable dimension or measure of the absolute spaces, which our senses determine by its position to bodies" (Newton). In the 'Ithaca' episode, Bloom is ironically called "a physicist... a philosopher... a physiologist" (Joyce 1992, 848), who attempts to explain the universe. He is especially interested in stars, comets and the solar system as a whole. Just like all interested laymen in the late 19th century, he is a believer in the Newtonian clockwork model of the Universe, and his apparent expertise provokes other Dubliners to laugh at him because his stargazing makes him apparently blind to his wife's infidelities. Lenehan recounts an anecdote about the comet tails and the Blooms:

> Coming home it was a gorgeous winter's night on the Featherbed Mountain. Bloom and Chris Callinan were on one side of the car and I was with the wife on the other... Hell's delights! She has a fine pair, God bless her. Like that... She's a gamey mare and no mistake.

> Bloom was pointing out all the stars and the comets in the heavens to Chris Callinan and the jarvey: the great bear and Hercules and the dragon, and the whole jingbang lot. But, by God, I was lost, so to speak, in the milky way. He knows them all, faith. At last she spotted a weeny weeshy one miles away. And what star is that, Poldy? says she. By God, she had Bloom cornered. That one, is it? says Chris Callinan, sure that's only what you might call a pinprick. (Joyce 1992, 300)

Lenehan tells this story to M'Coy, who calls Bloom "a cultured allroundman" and explains where his knowledge of the stars comes from – "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" (Joyce 1992, 299). Later in the day, when Bloom is already back home, the book in question is described: "*A Handbook of Astronomy* (cover, brown leather, detached, 5 plates, antique letterpress long primer, author's footnotes nonpareil, marginal clues brevier, captions small pica)" (Joyce 1992, 833). Whether Bloom bought the book because he could not resist the bargain (as M'Coy suggests) or because he was a genuine lover of astronomy, he is sure to have read it as the handbook is referred to in his inner monologues.

In the already-mentioned biography, *James Joyce*, Richard Ellmann quotes Joyce's letter in which he describes the chapter 'Ithaca' as: "a mathematico-astronomico-physico-mechanico-geometrico-chemico sublimation of Bloom and Stephen... [who] thereby become heavenly bodies, wanderers like the stars at which they gaze" (Joyce 1992, 501). Sam Slote in "1904: A Space Odyssey" underlines the exaggerated cosmic scale of 'Ithaca': "Bloom is equated with a comet roaming through the darkest reaches of the solar system and elsewhere. His Dublin odyssey is translated and projected into outer space" (Slote 2008, 164). Also Jeffrey S. Drouin, in an analysis of the 'Wandering Rocks' episode of *Ulysses*, in his seminal (though also highly criticized) *James Joyce, Science, and Modernist Print Culture* suggests that Joycean characters might be "read... as celestial bodies:" (Drouin 2018, 51) people are compared to wandering stars, *Planetai* in ancient Greek, and their lives to cosmic journeys. The "Newtonian clockwork model" (Drouin 2018, 51) of the universe allows us to describe their wanderings. In *Ulysses*, the moment when Bloom and Stephen leave the house and enter the star-lit garden is a mixture of apparent grandeur and irony. Bloom looks at the stars, and, just like in the anecdote told by Lenehan, indulges in showing off his knowledge. The often quoted-poetic metaphor calling the nightscape the "heaventree of stars hung with humid nightblue fruit" (Joyce 1992, 822) is followed by lofty passages of seemingly "learned" astrophysics. Pointing to various constellations Bloom ponders:

> Meditations of evolution increasingly vaster: of the moon invisible in incipient lunation, approaching perigee: 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: of Sirius (alpha in Canis Maior) 10 lightyears (57,000,000,000,000 miles) distant and in volume 900 times the dimension of our planet: of Arcturus: of the precession of equinoxes: of Orion with belt and sextuple sun theta and nebula in which 100 of our solar systems could be contained: of moribund and of nascent new stars such as Nova in 1901: of our system plunging towards the constellation

> of Hercules: of the parallax or parallactic drift of so-called fixed stars, in reality evermoving wanderers from immeasurably remote eons to infinitely remote futures. (Joyce 1992, 822)

The key term here is "parallax", a "cryptic word" (Gilbert 1958, 200). Bloom does not really understand "but vaguely senses its meaning" (Gornat 2006, 220). Throughout the day, the phenomenon of the parallax is present in Bloom's thoughts. The timeball on the Belfast Office that he sees in the morning makes him think about Sir Robert Ball's *Story of the Heavens*, and he involuntarily begins to wonder what "parallax" might mean. Later in the day, when thunder unexpectedly strikes, we see a half-serious vision in which "Parallax stalks behind and goads [the ghosts], the lancinating lightings of whose brow are scorpions" (Joyce 1992, 542). "Parallax" is for him a fascinating haunting word just because it somehow suggests that science can explain the universe, but for Bloom this explanation is too elusive to grasp.

Moreover, we learn that Bloom has always been interested in science and has always failed to understand it. We read about his youthful attempt at computing the problem of the quadrature of the circle – which actually links him to Giordano Bruno who also worked on this problem – and we are showered with phrases such as "arithmetical progression of intensity," "the line of demarcation between troposphere and stratosphere," "the stratifications of the earth," the "vast elliptical egressive and reentrant orbits from perihelion to aphelion," etc. Yet when Bloom starts thinking about the discoveries of Galileo, Simon Marius, Piazzi, Le Verrier, Herschel, and Galle (another reminiscence of popular science readings), his musings are sprinkled with factual errors. For example, he talks about "the cold of interstellar space, thousands of degrees below freezing point or the absolute zero of Fahrenheit, Centigrade or Réaumur: the incipient intimations of proximate dawn." In fact, it is not "thousands of degrees" but minus 273 grades centigrade. Bloom himself senses the absurdity of such thoughts, but his "scientific" temperament prompts him to construct models and schemas.

Interestingly, Jeffrey S. Drouin strives to prove that the number of erroneous "scientific" facts Bloom thinks of undermines traditional certainty in science, thereby also calling into question the mental image of the Solar System we all remember from school. Bloom's appreciation of Newtonian theories and classic scientific paradigms gives him only transient intellectual satisfaction; thinking about space and time he is vaguely aware of them. And yet, in 'Ithaca', the "heaventree of stars" is above the characters and the narrator persistently describes it. In the moment of Stephen's departure we learn that "a star precipitated with great apparent velocity across the firmament from Vega in the Lyre above the zenith beyond the stargroup of the Tress of Berenice towards the zodiacal sign of Leo" (Joyce 1992, 826). Stars fascinate both scientists and artists: "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" (Slote 2004, 163). Slote writes in "Joyce and Science".

During his meditations at night Bloom's mind elaborates on the possibility of alien life, the inhabitability of the planets and interplanetary research. In *Ulysses*, there is no indication that Bloom has read Wells, though *The War of the Worlds* –

serialized by *Pearson's Magazine* in 1897 and published in 1898 to favourable reviews–was an enormous success at the time the novel takes place. Wells' novel's impact on popular British culture at the turn of the 20th century was profound. Stuart Gilbert – who wrote his celebrated study of the novel *James Joyce's 'Ulysses'* in the late 1920s with the help of Joyce, who listened to all the chapters of the first draft and added his comments (Ellmann 1982a, 616) – makes a reference to *The War of the Worlds* in his discussion of 'The Wandering Rocks' chapter. Describing the art of the chapter and its mechanics, Gilbert compares the awkward movement of one of the characters to the mechanical walking of the alien contraptions: "he seems rather to progress like one of the H.G. Wells's Martians than as an ordinary human biped" (Gilbert 1958, 234).

Wells's book was therefore an intelligible vehicle of comparisons, and the model of the universe with the Earth rotating around the Sun and surrounded by other worlds whose inhabitants might well be more technologically advanced was prominent in the 19th century European culture. Wells's novel, as well as other invasion stories written under its influence, also reflected the increasing feeling of anxiety in the period just before the outbreak of the First World War. In 1904, when the action of *Ulysses* takes place, similar ideas concerning the Solar System and the inhuman threat of invasion from outer space were already part of the collective imagination.

> The broadening of men's views that has resulted can scarcely be exaggerated. Before the cylinder fell there was a general persuasion that through all the deep of space no life existed beyond the petty surface of our minute sphere. Now we see further. If the Martians can reach Venus, there is no reason to suppose that the thing is impossible for men, and when the slow cooling of the sun makes this earth uninhabitable, as at last it must do, it may be that the thread of life that has begun here will have streamed out and caught our sister planet within its toils. (Wells 2017, 221)

In *Ulysses* we read about a similar image of the Solar System where humans can only live on earth but "a more adaptable and differently anatomically constructed race of beings might subsist otherwise under Martian, Mercurial, Veneral, Jovian, Saturnian, Neptunian or Uranian sufficient and equivalent conditions" (Joyce 1992, 821). This echo of Wells's science fiction ideas (and their imaginary potential) is not yet elaborated and Wells's claim that "dim and wonderful is the vision I have conjured up in my mind of life spreading slowly from this little seed bed of the solar system throughout the inanimate vastness of sidereal space" (Wells, 2017, 310), is dismissed by the narrator. "Joyce's hyper-objective articulations of visual space in 'Ithaca' constitute a hyperbolic rendering of 'the scientific temperament'" (McMorran 2016, 89). Indicative of a scientific mind, the narrator is similarly reluctant to accept the applicability of astrology, and strange coincidences of human fate and celestial phenomena seem meaningless to him and yet he does notice the shooting star. Astrology is invoked and immediately rejected: "other stars of (presumably) similar origin which had (effectively or presumably) appeared in and disappeared from ... . other constellations some years before or after the birth or death of other persons" (Joyce 1992, 822).

Prone to creating elaborate mental constructions by nature (both plans for 'inventions' of gadgets and pieces of machinery and abstract images explaining the workings of the Cosmos), Bloom divagates the nature of time, which he imagines as linear. Ironically, the mechanical application of counting skills yields absurd results: pondering the ratio of Bloom's and Stephen's ages the "hyper-objective" narrator arrives at the most fantastic (though mathematically valid) calculations.

> In 1936 when Bloom would be 70 and Stephen 54 their ages initially in the ratio of 16 to 0 would be as 17 1/2 to 13 1/2, the proportion increasing and the disparity diminishing according as arbitrary future years were added, for if the proportion existing in 1883 had continued immutable, conceiving that to be possible, till then 1904 when Stephen was 22 Bloom would be 374 and ... in 1952 when Stephen would have attained the maximum post-diluvian age of 70 Bloom, being 1190 years alive having been born in the year 714, would have surpassed by 221 years the maximum antediluvian age, that of Methuselah, 969 years, while, if Stephen would continue to live until he would attain that age in the year 3072 A.D., Bloom would have been obliged to have been alive 83,300 years, having been obliged to have been born in the year 81,396 B.C. (Joyce 1992, 794)

The irony of this passage is emphasized by the remark that these calculations might be nullified not only by their deaths but also by the introduction of a new calendar or "the annihilation of the world" (Joyce 1992, 794). The latter possibility shows the broad perspective on time and space that *Ulysses* adapts. In Bloom's mind, the world in its diurnal voyage dictates the measuring of time. Thus, for a second, the scientific mind becomes that of a visionary and the master of fantastic extrapolation.

On the other hand, Stephen's artistic temperament lets him create fantastic images of space and time, play with them in his mind, cherish them (which also might be a source of powerful irony) and then abandon them. Sometimes his thoughts allude to classics he has read and he engages in imaginary conversations with, for example, Aristotle. The first attempt to create an image of a cosmology (with the artist figure in the centre) can be found in *A Portrait of the Artist as a Young Man,* in the scene when young Stephen is studying a geography primer, a textbook signed with his name. Instead of studying his maps, he indulges in envisioning his position in space—in a system of concentric circles – where he himself is central.

Stephen Dedalus
Class of Elements
Clongowes Wood College
Sallins
County Kildare
Ireland
Europe
The World
The Universe
(Joyce 1987, 255)

Valérie Bénéjam, in "The Artist as a Young Cartographer," part of her introduction to *Making Space in the Works of James Joyce*, emphasises the irony in this famous scene. The top lines identify the owner of the primer and, if the book

was lost, would allow the finder to return it. The list of locations reads like a list of postal addresses, but the bottom three lines are absurd: "Stephen envisaging himself ... at this scale is both ludicrous and impressive" (Bénéjam 2011, 1). Consecutive stages, the increasingly vast spheres around Stephen, create a model of his own cosmology. Reading the lines from bottom to top gives him a sense of identity. Reading in the opposite direction, from top to bottom, initiates the many "big thoughts" in his six-year-old mind: "What was after the universe? Nothing. But was there anything round the universe to show where it stopped before the nothing place began? It could be a wall but there could be a thin line there all round everything" (Joyce 1987, 255). The very young artist feels free to spin fantasies about God and the universe with himself in the very centre of his "geocentric" model of everything. Stephen's naiveté is touching but potent.

Stephen is even more imaginative when pondering upon the nature of time, which in his mind is not necessarily linear but rather resembles a probability tree. In his early twenties, teaching ancient history to a group of reluctant boys in the 'Nestor' episode of *Ulysses*, Stephen half-dreamily constructs temporal models and tries to visualize the diverse tracks human history has taken and might have taken. His thoughts wander. He recalls Blake's view that "history is fabled by the daughters of memory and so is a record of what never happened" (Ellmann 1982, 21); then he dismisses it as an overstatement. Neither does he agree with headmaster Mr Deasy's Hegelian opinion that "all history moves towards one great goal, the manifestation of God" (Joyce 1992, 42). His own answer to the problem of "ifs" in history is indebted to the "Aristotelian definition of movement" (Gilbert 1958, 109). Watching his students, he speculates:

> For them too, history was a tale like any other too often heard, their land a pawnshop.
>
> Had Pyrrhus not fallen by a beldam's hand in Argos or Julius Caesar not been knifed to death. They are not to be thought away. Time has branded them and fettered they are lodged in the room of the infinite possibilities they have ousted. But can those have been possible seeing that they never were? Or was that only possible which came to pass? Weave, weaver of the wind. (Joyce 1992, 30)

What Stephen does is ponder the concepts of Aristotle on possibility or necessity, potential and actuality, and, ultimately determinism or chance. Moreover, he wonders about the ontological status of 'alternate' possibilities that "never were," allowing his mind to creatively play with models. Similar fantasies can be found today in "alternative world" narratives and in popular science.[1] Stephen's musings, albeit imagination-provoking, are far from scientific and exact: his mind creatively plays with associations. The reader gets a feeling

[1] John Gribbin, a fan of the many-worlds theory, claims in his popular account of quantum mechanics, *Computing with Quantum Cats: From Colossus to Qubits* that our reality, including our path of choices and their results, is but a tiny fraction of the multi-verse where every possibility, even implausible ones, is made actual. Hugh Everett III came up with this idea in his PhD (he never published anything else and later abandoned the Academy) and today the many-worlds theory is rather rarely discussed in serious scientific works. Yet it had an enormous impact on science fiction writers – far from being "true" it is fascinating and its imaginative potential resulted in a surge of stories that are often described as 'parallel worlds' narratives.

that Stephen 'weaves' stories of things that were and might have been. His vivid, imaginative models of space and time are springboards for creating stories. In the 'Proteus' episode of *Ulysses*, he walks along the Strand just after his history class and one such story, of "his people" whose desires and behaviour is still an inherited part of him, is spun:

> Galleys of the Lochlanns ran here to beach, in quest of prey, their bloodbeaked prows riding low on a molten pewter surf. Dane Vikings, torcs of tomahawks aglitter on their breasts when Malachi wore the collar of gold. A school of turlehide whales stranded in hot noon, spouting, hobbling in the shallows. Then from the starving cagework city a horde of jerkined dwarfs, my people, with flayers' knives, running, scaling, hacking in green blubbery whalemeat. Famine, plague and slaughters. Their blood is in me, their lusts my waves. I moved among them on the frozen Liffey, that I, a changeling, among the spluttering resin fires. I spoke to no-one: none to me. (Joyce 1992, 56)

In this vision, Stephen is like a member of a primitive primordial tribe, a changeling between the Irish people. The Homeric motif of the metamorphoses of Proteus is here modified by the vague memory of his own divagations from the history lesson. This is how the "artistic temperament" works: models and schemas are easily produced, easily abandoned but never forgotten: their amalgamation produces stories. In this respect, Stephen is like history-inspired writers who are prone to conceive fantastic narratives that describe Earth as it might look had some historical event been altered. Such narratives were written already in the 1910s and 1920s but became popular only after WWII. They belong to speculative fiction and are often read as if they were hypothetical exercises in history. Clute and Nicholls's *Encyclopaedia of Science Fiction* traces this subgenre back to the 1907 essay *If Napoleon Had Won the Battle of Waterloo* by the eminent historian G.M. Trevelyan, which inspired J.C. Squire to edit the seminal anthology *If It Had Happened Otherwise* in 1931. The essays collected by Squire are speculations by theorists of history, including Winston Churchill, and non-fiction. Similar non-fictions were also written later, the two most significant being *If the South Had Won the Civil War* (1960) by McKinley Kantor (2001, 5) – which Harry Turtledove in his Introduction to its recent edition calls "the first work of alternate history I ever found" – and "If Hitler Had Won World War II" by William L. Shirer (1961). Each provoked a surge of fiction answering the titular questions. Moreover, science fiction writers have attempted to find other pivotal moments in the history of the West that might have turned out otherwise.

It is by telling stories, by imagining models and depicting miniature universes that we try to understand nature. Bloom's absurd inventions and Stephen's imagination-provoking musings combine creative imagination and scientific divagation. Joyce's *Ulysses* is focused on the minds of protagonists who, just as the author himself, are puzzled by scientific concepts and yet somehow find them alluring. From the perspective of over a century later James Joyce's novel seems to some critics to belong together with the advent of the new paradigm in science– reading Joyce is an attempt to say goodbye to the 19th century and embrace the new century. As Andrzej Duszenko claims in "The Joyce of Science: Quantum Physics in *Finnegans Wake*," Joyce did admire Einstein's theory for its powerful

novelty. Einstein's ideas had for him the power to stir the imagination and spawn radical visions of the universe and how humans try to understand it. Written after *Ulysses* was published, *Finnegans Wake* tells, among other things, the story of the re-evaluation of Newtonian physics. In Duszenko's interpretation, it also introduces the notion of the reader-observer who suffers from the observer effect, and yet this painful experience allows for new kinds of playful readings of the text. Similarly, Claire A. Culleton discusses Joycean references to the Butterfly Effect in *Ulysses* and *Finnegans Wake* as well as his allusions to the Uncertainty Principle and theories of chaos (Culleton 1994, 45). And yet, other critics disagree with this interpretation–as the already mentioned Allen Thiher underlines, Joyce started reading about the new physics only "when he began documenting himself on everything in order to write *Finnegans Wake*...this occurred after *Ulysses* was published in 1922" (Thiher 2005, 174). Therefore, *Ulysses* does reflect the solidity of the pre-Einsteinian Universe although with a hint of anticipation of something new to come. The "world pictures" Joyce is sketching by reconstructing and juxtaposing the pre-Einsteinian models of the Universe Stephen and Bloom imagine do have an element of creative speculation.

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