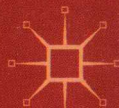


NEW DIRECTIONS IN IRISH AND IRISH AMERICAN LITERATURE



JOYCE AND THE SCIENCE OF RHYTHM

William Martin

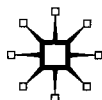


Joyce and the Science of Rhythm

William Martin



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Dedicated to Peter Kuch

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Abbreviations

- CW *The Critical Writings of James Joyce*, 1959.
D *"Dubliners": Text, Criticism, and Notes*, 1969.
FW *Finnegans Wake*, 1939.
JJ *James Joyce: New and Revised Edition*, 1982.
Letters *Letters of James Joyce*, Vols I, II, and III, 1957–1966.
P *A Portrait of the Artist as a Young Man*, 1964.
PSW *Poems and Shorter Writings: Including Epiphanies, Giacomo Joyce and "A Portrait of the Artist,"* 1991.
SH *Stephen Hero*
U *Ulysses*, 1984.

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Chapter 1

Introduction

The Science of Rhythm

At the turn of the twentieth century, scholars in the fields of physics, physiology, psychology, and prosody were engaged in the formation of a scientific discourse on rhythm that informed the critical and creative writings of modernist authors such as James Joyce. Contrary to the aesthetic conception of rhythm developed by the classical Greeks (Plato, Aristotle, and Aristoxenus), which is identified with the recurring temporal forms of music, poetry, and dance, scientists studying rhythm in the middle to late nineteenth century discovered periodic movements occurring in all spheres of nature. As “rhythm” was studied from a number of different perspectives, the term began to acquire a set of new connotations, including the vibrations of light and sound waves, the elliptical movement of planetary bodies, the cyclical growth of living organisms, as well as the perception of recurring, temporal patterns. In many ways, the development of the new “rhythmic” science was prefigured by Herbert Spencer’s chapter on “The Rhythm of Motion” in *First Principles* (1880), for the English philosopher there develops a physical conception of rhythm as the periodic equalization of force that is applied to diverse fields such as evolutionary biology, physiology, psychology, and prosody. Significantly, Spencer traces the rhythms of music and poetry to the alternating phases of tension and relaxation that regulate the healthy functioning of the human body, thereby reducing the origin of art to periodic processes occurring in nature. In the domain of aesthetics, the discovery of rhythms in nature led to the reintegration of the “institution” of art into the sphere of everyday life (Bürger 1984), for the rhythmic forms of modernist poetry, prose, and drama became a *literary* expression of the periodic movements already occurring in the body. In the modernist writings of James Joyce, the interaction between the mechanical rhythms of the city and the organic movements of the body is recorded on the

pages of *A Portrait of the Artist as a Young Man* and *Ulysses*, for the emergence of the interior monologue technique in these texts provides the perfect medium for describing how the periodic movements of the body structure the experience of space and time in a modern, industrial city.

Thanks to the recent publication of Michael Golston's *Rhythm and Race in Modernist Poetics and Science* (2008), many of the texts that contributed to the formation of this scientific discourse on rhythm have come to light, and it has now become possible to gauge the extent to which the work of modernists such as Pound, Yeats, and Joyce was informed by such ideas. In 1913, an experimental psychologist at Cornell University named Christian Ruckmich surveyed the field, his "Bibliography of Rhythm" containing more than 200 articles and books written in English, French, and German. Noting that the study of rhythm had been initially developed in "experimental psychology," a field first developed by Willhelm Wundt in his Leipzig laboratory, Ruckmich observed:

The subject of rhythm has been carried into many fields both inside and outside the science of psychology: within, it has been related to attention, work, fatigue, temporal estimation, affection and melody; without, it has been frequently mentioned in connection with music, literature, biology, geology, gymnastics, physiology and pedagogy. (cited in Golston 2008, 2)

Although the scientific study of rhythm would never attain the status of an academic discipline, its rapid development in the first two decades of the twentieth century enabled it to be identified as an independent field of research, allowing Golston to coin the expression "rhythmics" to retrospectively describe the various investigations that contributed to the formation of this discourse. According to Golston, the period of modernism in English literature can be analyzed as an interaction between the stylistic practice of the modernist poets and the new science of "rhythmics," for as he puts it, "the innovations in form and prosody that characterize much Modernist poetry are based on a now forgotten set of ideas about rhythm" (2008, 4). For the purpose of studying the development of modernist poetry, free verse, and prose, the interaction between the fields of experimental psychology and prosody is of particular interest to the literary critic, as the theories of rhythm developed during this time not only worked to *motivate* the creation of new poetic forms, but also served to *legitimate* the stylistic experiments of modernists such as Pound, Yeats, and Joyce.

For the sake of outlining the relationship between “rhythmic” science and the legitimization of modernist poetry, it will be useful to make a brief comparison between Pound and Joyce, as we know that the American poet was directly familiar with the experimental techniques invented by the French phonologist, Abbé Rousselot. As a linguist and physiologist interested in studying the geographical and genealogical causes of dialectical variation, Rousselot invented a machine in the 1880s called the “phonoscope” that was able to graphically represent the duration and intensity of muscular contractions in the vocal apparatus. From a memoir describing his time in Paris in the 1910s, we know that Pound was familiar with the workings of this machine, for he writes: “The Abbé ... M. Rousselot ... had made a machine for measuring the duration of verbal components. A quill or tube held in the nostril, a less shaved quill or other tube in the mouth, and your consonants signed as you spoke them” (cited in Golston 2008, 65). For practitioners of *vers libre*, such as Pound, the invention of the phonoscope performed an important political function, for by measuring the duration and intensity of muscular contraction during the recitation of poetry, it provided a scientific explanation for the rhythmic principles of “free verse.” Indeed, it is significant that Pound alludes to the composition of the “The Return” in the same memoir (“They return, One and by one, With fear, As half awakened each letter with a double registration of quavering”), for it suggests that the invention of the phonoscope inspired some of the free verse published in the first volume of *Des Imagistes* (1914). Coining the phrase “phonoscopic modernism,” Golston argues that Pound sought to express imperceptible rhythms in his poetry that were either too rapid in frequency to be heard (the vibration of a tone) or too difficult to notate in the linear form of verse (intonation, volume, accent, gesture, pause, and so on). The invention of the phonoscope therefore served both to *motivate* and *legitimate* the free-verse experimentation of the modernist poets, for in the absence of metrical conventions, it provided an objective method for recording the inaudible and invisible rhythms of the voice.

As Pound included Joyce’s “I hear an army” in the first anthology of Imagist poetry, we can establish a textual connection between the “free verse” of the two modernist authors, but it should be noted that Joyce had no direct knowledge of the experimental techniques developed by Rousselot. For the sake of reconstructing the impact of rhythmic science on the critical and creative writings of James Joyce, I will focus more on the discussion of rhythm in psychological textbooks of the late nineteenth century, as these texts give a coherent account of

the physiological and psychological theories of movement and sensation that permeated the cultural milieu in Europe and North America. From his reading of Maher's *Psychology* (1895) at University College, Joyce would have possessed a general knowledge of eighteenth- and nineteenth-century psychology, ranging from the empirical accounts of Locke, Berkeley, Hume, and Kant, to the more materialistic theories of Bain, Spencer, Weber, Fechner, and Sully.¹ When attempting to gauge the influence of such ideas on the aesthetic theory of the young James Joyce, it is important to note that Maher presents many of these thinkers simply as straw men to be knocked down by the transcendental philosophy of Aristotle and Aquinas. Nevertheless, Joyce seems to have developed an independent interest in contemporary psychological science, for the aesthetic dialogues in *Stephen Hero* and *Portrait* contain allusions to Grant Allen's *Physiological Aesthetics* (1877), a work that explains the evolutionary origin of art in terms of "physiological psychology." In particular, Stephen's theory of the "epiphany" seems to have been inspired by the work of Allen, for the latter uses the example of a clock-face to illustrate the process by which the mind's attention is turned toward the intellectual dimension of the image.

According to his first biographer, Herbert Gorman, Joyce read the work of Herbert Spencer during his time at University College (JJ, 142), and it is likely that he read the chapter on "The Rhythm of Motion" from *First Principles* (1880) because the term "rhythm" becomes one of the central concepts of his aesthetic theory. Starting from the assumption that there can never be two physical forces that are perfectly in balance with one another, Spencer traces the origin of rhythm to the state of disequilibrium that results: "Rhythm results whenever there is a conflict of forces not in equilibrium" (1880, 254). By expanding the duration of the rhythmic phenomenon beyond the limits of human perception, Spencer is able to apply the term to describe any periodic motion in nature, ranging from the slow orbits of the planets to the rapid vibration of light waves to produce colors. In the context of nineteenth-century science, it is significant that Spencer alludes to the vibration of air particles to produce musical tones, for it shows that his account was informed by the acoustic theory of the German physicist Hermann von Helmholtz. Indeed, when Spencer discusses the acoustic phenomenon of beats—"recurring intervals of sound and silence which are perceived when two notes are struck together; and which are due to the alternate correspondence and antagonism of atmospheric waves" (1880, 253)—he alludes to the explanation given by Helmholtz in *On the Sensations of Tone as a*

Physiological Basis for the Theory of Music (1895), for the alternation between sound and silence is attributed to the interference between the differing forms of two vibrations. Building on the mathematical method of analyzing the interference of waves developed by Fourier and applied by Helmholtz to explain the different “timbre” (or “tone-color”) of musical instruments, Spencer develops the concept of compound rhythms (secondary, tertiary, and quaternary) that accounts for the interference of one or more periodic phenomena. Significantly, he appeals to the visual image of the waves of the sea to illustrate his theory, an image that would have appealed to an aspiring poet such as the young Joyce: “We have again that which is furnished by the surface of the sea: every large wave bearing smaller ones on its sides, and these still smaller ones; with the result that each flake of foam, along with the portion of water bearing it, undergoes minor ascents and descents of several orders while being raised and lowered by the greater billows” (1880, 254). As the mathematical computation of compound rhythms provides a method for analyzing the interference of rhythms at different levels of complexity, we will see that this scientific theory also provides a model for explaining the manner in which the various elements or “parts” of poetry (rhythm, meter, accent, line, rhyme, and stanza) combine to form a structural impression of the poem as a whole.

We know that Joyce was familiar with the physical concept of rhythm as a periodic movement, for in the surviving draft of *Stephen Hero*, he contrasts the epochal rise and fall of the Roman Catholic Church to the rapid vibration of light waves: “The waves of the rise and fall of empires do not travel with the rapidity of waves of light and it will perhaps be a considerable time before Ireland will be able to understand that the Papacy is no longer going through a period of anabolism” (*SH*, 152). By using the term “anabolism,” Joyce employs the terminology of biological science to suggest that the Roman Catholic Church is no longer evolving through the transformation of simple substances into more complex ones. More specifically, the term “wave” refers to the rise and fall of a rhythmic or periodic movement, and it is significant that Stephen differentiates his own *perception* of Rome’s decline from the ignorance of Irish Catholics, for it demonstrates that the aesthete possesses a special capacity to perceive the rhythmic interaction of forces that govern the evolution of society. While Joyce probably read Spencer’s chapter on “The Rhythm of Motion,” the application of the physical concept of rhythm to the analysis of social change indicates that he may have already consulted Spencer’s *The Study of Sociology* (1874).

Of course, Joyce possessed a 1918 edition of Spencer's work in his Trieste library; yet, it is possible that he read an earlier edition during his time at University College. Just as Joyce compares the rapid vibration of light waves to the rise and fall of Roman civilization, Spencer uses the concept of compound rhythms to describe the interaction of multiple social forces, writing in a memorable passage:

In a society living, growing, changing, every new factor becomes a permanent force; modifying more or less the direction of movement determined by the aggregate of forces. Never simple and direct, but, by the cooperation of so many causes, made irregular, involved, *and always rhythmical*, the course of social change cannot be judged of in its general direction by inspecting any small portion of it. Each action will inevitably be followed, after a while, by some direct or indirect reaction, and this again by a reaction; and until the successive effects have shown themselves, no one can say how the total motion will be modified ... Surely, then, in such complex and slowly-evolving movements as those of a nation's life, all the smaller and greater *rhythms* of which fall within certain general directions, it is impossible that such general directions can be traced by looking at stages that are close together—it is impossible that the effect wrought on any general direction by some additional force, can be truly computed from observations extending over but a few years, or but a few generations. (1874, 105: my emphasis, WM)

Considering the aesthetic perspective adopted by Joyce (and his fictional alter ego, Stephen Dedalus), Spencer's account of social evolution as a rhythmic movement would have appealed to the young Irish writer, for it enables the aesthete to perceive the interaction of multiple social forces as a "wave," "curve," or "parabola" that is formed from the interference of different rhythms. Indeed, as the poet is an expert in constructing verse-rhythms, this innate capacity to perceive the periodic motions occurring in nature can be extended to the diagnosis of social tendencies.

From the perspective of literary modernism more generally, Spencer's chapter on the "Rhythm of Motion" should be seen as a revolutionary document, for not only does the *physical* concept of rhythm work to reintegrate the periodic movements of nature back into the sphere of everyday life, but the *physiological* concept of rhythm works to correlate the temporal forms of poetry and music with the muscular movements of the body. Drawing on the laws of thermodynamics developed by Helmholtz,² Spencer analyzes the bodily expenditure of energy as a rhythmic process, arguing that phases of work

must be balanced by phases of rest to prevent the onset of fatigue. Indeed, most of the bodily processes that contribute to the sustenance of life exhibit rhythmic cycles, such as the undulatory motions of the stomach, the peristaltic movement of the intestines, or the pumping of blood around the body. Significantly, Spencer relates the periodic alternation between attention and relaxation to the embodied performance of dance, poetry, and music:

The measure of a dance is produced by the alternation of strong muscular contractions with weaker ones ... Poetry is a form of speech in which the emphasis is regularly recurrent, that is—in which the muscular effort of pronunciation has definite periods of great and less intensity: periods that are complicated with others answering to successive verses. Music more variously exemplifies the law. There are recurring bars, in each of which there is a primary and a secondary beat. There is the alternate increase and decrease of muscular strain implied by the ascents and descents to the higher and lower notes—ascents and descents composed of smaller waves, breaking the rise and fall of the larger ones, in a mode peculiar to each melody. (1880, 211)

As can be seen, Spencer relates the stresses of poetry to the muscular contractions of the body and the tones of music to the tension of the vocal chords, a theoretical gesture that works to reinscribe the embodied performance of music and poetry within the sphere of everyday life. With regard to the development of poetic form, furthermore, the physiological conception of rhythm challenges the generic distinction between poetry and prose, for it can be seen that the temporal form of everyday speech is now already shaped by the regular contractions of the vocal apparatus: “Every sentence has its primary and secondary emphases and its cadence containing a chief rise and fall complicated with subordinate rise and falls” (212). Although Spencer’s account of physiological rhythms precedes the rise of rhythmic science by two or three decades, he nevertheless outlines the direction of future research, suggesting that the sensation of rhythm is motivated by the corresponding movements of the body.

In the late nineteenth century, the German philosopher Wilhelm Wundt founded the field of “physiological psychology,” and conducted a number of experiments with his students in his Leipzig laboratory that were designed to test the capacity of the mind to retain a series of temporal stimuli. Published in the second volume of his *Grundzüge der Physiologischen Psychologie* (1874), these experiments exerted a decisive influence on the work of “experimental psychologists” working in North America, particularly Thaddeus Bolton (1894),

Robert MacDougal (1902), and Thomas Stetson (1905). Although never translated into English, an accessible account of these experiments appears in William James's *The Principles of Psychology* (1890), where it is argued that the mind can retain a longer sequence of impressions when temporal ideas are ordered into rhythmic groups. While these early experiments do not posit any connection between auditory sensation and tactile movement, a more popular summary of Wundt's rhythmic theory appeared in a text translated as *Outlines of Psychology* (1897), where the German psychologist correlates the feeling of tension and release with the contraction and relaxation of the muscles in the body. Observing that rhythmic movements such as walking and running are governed by the principle of *isochrony* (equivalent temporal periods), Wundt notes that the regular contraction and relaxation of the muscles in the limbs of the body give rise to a series of inner tactile sensations. As these "kinestheses" give birth to an exactly parallel series of *feelings* that are marked by similar changes in intensity, Wundt is able to correlate the psychological perception of rhythm to the contraction and release of the muscles in the body:

If we consider a single period in a series of rhythmical movements, there is always at its beginning and end a feeling of fulfilled expectation. Between the two limits of the period there is, beginning with the first movement, a gradually growing feeling of strained expectation, which suddenly sinks at the last moment from its maximum to zero, and gives place to the rapidly rising and sinking feeling of fulfillment. From this point on the same series is again repeated. Thus, the whole process of rhythmical touch movement consists, on its affective side, of a succession of two qualitatively antagonistic feelings. In their general character these feelings belong to the series of straining and relaxing feelings. One of these feelings is very rapid in its course, the other gradually reaches a minimum and then suddenly disappears. As a result, the most intense affective processes are crowded together at the extremes of the periods, and are made all the more intense through the contrast between the feeling of satisfaction and the preceding feeling of expectation. Just as this sharply marked limit between the different periods has its sensuous substratum in the strong outer and inner tactual impressions arising at this instant, as above pointed out, so there is a complete series of feelings of expectation corresponding to the continuous series of weaker inner tactual sensations accompanying the oscillatory movements of the limbs. (1897, 146–7)

Rather than describing the perception of rhythm in purely psychological terms, Wundt here traces the feelings of expectation and fulfillment to a series of inner tactile sensations that are associated with the periodic movements of the body. Nevertheless, by abstracting the feelings of

expectation and release from the physical movements and kinestheses that underlie them, Wundt establishes the groundwork for a purely psychological theory of rhythmic sensation that *abstracts* the form of the rhythmic structure from the sensory material in which it is embodied.

From the perspective of prosodic science, the publication of Sidney Lanier's *The Science of English Verse* (1880) should be interpreted as the beginning of modern metrics, for the American author relates the psychological perception of rhythms to the conventional structures of English verse. Building on Spencer's concept of the "compound rhythm," Lanier constructs a hierarchical model of poetic structure that accounts for the different levels at which the human ear can perceive the phenomenon of rhythm. Beginning with the dimension of "quantity," Lanier defines the "primary rhythm" as "equally or simply proportional intervals of time ... marked off to our sense by any recurrent series of similar events" (62), suggesting that primary rhythms can be perceived by the eye and ear alike. To illustrate the perception of the primary rhythm, Lanier appeals to the example of a ticking clock, for not only is the duration between "ticks" exactly equal, but the mind makes a distinction between the higher pitch of the first "tick" and the lower pitch of the second "tack." By marking the recurrence of each temporal period with an "accent," the human mind automatically creates a "secondary rhythm" that corresponds to the foot in classical verse or the bar in music. For the method of scansion developed by Lanier, the perception of the secondary rhythm is highly significant, for he uses musical notation to represent the quantity of the syllables (quavers, crotchets, minims, and so on) and bar lines to differentiate between metrical groups. At the time of publication, Lanier's method was criticized for using musical notation to scan the rhythms of English verse—the most-cited example of his scansion of Hamlet's famous soliloquy (172) (Figure 1.1).

As can be seen from the transcription, the time signature $3/8$ indicates that the primary rhythm is determined by a monotonous series

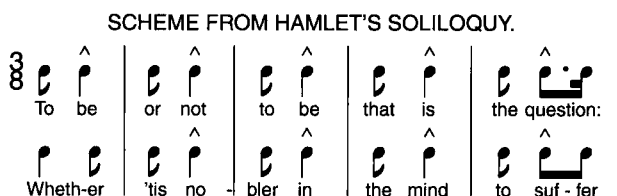


Figure 1.1 Lanier's scansion of Hamlet's soliloquy.