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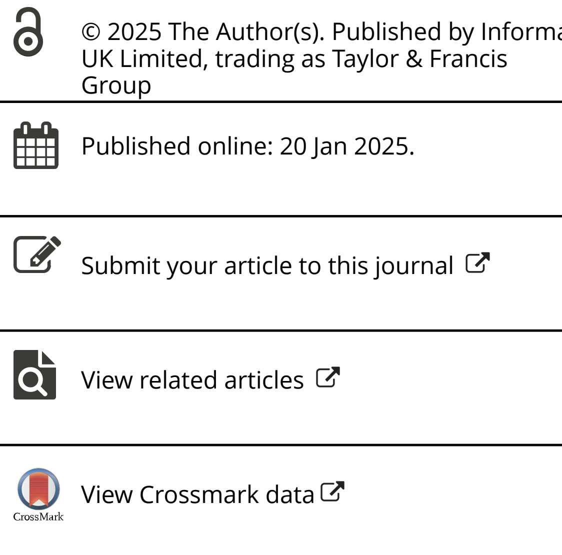

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From Palibino to Riviera: *narrative rhythmanalysis* of Sofia Kovalevskaya's literary writings

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ABSTRACT

This paper explores the spatio-temporal rhythms in Sofia Kovalevskaya's literary writings. Renowned as the first woman professor of mathematics in modern Europe, Kovalevskaya made significant scientific contributions but also excelled in literature, producing novels, poetry, and plays. She believed that great mathematicians must possess "the soul of a poet." Despite the acclaim her literary work received, most research has focused on her mathematical achievements. As a cosmopolitan figure of her era, Kovalevskaya's life spanned diverse geographies—born in Russia, studying in Germany, living in Paris, and eventually settling in Sweden as a professor at Stockholm University. These spatial and temporal dimensions deeply influenced her literary narratives. This paper employs narrative rhythmanalysis to trace the flows, forces, and energies within her writings, highlighting the interplay of space, time, and matter in literary creation. Far from offering final conclusions, this approach reveals a dynamic process, continually uncovering new insights into Kovalevskaya's life, works, and worlds.

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> I was twenty-two years old when I moved to Petersburg. Three months earlier I had graduated from a university abroad and returned to Russia, doctoral degree in hand. After five years of isolated, cloistered existence in a small university town, life in Petersburg immediately enveloped and, as it were, intoxicated me. Putting aside for a while the consideration of analytic functions, space and the four dimensions, which had so recently obsessed me, I threw myself into new interests. I made acquaintances left and right. I tried to penetrate the most varied circles. With greedy curiosity I turned my attention to all the essentially empty but initially so engaging manifestations of the complex hubbub that we call life in Petersburg.[1]

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In the opening pages of her autofictional novella, *The Nihilist Girl,* Sofia Kovalevskaya (1850–1891) paints a vivid portrait of her life in Russia shortly after the completion of her doctoral degree, in 1874. She was the first woman to have been awarded such a high-level university degree in mathematics, and later the first woman to hold a chair in mathematics in modern Europe, with significant contributions in the mathematical sciences.[2] Kovalevskaya wrote this novel during a period that she was trying to reposition herself as a young educated woman in the Russian society she had left behind in 1869, so that she could get access to higher education in Europe. *The Nihilist girl* is the only completed novella among Kovalevskaya's literary writings, which include an autobiography of her early years in Russia, poetry, as well as theatrical plays and novels in drafts and unfinished forms.[3]

Kovalevskaya's literary writings were celebrated during her lifetime and beyond,[4] to the point that the editor of the journal *Russkaya starina,* maintained that her *Russian Childhood* was worthy of standing side by side with Tolstoy's *Childhood.* Possible exaggerations notwithstanding, research around Kovalevskaya has mostly focused on her amazing and almost mythologised biography, as well as her mathematical achievements.[5] It is this gap in the literature that I address in this paper, particularly considering spatiotemporal rhythms in Kovalevskaya's autobiography, novels, theatrical plays and poetry. The paper emerges from a wider Leverhulme-funded project of writing a feminist genealogy of 'automathographies', a term Paul Halmos has used to narrate the life process of becoming a mathematician.[6]

Kovalevskaya was an exemplary cosmopolitan subject of her times and geographies: she was born and grew up in Russia, studied in Germany, lived in Paris for extended periods of time and eventually settled down in Sweden, where she was offered an academic position at Stockholm University in 1894. The spatiotemporal rhythms of her lived experiences are thus beautifully entangled in the narrative modalities of her literary writings, and it is their flow, forces, and energies that I follow in this paper through the beats of what I configure as *narrative rhythmanalysis*.[7]

The paper unfolds in four parts: after this introduction, I offer some glimpses in philosophical treatments of rhythm, in mapping what I have configured as a *rhythm assemblage.* Then I turn to Kovalevskaya's literary writings reading them through the lens of *narrative rhythmanalysis* and in the conclusion I reflect on the idea that it is impossible to be a mathematician without the soul of a poet, which seems to have been influential in Kovalevskaya's scientific and literary creativity.

Mapping a *rhythm assemblage*

In recent years there has been a proliferation of studies in different disciplinary fields that have deployed the notion of rhythm in their analyses, but as

Jonas Rutgeerts has pithily observed, in this turn to rhythmanalysis, the very notion of rhythm has often remained fuzzy or 'enigmatic'.[8] Elsewhere in my work I have deployed the notion of *narrative rhythmanalysis* in studying oral stories of forced displacement, mostly drawing on Henri Lefebvre, who has followed Gaston Bachelard in his deployment of rhythmanalysis, as well as on Gilles Deleuze and Felix Guattari's notion of the *refrain* (ritornello).[9] In this paper however, my focus is on literary narratives, considering how the rhythm of the poetic order stages the encounter between the narrator, her protagonist, the reader/researcher and the pulsation of the natural and socio-cultural rhythms of subjects and their world. In taking up the challenge of clearing the grounds then, I will now follow some lines in rhythm's rich philosophical genealogy, particularly focusing on its role in the constitution of the writing subject, which is the topic of this paper.

According to most dictionaries and linguistic studies, rhythm's etymology lies in the Greek word *rhythmós* [ῥυθμός], which derives from the verb to flow [ῥεῖν], and the suffix *-thmos* [-θμός], which denotes any measured flow or movement. Flow and order are therefore already embedded in rhythm's linguistic roots but have also created different strands in its philosophical treatment, as we will further see. Overall, however, rhythm 'designates the movement or variation characterized by the regular recurrence or alternation of different quantities or conditions', as Jūratė Baranova, Laura Junutytė and Lilija Duoblienė have very succinctly put it.[10] But not all linguists agree about the etymology of the word. In his oft-cited essay 'The Notion of "Rhythm" in its Linguistic Expression', Émile Benveniste traces the root of the word in the presocratic philosophers, Herodotus and the tragedians, but argues that *rhythmós* [ῥυθμός] in their work, always meant form, schema or figure and never derived from the verb to flow [ῥεῖν].[11] While disputing its etymology however, Benveniste makes connections and comparisons between the two words, arguing that there is a difference between schema [*σχῆμα*] and rhythm [ῥυθμός]. While schema is defined as a fixed form,

> 'ῥυθμός according to the contexts in which it is given, designates the form in the instant that it is assumed by what is moving, mobile and fluid, the form of that which does not have organic consistency; it fits the pattern of a fluid element, […] of a particular state of character or mood. It is the form as improvised, momentary, changeable.[12]

As we will discuss later in the section, connecting lines between rhythm, flow, the moment/instant and the figure or the form are entangled in the *rhythm assemblage* of this paper. Differences in linguists notwithstanding, in their introduction to the volume, *The Philosophy of rhythm,* Peter Cheyne, Andy Hamilton, and Max Paddison, give a short but succinct history of rhythm philosophies, starting from the presocratic philosophers

and reaching contemporary philosophical takes of it.[13] In their reading, it was Heraclitus' famous fragment that 'everything flows' [τὰ πάντα ῥεῖ], that initiated the tradition of taking rhythm as flow, a cosmic connotation, that is still present in the different strands of process philosophies.[14] As Cheyne, Hamilton and Paddison have further observed, Plato's 'socio-cultural' approach and his famous definition of rhythm as 'order within movement' has created a different strand in the philosophies of rhythm.[15] What is also important to have in mind is Rutgeerts' pithy remark that at the turn of the twentieth century, rhythm was an important concept not only for philosophers, but also for scientists and social theorists alike 'and was often framed as a mechanism that underscores all movement'.[16]

My point in referring to some genealogical lines in the rich linguistic and philosophical history on rhythm is to give the context of my own take in this paper, which maps an *assemblage* of different but entangled theoretical approaches. The notion of the *assemblage* is taken here from Deleuze and Guattari's conceptual toolbox, denoting the complexity of discursive and non-discursive components and formations in the constitution of knowledge and understandings around rhythm.[17] Components of this assemblage include the great debate on rhythm in the twentieth century, between Henri Bergson and Gaston Bachelard.[18] As I will further discuss below, although there are important differences between the two philosophers, there are also glaring resemblances in their conceptualisation of rhythm, and there is a body of literature that has explored interconnections in their philosophy of time.[19] It is such theoretical entanglements on rhythm that I have read diffractively with Deleuze's and Guattari's notion of the refrain [ritornello][20], as well as Philippe Lacoue-Labarthe's take on rhythm as the intermezzo between beat and figure, in his configuration of the 'echo' as constitutive of the subject.[21] Here again by referring to diffractive readings I follow lines of feminist affirmative approaches to theoretical texts 'reading important insights through one another [and thus] reworking concepts that structure these insights in the traditions of thought from which they stem'.[22]

It is well known that Bergson's work on time, duration and memory became largely influential in the beginning of the twentieth century and continues to be so, particularly among contemporary strands in process philosophy and new materialisms.[23] Rhythm is indeed a key concept in Berson's early essay, *Time and Free Will,*[24] but also later in his major work *Matter and Memory.*[25] Against the imposed compartmentalisation of time as a homogeneous repetition of instants, Bergson offers the image of duration, wherein, past, present and future co-exist in our experience of time:

> In a word, pure duration might well be nothing but a succession of qualitative changes, which melt into and permeate one another, without precise outlines,

> without any tendency to externalise themselves in relation to one another, without any affiliation with number: it would be pure heterogeneity.[26]

Since Bergson uses music to illustrate the experience of time, rhythm emerges as a crucial notion in his configuration of pure duration, it is indeed an aesthetic tool that evokes duration:

> in music, the rhythm and measure suspend the normal flow of our sensations and ideas […] and they take hold of us with such force that even the faintest imitation of a groan will suffice to fill us with the utmost sadness.[27]

As Rutgeerst observes however, in *Matter and Memory* rhythm is much more than an aesthetic tool, evoking or suggesting duration; it rather becomes the defining feature of all entities and phenomena: 'not only does everything have its own rhythm, *rather, each entity is its rhythm*'.[28] For Bergson, then rhythm is the expression of the force of duration 'that permeates everything and makes everything move or "vibrate"'.[29] It is precisely the rate of vibration or rhythm that makes entities singular and unique in Bergson's image of duration and therefore his reality is polyrhythmic:

> In reality there is no one rhythm of duration; it is possible to imagine many different rhythms which, slower or faster, measure the degree of tension or relaxation of different kinds of consciousness, and thereby fix their respective places in the scale of being.[30]

It is because of these differences in rhythm that we sometimes have to follow one dominant rhythm and we do that by imposing our intense rhythm of duration on slower rhythms that are difficult to be perceived: 'to perceive is to immobilize', notes Bergson.[31] But by immobilising the phenomena that surround us, 'we turn our back upon true knowledge'[32] and we reduce the complexity of reality. Instead of imposing our rhythm to the world that surrounds us, we should rather surrender to the rhythms of duration in the mode of 'intuition', as a way of coinciding with 'the extra-intellectual matter of knowledge […] adopting the same rhythm and the same movement' and thus grasping reality from within.[33]

Although influenced by Bergson, Bachelard took a critical stance not only vis-à-vis the notion of duration but also to the image of rhythm as flow. In the opening page of his book, *Intuition of the Instant,* which is a critical response to Gaston Roupnel's philosophical drama *Siloë,*[34] Bachelard highlights the author's central thesis that 'time has but one reality, the reality of the instant'.[35] Indeed, the idea that time can only exist as solitary instant becomes a recurring theme in the book, 'thus depriving past and future from any ontological reality', as Rutgeerts has aptly noted.[36] But if the instant is the only temporal reality, Bachelard also needed to give account of 'why we experience time as something that is continuously unfolding', [37] Rutgeerts has remarked, thus pointing

to the challenge of the Bergsonian durée in Bachelard's take of time as a solitary instant.

It is in response to this challenge that rhythm is deployed in Bachelard's philosophy of time, but it also extends to and indeed is intertwined with his understanding of the subject: 'The individual being, insofar as it is complex, corresponds first of all to a simultaneity of instantaneous actions. It rediscovers itself only to the degree that it resumes these simultaneous actions',[38] Bachelard writes. Considering the subject 'as the sum of its qualities', but also of its potentialities, 'its becoming', Bachelard points to how the subject 'corresponds to a harmony of temporal rhythms'.[39] Rhythm thus becomes the medium through which 'the continuity of the discontinuous will best be understood'.[40] In thus configuring the paradox of 'discontinuous continuity' in the experience of the subject, Bachelard juxtaposes the way 'rhythm traverses silence' with the way the subject 'traverses the temporal vacuum that separates instants'.[41] The continuity between past, present and future, the Bergsonian durée is not a real force, but rather a subjective construct, an assemblage of instants produced by rhythms: 'There is but one reality: the instant. Duration, habit, and progress are only groupings of instants – the simplest among the phenomena of time. None of these temporal phenomena can have an ontological privilege.'[42]

Habits are thus 'fundamental' in Bachelard's philosophy of time and being, constitutive of the subject through 'more or less accurate repetitions, more or less detailed reflections'.[43] Past memories are also important and 'the individual will no doubt make an effort to trace its today upon its yesterday, and this copy will be aided by the dynamics of rhythms'.[44] But since 'the past is as empty as the future' and the future 'as dead as the past',[45] it is only the echo of the past that can reach the present of the instant: 'in us the past is a voice that has found an echo', notes Bachelard.[46]

Rhythm in Bachelard's philosophy is further developed in *The Dialectic of duration,*[47] where it not only connects solitary instants into a continuous refrain, but also develops dialectically, vis-à-vis different states of action and existence: 'there is a fundamental heterogeneity at the very heart of lived, active, creative duration, and […] in order to know or use time well, we must activate the rhythm of creation and destruction, of work and repose'.[48] As Rutgeerts comments, 'rather than being a concatenation of instants, rhythm thus appears as the alternation of – or interaction between – two opposite possibilities'.[49] But dialectics also refers to the idea that 'rhythms are overlaid and interdependent',[50] they are simply 'dialectically conditioned by other rhythms'.[51] Here Bachelard seems very close to Bergson's polyrhythmic reality that we have discussed above.

Indeed, rhythm is crucial in how both philosophers understand temporal existence. Rhythm is constitutive of both reality and the self, but it is also a tool that we deploy to position ourselves in the world and tune into it. As

Rutgeerts helpfully summarises it, for Bergson 'this happens because through our perception, we impose the fast rhythm of our thinking onto the slow rhythm of material things, thus immobilizing them and making it possible for us to use them'.[52] For Bachelard we feel at home in the world through our habits, that include repetitions, refrains and echoes of the past. Thus, while for Bergson rhythm is an expression of pure duration, for Bachelard it is simply a way of constructing and making sense of the continuity of the discontinuous. It is here that Deleuze and Guattari's notion of 'the refrain' and Lacoue-Labarthe's 'echo of the subject' become components of the *rhythm assemblage* that I map in this paper.

For Deleuze and Guattari, rhythms orchestrate otherwise chaotic instances that elude measure and can be found in the passages between milieus or environments: 'rhythm is the milieu's answer to chaos' they write, further adding that 'rhythm ties together critical moments',[53] thus referring to Bachelard's take on rhythm, which they duly acknowledge: 'Bachelard is right to say that "the link between truly active moments (rhythm) is always affected on a different plane from the one upon which the action is carried out"'.[54] On this plane of analysis their concept of the *refrain* [ritournelle][55] plays an important role in their exploration of various themes, including philosophy, art, culture, as well as human and non-human relations and entities.

The refrain refers to any repetitive and patterned activity or mode of being that creates a sense of order or structure in what they refer as the *chaosmos*: 'what chaos and rhythm have in common is the in-between – between two milieus, rhythm-chaos or the chaosmos'.[56] In this configuration the *refrain* is not only about repetition, but also about becoming and transformation: 'the refrain is a prism, a crystal of space time [that] acts upon that which surrounds it, sound or light, extracting from it various vibrations, or decompositions, projections or transformations'.[57] Here it is also important to note that although related, rhythm is different from the *refrain* and it is actually from *refrains* that rhythm is born in music and beyond: 'Music is pervaded by every minority, and yet composes an immense power. Children's, women's, ethnic, and territorial refrains, refrains of love and destruction: the birth of rhythm.'[58]

We have already seen how in their configuration of the *refrain*, Deleuze and Guattari make a direct reference to Bachelard's notion of the rhythm as tying together 'critical moments'. They further argue 'that it is of the nature of the refrain to become concentrated by elimination in a very short moment' and in this way the *refrain* 'fabricates time', [59] thus relating the *refrain* to Bachelard's 'instance' as the only temporal reality. Bergson's influence upon Deleuze is of course very well documented and elaborated in Deleuze's own work,[60] but it is also significantly treated in the literature that discusses and makes connections in their work.[61] But what we have in

Deleuze and Guattari's configuration of the *refrain* as a prism that extracts from its surroundings 'various vibrations'[62] is a direct reference to Bergson's notion of 'vibration' as an effect of the durational force, which marks the singularity and uniqueness of entities, as we have seen above. I will return to these theoretical entanglements on rhythm in the analysis of Kovalevskaya's literary writings in the next section, but I will now consider Lacoue-Labarthe's 'echo of the subject', as the last component of the *rhythm assemblage* that I map and draw upon in this paper.

In exploring the relationship between language, subjectivity and literature Lacoue-Labarthe engaged with the concept of the 'subject' in various contexts, including the subject's relationship to language, representation, and the political realm.[63] More specifically in his essay 'The Echo of the Subject'[64] Lacoue-Labarthe traces connections between autobiography and music, deploying rhythm as a motif in tracing their connection: 'What is it that ties together autobiography, that is to say, the autobiographical compulsion [Zuang] (the need to tell, to confess, to write oneself), and music-the haunting by music or the musical obsession?'[65] It is through autobiography that Lacoue-Labarthe's interest in the subject or rather 'the writing subject', and/or 'the subject of writing' is inscribed. Thus, the inscription of the subject is very important in Lacoue-Labarthe's approach, 'the subject that writes itself [s'écrit]: that writes about the subject, that is written about, that is written-in short, the subject that is one, "one" only insofar as it is in some way or other inscribed'.[66] As we will see in the next section, this conceptualisation of the subject as 'one' only in the act of inscription is critical in understanding Kovalevskaya's becomings through a reading of her literary work.

In thus following psychoanalytic and philosophical trails in his explorations Lacoue-Labarthe proposes that it is music that 'sets off the autobiographical gesture'[67] – we all know that anyway, every time that we start reminiscing when listening to a song or melody that triggers memory. Since 'music is prime'[68] then, it is no wonder that the subject is configured in terms of sounds, refrains and echoes for Lacoue-Labarthe. Although rhythm is difficult to access – it cannot be seen, only heard – and it is something 'pre-specular' and even 'pre-figural', it is nevertheless possible to understand its connections with 'catacoustic repercussion, to resonance or to echo and to reverberation' since 'it is only definable on the basis of repetition'.[69]

We see that there is no rhythm without repetition – or shall we say refrains – for Lacoue-Labarthe, and he thus defines rhythm as 'the spacing and the division in the Same, the repeated difference-from-itself of the Same'.[70] In this line of thought, rhythm is taken as 'the essence of the mimetic movement that "echoes" the subject to itself', as John Martis has succinctly put it.[71] Indeed, the subject feels trapped in an uncanny world

should rhythm vanish, ‘unable to find the reassuring echo that would double and so differentiate it’, Martis has remarked.[72] If loss of rhythm means loss of the subject then, ‘rhythm could also be the condition of possibility for the subject’,[73] as Lacoue-Labarthe argues. Consequently, ‘we are constituted by this rhythm’, Jacques Derrida has observed in his famous introduction to *Typography*. [74]

In this context Lacoue-Labarthe’s notion of ‘the echo’ refers to the ways language reverberates and resonates, suggesting that meaning and subjectivity emerge through a complex interplay of sounds, language, history, and culture. The subject, then, becomes entangled in this web of echoes, constantly mediated by music, language and inscription: ‘“every soul is a rhythmic knot.” We (“we”) are rhythmed’,[75] Lacoue-Labarthe notes, referring to Mallarmé’s *La Musique et les Lettres*.[76] Thus, rhythm in his work ‘is not only a musical category’, but neither is it simply ‘the figure’.[77] His take on rhythm is ‘something between beat and figure’,[78] or as he poetically configures the relationship between music, inscription and the self, ‘it is perhaps simply a rhythm in which “I” seek desperately to recognize “myself”’.[79] Recall here, how ‘each entity is its rhythm’[80] for Bergson, but also how the self is nothing ‘but the integral sum of rhythms’ for Bachelard.[81]

The different strands in the philosophical treatment of rhythm notwithstanding, there is of course an important body of scholarship around reading rhythm in literature and as Rebecca Wallbank has succinctly argued, ‘rhythmic auditory-imagery is prevalent within one’s experience of literature, even if one is not attentive to it, and it can alter the tone, tenor, and mood of an author’s writings in a non-voluntary, non-foregrounded manner’.[82] It is in this context that I have followed spatio-temporal rhythms in Kovalevskaya’s literary writings, as a way of tuning into her existential need and indeed desire to make sense of two interrelated forces in her life, continuity – her life as an aristocratic Russian woman and discontinuity. There were indeed different planes of instants, ruptures, as well as durations in Kovalevskaya’s life: the Bachelardian ‘intuition’ of becoming a mathematician, her cosmopolitan wanderings in Europe, as ruptures in the life of a daughter of the aristocracy, the continuity and intensity of her mathematical work, the fervour of her immersion in radical politics, the struggle to become a professor in mathematics, while also juggling with the demands of being a single mother. In this backdrop, her literary writings allow a glimpse into the different temporalities that she experienced as a complex rhythmic interplay between break and flow, permanence and flux, continuity and discontinuity. As Bergson has written, there is ‘no unique rhythm of duration’, but a multiplicity of ‘different rhythms’, [83] as we have already noted above. Let us then now follow some tracks and traces of Kovalevskaya’s spatiotemporal rhythms in her literary writings.

Writing, reading and sensing rhythm

> Palibino lay quite close to a wood, which gradually became denser and denser, and at last merged into the enormous imperial forest, which extended for hundreds of miles. In its thickets you never heard the sound of an axe, except perhaps at night, when a peasant was bold enough to steal a little crown-wood. Many curious stories were told about this forest. Of course, superstition peopled it with supernatural beings: fairies, trolls and gnomes.[84]

In this short extract from the first version of her autobiography, which was written in the third person and disguised as a novel, *Life in Russia: The Sisters Rajevski,* when it was first published in Swedish in 1889, Kovalevskaya paints the landscape of her childhood home in Palibino, the family estate where they moved when she was eight years old. The thick materiality and indeed silence of the wood is disrupted in the above extract by the dissonant sound of the axe, which invokes time in its Bachelardian conception as instant; recall how 'time has but one reality, the reality of the instant'. [85]

The rich description of the Palibino countryside is also striking in Kovalevskaya's autobiography *A Russian Childhood,* written in the first person and first published in Russia, only a year later, in 1890, in two issues of the journal *Vestnik Europy* [Messenger of Europe]. We do not know with certainty what made Kovalevskaya write her life in two versions, first as an autofiction and then as a classical autobiography. Perhaps her reservations of revealing herself in the public arena receded as her fame as an accomplished mathematician rose. Or perhaps the immediate success of the first publication in Sweden made Kovalevskaya bolder and fearless as an author. What is interesting however in reading both versions of Kovalevskaya's autobiography is that the slightly different texts allow for a rich manifestation of the refrain-rhythm entanglements in Deleuze and Guattari's notion of the *ritornello*, as well as 'the repeated difference-from-itself of the Same'[86] in Lacoue-Labarthe's approach, as discussed in the previous section. It is precisely the little differences in the literary development of the same theme that fascinates the reader in tuning into the rhythm of Kovalevskaya's prose, while taking in mind that some of these differences might simply be linguistic signs of different translations of her work from Swedish to English or Russian to English over the years:[87]

> One side of our estate abutted upon wooded land almost to its very edge. At first this wood was kept cleared and looking like a park, but little by little it had grown denser and more impassable, until at last it merged with the vast State forest. This latter extended over an area of hundreds of versts. No axe had ever sounded in it in the memory of man except clandestinely, perhaps, in the hands of some poaching peasant come to make off with government wood by dark of night. Strange legends about this forest circulated among the peasants, and it was hard to determine where truth left off and myth

> began. Like all Russian forests, it was of course, inhabited by a variety of evil spirits such as wood-demons and river-nymphs.[88]

Differentiations in the same theme notwithstanding, space/time and the history of the empire are entangled in these short but forceful descriptions of the wood, which is invested with folklore myths and popular imagination as it becomes 'denser and denser' with the passing of time. The dissonance between the silence of the night and the sound of a peasant's axe which steals, or shall we say reclaims a tiny portion of their land rights creates the soundscape of continuity and discontinuity, particularly in the context of the emancipation reform of 1861, which abolished serfdom in around the time that Kovalevskaya's family moved to Palibino. This rhythmic interplay between countryside and history and in effect space [extension] and time [inextension], is a literary expression of the fact that space and time are no longer radically separate categories for Bergson in *Matter and Memory,* but rather co-exist as extremes on a continuum, as Rutgeers has pointed out. [89] In this context rhythm emerges as 'the specific outcome of the concrete interplay between the forces of *extension* and *inextension* that takes place in each phenomenon and characterises it'.[90] As readers we follow this rhythm and indeed are mesmerised by it, tuning into the vibrations and space/time pulses of the Palibino countryside, through which Kovalevskaya's echo, as a rhythmed subject can also be heard.

Thus while entering Bergson's image of rhythm, we find ourselves immersed in a world of incessant movement and vibrations, and in the midst of such polyrhythmic reality, it is only by imposing our intense rhythm of duration upon slower rhythms that we can experience stability, since 'to perceive means to immobilize' for Bergson.[91] It is such a moment of creating stability through the imposition of rhythms on the phenomena and things that surround us that the following extract, narrating moments of the house clock in the Palibino house brings to the fore:

> The clock on the classroom wall struck seven. Those seven repeated strokes reached me through sleep and gave rise to the sad certainty that now, this minute, Dunyasha, the chambermaid, would be coming in to wake me up. But sleeping was still so sweet that I tried to convince myself that those seven repulsive strokes of the clock were only in my imagination.[92]

In juxtaposing her desire for the sweet sleep to be prolonged with the harsh seven repeated strokes of the clock, Kovalevskaya, remembering herself as a young child, experiences Bergson's dual state of perception, when he asks: 'do we not sometimes perceive in ourselves, in sleep, two contemporaneous and distinct persons one of whom sleeps a few minutes, while the other's dream fills days and weeks?'[93] The clock time of having to wake up is juxtaposed here to the Bergsonian durée of a child's time, an infinite 'moment of brief bliss', as we all remember it from our endless childhood's summers. The

stroke of the clock is of course exemplary of the amelodic images that Bergson uses to illustrate the intuition of duration, as Christopher Corbier has noted.[94] Indeed, 'the monotone and staccato repetition of the strokes serves as the condition for a state of self-forgetfulness, which in turn allows for the experience of real duration'[95], Rutgeers has further commented – the child's decision to ignore clock time and enjoy her sleep, in our case.

But it is here worth noting that the stroke of the clock, which both measures and regulates time, also allows for the Bachelardian bliss of the instant, 'the last moment of sleep' to be indulged. So, is it duration or the instant that is at play in Kovalevskaya's short literary extract above? I would think it is their entanglement and not opposition that we should be considering here, as well as elsewhere in her literary writings. Living in the Bergsonian durée then, Kovalevskaya remembers and indeed rewrites herelf as a child that dismisses the strokes of the clock and instead of counting them, she stays in bed feeling the rhythm of the last moment of sleep.

But as Kovalevskaya grew up and dreamt of becoming a scientist, the new woman of the 1860s generation,[96] time in her writings is also perceived as a project to be crafted, very much in the Bachelardian image of rhythmanalysis: 'to discover new opportunities for creating rhythms'.[97] It is the possibilities of new times to come that the extract from a letter to her friend Iulia Lermontova,[98] written on 19 January 1869 beautifully illustrates: 'I can hardly wait to go abroad and how I would like to study with you Iulia; I cannot imagine a happier existence than a quiet, modest life in some forgotten corner of Germany or Switzerland, among books and studies'.[99] The Bachelardian time of radical futurity as discontinuity and rupture is striking in the above epistolary extract from a letter that Kovalevskaya penned to her friend at around the time she was ready to leave Russia with her newlywed husband and her sister Anyuta.[100] Her fictitious marriage, common among the 1860s' generation who were dreaming of a new Russia,[101] had created the conditions of possibility for imagining different times, not times remembered any more, but times to come!

It is thus in Kovalevskaya's poetry, published posthumously, that we find traces of the heterotopic spaces she had imagined when preparing for her studies overseas. Here, as elsewhere in my work of writing genealogies of the female self in education,[102] Michel Foucault's well-rehearsed notion of 'heterotopias' have been included in the narrative rhythmanalysis of Kovalevskaya's real and imaginary spaces.[103] As juxtaposed to utopias, or unreal places, heterotopias are configured as spatial entities of heterogeneous elements that are part of the hegemonic spaces, 'but in such a way that they suspend, neutralize, or reverse the set of relations that are designated, reflected, or represented by them',[104] as Foucault has written. Given their heterogeneous constitution, heterotopias are ambiguous spaces, traversed by antagonistic power relations and saturated by dissonant discourses,

unruly passions, and untamed desires. Heidelberg the little German town where Kovalevskaya first studied mathematics thus appears as a heterotopic space in the verses of her poetry:

April 13

Now unfolds a different image
In the changing scene I'm viewing
Of a tidy German village
With a castle, now in ruins.
All the mountains outlined softly
And the chestnuts lush and verdant
Are enveloped in a misty,
Hazy blue transparent curtain
Green, as boundless, as the ocean,
And the sky of vivid azure
I see whimsically patterned,
With great arches and with towers[105]

In the rhythm of her verses, nature and culture are mingled together in the portrayal of landscapes and timescapes, and all these different spaces have different rhythms in the stanzas of her poems.[106] Indeed, different sensations are obtained by the fusion of different rhythms in this short stanza from the poem, 'April 13'. As a poet, Kovalevskaya turns her feelings into images and subsequently into words, 'which translate them while obeying the laws of rhythm', as Bergson has written.[107] It is while reading these words saturated with the poet's feelings that we can have some sense of the emotional and affective forces that have created them, but here comes Bergson's warning that 'we should never realize these images so strongly without the regular movement of the rhythm by which our soul is lulled into self-forgetfulness, and, as in a dream thinks and sees with the poet'.[108] The power of rhythm for Bergson is 'to rock [bercer] our imagination'[109] and thus prepare it to receive the poetic images.

When her years of study eventually ended with the award of her doctoral degree in 1874, Kovalevskaya had to grapple with the untenable position of being a highly educated aristocratic woman but without prospects whatsoever of attaining an academic position in Russia. Her only complete novella, *The Nihilist girl* expresses this frustration through a dialogic rhythm between the narrator (herself) and Vera Barantsova, the nihilist girl. In the genre of the Russian realist novel, the narrator's encounter with Barantsova shakes off her world. Staring from Bazarov in Turgenev's *Fathers and Sons,* the figure of the nihilist played a central role in post-emancipation intellectual Russian life and is a recurring type in the fiction of that period. Nihilist attitudes always involved a strong belief in the unfettering of the individual, a personal revolt against social norms that were regarded as backwards and oppressive.

Well before the publication of her novella, Kovalevskaya herself had a reputation as a nihilist and it was because of this reputation that she was turned down for a professorship at Helsinki University.[110] Following this literary tradition, but also her own auto/biographical experiences, Kovalevskaya portrays Barantsova as an idealistic young gentry woman, who leaves behind the comforts of home and family to find autonomy and at the same time serve the radical cause. The scene at the end of the novella where the narrator goes to the railway station to see Barantsova off on her long journey to Siberia, to be with a 'husband' she had chosen to marry, as a gesture of support and solidarity, is telling of the nihilist attitude:

> I barely managed to exchange a few words with Vera because of the croud around her, but when the last bell sounded and the train was about to start, she extended her hand from the window to bid me farewell. At that moment, I could imagine so vividly the fate awaiting this charming young being that my heart grew heavy and tears rolled from my eyes.
>
> 'Are you crying for me?' said Vera with a bright smile. 'Oh, if only you knew how much I, on the contrary, pity all of you who are staying here!
>
> Those were her last words.[111]

By writing poetry Kovalevskaya materialized Karl Weiestrass'[112] idea that 'the highest point within our science is accessible only to one who is to a certain extent a poet and has prophetic vision and a sense of beauty'[113], but she did it through the support of a network of significant others, including Gösta Mittag-Leffler[114] who first invited her to Stockholm university for a visiting academic position, which later became a tenured position. It was also in Stockholm that Kovalevskaya met Mittag-Leffler's sister, Carlotta,[115] with whom they co-wrote a theatrical play, *The Struggle for Happiness,* in two parallel dramas: (a) *How It Was* and (b) *How It Might Have Been*. Here in the opening scene of the first drama, we see the protagonist, Alisa returning home from university studies, full of dreams, but already feeling the pressure of her family to fulfil her purpose as a dutiful daughter of the aristocracy.

> MDM SELEN (*emerges from the castle, turns to Aunt Amelia and points towards Alisa)*
>
> - What a lovely picture! Everyone's so happy to be welcoming our precious Alisa back home again.
>
> AUNT AMELIA (*seems to be thinking before speaking in a meek, mournful voice)*
>
> - Of course- It's wonderful! Our precious girl has always brought such life to this house! She has so many plans- plans to organize schools, public lectures, and other projects to help the workers.

MDM SELEN

- I heard she performed brilliantly on the university exams.

AUNT AMELIA

- Yes, she has a good head on her shoulders. She's like her father. And since the good Lord hasn't seen fit to give my dear brother a son, it's a good thing that at least his daughter …

MDM SELEN

- So, she will be continuing with classes at Uppsala?

AUNT AMELIA (*smiling and casting a glance at Yalmar who is coming towards her)*

- Oh, I am hopeful that something very different could be happening in the near future.[116]

Even though staged in Sweden the space of the aristocratic mansion, the Gerrrgamra castle where the play unfolds is filled with the dreams of the young as they clash with the plans of the elders. Such experiences are condensed in Bachelard's 'solitary instance', but erupt nevertheless in the Bergsonian durée of 'the struggle for happiness':

ERNEST.

- There seems to be some kind of magnetism in the air tonight. On a night like this, I think it would be impossible for any person with a drop of blood in his vein not to be a little bit enamoured.

ALISA. (*runs up to them and embraces Paula).*

- What a wonderful night! Even the air! How intoxicating! How perfectly beautiful the sky and the hills, there in the distance! Oh! Paula! It's so good- so completely wonderful just to be alive![117]

As Rutgeers has observed, for both Bachelard and Bergson concrete duration can only be understood as the outcome of a relation between continuity and discontinuity, or between a 'dynamic force' and a 'force of resistance',[118] and it is in understanding this relation that both philosophers turn to rhythm analytics. As we have already discussed in the previous section, Bergson suggests that if we really want to comprehend life, we need to relax our own rhythm and allow ourselves dive into the polyrhythmic reality of duration. We can do that through intuition, rather than intelligence, his philosophical method par excellence. Ernest and Alisa in the extract above immerse themselves in the space/time rhythms of the beautiful night. In doing so they forget the mundane worries of everyday life and can thus sense some fleeting moments of existential happiness.

Space/time rhythms forcefully mingle with music towards the end of the first play when Alisa and her husband Yalmar, an accomplished musician, have realised that their long-planned arranged marriage for the sake of the family fortune has failed both emotionally and financially and they are planning together the waterfall symphony as the grand finale of their dreams taking their inspiration from the waterfall of their estate, which was instrumental in the factory they had inherited, but had eventually gone bust:

ALISA

- A musical narrative – 'The Waterfall' – our waterfall, of course! It's a great idea! First you would need to portray it in primitive times, flowing freely in a wide, rough stream from the region of eternal snows-from the glaciers […]

ALISA (continuing)

- So, then, the construction of the factory begins – dams are constructed and the waterfall is forced to flow through a certain channel.

YALMAR

- Yes, of course, and a deafening grumble from the waterfall!

ALISA

- And the scratch of a saw, sharply and disharmoniously rushing to join the powerful roar of the water!

YALMAR

- A saw?? Yes, it seems right! You are a genius (*He embraces her)* What wonderful discords could be created on this theme!

[…]

YALMAR

- Then the resistance of our waterfall will end, as all the other streams merge into a powerful chorus, audible from everywhere-from the ends of the earth! Then our waterfall will not want to be left behind. Its voice will be heard and will sound, at last, with increasing force, until its roar finally covers the entire orchestra with its high silvery tone. Wouldn't this be an excellent finale?

Bergson's well-known thesis that space disturbs and distorts our existential experience of time has been criticised by theorists of the dynamism of space. As Foucault famously put it in one of his interviews,

> a critique could be carried out of this devaluation of space that has prevailed for generations. Did it start with Bergson, or before? Space was treated as

> the dead, the fixed, the undialectical, the immobile. Time, on the contrary, was richness, fecundity, life, dialectic.[119]

Despite Foucault's critique however, what Bergson was castigating in *Time and Free Will,* was the conceptualisation of time as a 'homogeneous medium in which our conscious states are ranged alongside one another as in space, so as to form a discrete multiplicity'.[120] Against this spatialisation or rather compartmentalisation of time, Bergson proposed the experience of time as synthesis and in this context, melody was used as an exemplar of his proposition: 'we have here to do with a synthesis which is, so to speak, qualitative, a gradual organization of our successive sensations, a unity resembling that of a phrase in a melody'.[121] In thus trying to make sense of the passing of time in relation to what had happened in their lives, which revolved around the estate, the factory, and the waterfall that gave it energy, Alisa and Yalmar tune themselves into the musical movement of the *Waterfall Symphony* and let themselves get carried away by its multifarious rhythms.

In the *Dialectic of Duration,* Bachelard shows how continuity is actually being constructed through rhythm and in doing so he also draws on the metaphor of the melody. But in his phenomenological universe, melodic continuity 'is not *heard* straightaway',[122] but is rather recognised and learnt gradually through our experience of time: 'let us first emphasize this reflux of impression flowing from the present to the past and giving to rhythm, melody and poetry the continuity and life they lacked when first produced'.[123] Moreover, continuity in music is not experienced individually, but on the level of the orchestra, where the different musical instruments, which never play continuously, come together and 'correlate with each other', in the same way that 'rhythms are overlaid and interdependent'.[124]

What we therefore have in the *Waterfall Symphony* is the construction of continuity and rhythm not only in the lives of two young people, but also in the history of their estate and family fortune. Moreover, and perhaps more importantly, what also emerges from Kovalevskaya's play is a synthesis of space and time. In this backdrop time as both duration and momentum, but also space in its dynamic conceptualisation [through the feature of the waterfall] are immersed in the existential experience of rhythm, melody and vibrations.

Kovalevskaya's own 'fictitious' marriage, which was initially planned to liberate her from the paternal control and allow her to travel to Europe in pursue of her studies, went through a happy period when she had her daughter after the award of her doctoral degree, but eventually ended up in ruins and her husband's suicide. But during the years of her academic position, she also found a new love. Maksim Kovalevski,[125] a distant relative of her husband had a villa in the Riviera and it is the unfinished novella *A Fragment*

of Romance on the Riviera that carries traces of Kovalevskaya's last love in her own struggle for happiness:

> With a sharp and shrill whistle, the train took off from a tunnel near Genoa and rushed along the coast of the Mediterranean Sea towards Ventimiglia. It was the end of January; the morning was lovely and warm. On the blue background of the sky white lambs roamed, and the whole vicinity was constantly changing character and colour; when the sun went behind a cloud, the sea suddenly darkened and twitched with a grey haze; but in a minute it sparkled again and took off; rocks monotonously steel and surrounding mountains took on a pink hue. Grayish green shimmered with silver. The sea was stained suddenly with countless different colours. Along the banks, where the ground was sandy, there was a pale bluish stripe; a little further away it turned into emerald green. Even further, the presence of an underwater rock was detected with a whole row of small white scallops, and behind a large sail long, glittering, golden ripples stretched across a ship.[126]

The different scenes on the train to Genoa, invoke different sensations which unfold through the fusion of the spatio-temporal rhythms in the novella, as sensed by the protagonist, Marya Nikolaevna, a young aristocratic Russian woman, who has just finished her studies at the *Bestuzhev Courses* and travels by train on her way to meet relatives in Nice. The monotone and staccato repetition of the train engine serves as the amelodic condition for a state of self-forgetfulness, which in turn allows for the experience of real duration, as we have already discussed above. Rhythm thus functions as 'instrument of suggestion', or 'vector of hypnosis', as Corbier has commented.[127] Recall how its repetition for Bergson, makes the listener, the young traveller in the case of the novella, forget herself on her way to Genoa. But this amelodic rhythm of the train also lulls us, as readers of the novella, in a state where we experience the different strokes of the train engine as one continuous melody.

In thus following the rhythm of the train, we trace connections between Alisa, Marya, but also the author herself, in the dreams of well-educated young women to be of service to the world, while also falling in love and feeling intensely the vibes of nature. In the extract below the protagonist of the novella meets a well-known figure of the Russian intelligentsia, Mikhail Mikhailovich Zvantsev, on the train and they start a conversation about her plans, but also about the beauties of the Riviera:

> - Oh, how good it is here! What a wonderful place! – constantly exclaimed Marya Nikolaevna. 'You know, I'm even scared that I'm spoiling myself here? But after that I will have to go to the wilderness, to the Saratov province, to take up my position as a country teacher! she suddenly said.
>
> - Yes, Saratov, of course, is not like the Riviera. Only why are you taking a position this far! Really you did not find a place in Petersburg? asked Zvantsev naively, wanting to show his interest.
>
> Marya Nikolaevna looked at him and blushed all over.

- I am not going out of necessity, she said, rushing and confused. I finished first the courses and, of course, I could have stayed in Petersburg. And besides, I do not need a position anyway. But it seems to me that every intelligent person can be more useful in the provinces. Here I am with my friend Yulia Ivanovna Rumyantseva, and we are to open a rural school in the Saratov province. There are enough intelligent people in St Petersburg without us.[128]

As Kovalevskaya's biographers have pointed out, Zvantsev is a reflection or rather an echo of Kovalevskaya's lover, Maksim Kovalevsky, a liberal thinker, who had left the oppressive regime in Russia to live in Europe.[129] Maksim looked after the publication of Kovalevkaya's literary work after her untimely death in 1891, and he wrote the introduction to the first publication of *The Nihilist Girl* in Geneva in 1892. Having been acknowledged and widely recognised as an important mathematician during her lifetime, Kovalevskaya was also celebrated as a literary figure posthumously, thus achieving to inhabit the two figures that Bachelard regarded as most important: the scientist and the poet. It is on these two subject positions that I will reflect, by way of conclusion.

Echoes of the subject: the scientist and the poet

Bachelard has been recognised as both a philosopher of science and imagination and in this backdrop the two figures of the scientist and the poet are interwoven throughout his work.[130] The scientist is the one who breaks with tradition and engages in rigorous and objective inquiry, which in the case of Kovalevskaya was her passionate work in mathematics, that eventually led to one of the highest mathematical awards of her times: the Prix Bordin that she received from the French Academy of Sciences in 1888. This is how she was imagining her contribution to the world of science in a letter to her friend Maria Jankowska-Mendelson, penned on 19 January 1884, early on in the beginning of her academic career:

> I am currently very busy and completely wrapped up in my worries about consolidating my position at the university, so as to open this path for women in this way. The new mathematical work I have recently embarked upon fascinates me now, and I would not like to die without having discovered what it is I am looking for. If I manage to solve the problem I am currently working on, then my name will be entered among the names of the most eminent mathematicians. By my reckoning, I need another five years to achieve good results.[131]

But as we have already discussed throughout this paper mathematics went hand in hand with poetry and imagination both for Kovalevskaya and Bachelard.[132] 'Being a poet means multiplying the temporal dialectic and refusing the easy continuity of sensation and deduction; it means refusing catagenic repose and welcoming a repose that vibrates, a psyche that vibrates'

Bachelard wrote in the *Dialectic of Duration.*[133] In further making a distinction between 'thought poetry' and 'poetry that is spoken', Bachelard discussed their interrelation, pointing out that 'the echo will reveal the voice that lies deep'.[134] We listen to the echo of this hidden voice through our bodily rhythm, since 'the rhythm we think is our starting point for organising the rhythm we hear, and not the reverse', he argued in line with his phenomenological position.[135] Kovalevskaya was equally persuaded about the importance of literary imagination in the mathematician's mind and work. This is what she wrote to the Russian writer Aleksandra Stanislanova Shabelskaya in the autumn of 1890, in response to a fan letter she had received from her:

> I understand that you are surprised that I can pursue both literature and mathematics at the same time. Many people who have never been presented with an opportunity to know more about mathematics confuse it with arithmetic and believe it to be a dry and arid science. In essence, though, it is the science that demands the greatest imagination, and one of the most respected mathematicians of our century says completely correctly that you cannot be a mathematician without at the same time being a poet in your heart. Only, naturally, in order to understand the truth in this pronouncement, you need to rid yourself of your old prejudice that a poet has to compose something imaginary, that imagination and invention are one and the same. I think that a poet should see what others don't see, see more deeply than others. Which is what a mathematician should also do.[136]

Kovalevskaya's literary work reveals that she had indeed the soul of a poet and that she could see what others couldn't. Vacillating between the figures of the poet and the mathematician Kovalevskaya thus emerges as a 'rhythmic knot', she is indeed rhythmed between mathematics and literature. As she wrote to Shabelskaya in the letter above, throughout her life she was unable to decide whether she had more aptitude for mathematics or literature:

> Just when my head starts getting tired over purely abstract speculations, it immediately begins gravitating towards observations of life, to stories and, on the contrary, at other times everything in life suddenly starts seeming petty and uninteresting, and only the eternal, immutable laws of science appeal.[137]

Without the rhythm of her literary writings, Kovalevskaya's echo cannot be heard. Remember that we need rhythm to listen to the echo of the subject. But this rhythm need not originate from the listener or the reader in our case, as Bachelard has suggested above. Kovalevskaya's voice vibrates through her literary writings, but without them her echo is in danger of being trapped in the myths, discourses and metanarratives that have been constructed around her.[138] Recall that loss of rhythm might effectuate the loss of the subject, 'in which case, rhythm would also be the condition of possibility for the subject' for Lacoue-Labarthe.[139]

Kovalevskaya is hesitant and undecidable about her subject position, as she must always confront two figures and thus the reader's only chance to listen to the echo of her voice, lies in tuning into the rhythm of oscillating between the poet and the mathematician. This is where narrative rhythmanalysis becomes the medium through which Kovalevskaya figure as a writing subject, emerges.

Notes

1. Sofya Kovalevskaya, *Nihilist Girl*, trans. Natasha Kolchevska with Mary Zirin (New York: The Modern Language Association of America, 2001 [1892]), p. 3.
2. For an overview of Kovalevskaya's contribution to mathematics see amongst others, Roger Cooke, *The Mathematics of Sonya Kovalevskaya* (New York: Springer-Verlag, 1984) and Pelageya Kochina, *Love and Mathematics: Sofia Kovalevskaya*, trans. Michael Burov (Moscow: Mir Publishers, 1985).
3. See Sofya Kovalevskaya, *A Russian Childhood*, trans. Beatrice Stillman (New York: Springer-Verlag, 1978 [1895]); Kovaleskaia, *Memories and Letters*; Kovalevskaya, *Memories and Stories [Vospominani Povesti]*, ed. Kochina Pelageya (Moscow: Nauka, 1974); Sandra DeLozier Coleman, *Mathematician with the Soul of a Poet: Poems and Plays of Sofia Kovalevskaya* (North Carolina: Bohannon Hall Press, 2021).
4. See Kochina, *Love and Mathematics,* pp. 224–5.
5. See amongst others, Michèle Audin, *Remembering Sofya Kovaleskaya*, trans. M. Audin (London: Springer, 2011); Don H. Kennedy, *Little Sparrow: A Portrait of Sophia Kovalevskaya* (Athens: Ohio University Press, 1983); Ann Hibner Koblitz, *A Convergence of Lives: Sofia Kovalevskaya: Scientist, Writer, Revolutionary* (New Brunswick: Rutgers University Press, 1993 [1983]); Joan Spicci, *Beyond the Limit: The Dream of Sofya Kovalevskaya* (London: Forge Books, 2002).
6. Paul Halmos, *I Want to Become a Mathematician: An Automathography* (New York: Springer, 1985). For more details on the project, see https://sites.google.com/view/numbersandnarratives/a-feminist-genealogy-of-automathographies.
7. See Maria Tamboukou, 'Narrative Rhythmanalysis: The Art and Politics of Listening to Women's Narratives of Forced Displacement', *International Journal of Social Research Methodology*, 24.2 (2021), pp. 149–62.
8. Jonas Rutgeerts, 'Revisiting Rhythmanalysis: How Rhythm Operates in the Work of Gaston Bachelard and Henri Bergson', *Parrhesia*, 31 (2019), pp. 85–102, p. 85. This article also offers a very comprehensive overview of the 'rhythmanalysis' literature.
9. See Gilles Deleuze and Felix Guattari, *A Thousand Plateaus*, trans. Brian Massumi (London: The Athlone Press, 1999).
10. Jūratė Baranova, Laura Junutytė, and Lilija Duobliené, 'Introduction', in *Rhythm and Refrain: In Between Philosophy and Arts* (Vilnius: Lithuanian University of Educational Sciences, 2016), pp. 9–22, p. 10.
11. Emile Benveniste, 'The Notion of "Rhythm" in Its Linguistic Expression', in *Problems in General Linguistics*, Miami Linguistic (Miami: University of Miami Press, 1973), Vol. 8, pp. 281–8, p. 282.
12. Ibid., pp. 285–6.

13. See Peter Cheyne, Andy Hamilton, and Max Paddison, ‘Introduction: Philosophy of Rhythm’, in P. Cheyne, A. Hamilton and M. Paddison (eds), *The Philosophy of Rhythm* (New York: Oxford University Press, 2019), pp. 1–12.
14. Ibid., pp. 1–2.
15. Ibid., 2.
16. Rutgeerts, ‘Revisiting Rhythmanalysis’, p. 100, n21.
17. Deleuze and Guattari, *A Thousand Plateaus*.
18. See Rutgeerts, ‘Revisiting Rhythmanalysis’, for a critical overview of Bergson’s and Bachelard’s take on rhythm.
19. See amongst others Eileen Rizo-Patron, *Adventures in Phenomenology: Gaston Bachelard* (New York: Suny, 2017); Frédéric Worms and Jaen-Jacques Wunenburger, *Bachelard et Bergson: continuité et discontinuité* (Paris: Presses Universitaires de France, 2008); Roch C. Smith, *Gaston Bachelard: Philosopher of Science and Imagination* (Albany: Suny Press, 2016).
20. Deleuze and Guattari, *A Thousand Plateaus.*
21. Philippe Lacoue-Labarthe, *Typography: Mimesis, Philosophy, Politics*, ed. Christpher Fynsk (Cambridge MA: Harvard University Press, 1989).
22. Karen Barad, ‘Posthumanist Performativity: Toward an Understanding of How Matter Comes to Matter’, *Signs: Journal of Women in Culture and Society*, 28.3 (2003), pp. 801–31, p. 811.
23. See Keith Robinson, ed., *Deleuze, Whitehead, Bergson: Rhizomatic Connections* (Basingstoke: Palgrave Macmillan, 2009) and Iris Van der Tuin, ‘“A Different Starting Point, Different Metaphysics”: Reading Bergson and Barad Diffractively’, *Hypatia*, 26.1 (2011), pp. 22–42.
24. Henri Bergson, *Time and Free Will: An Essay on the Immediate Data of Consciousness*, trans. L. Pogson Frank (New York: Dover Publications, 2001 [1889]).
25. Bergson, *Matter and Memory*, trans. N.M. Paul and W.S. Palmer (New York: Zone Books, 2002).
26. Bergson, *Time and Free Will*, p. 104.
27. Ibid., pp. 14–15.
28. Rutgeerts, ‘Revisiting Rhythmanalysis’, p. 91, emphasis in the text.
29. Ibid.
30. Bergson, *Matter and Memory*, p. 207.
31. Ibid., p. 208.
32. Ibid., p. 199.
33. Bergson, *Creative Evolution*, trans. Arthur Mitchell (New York: Cosimo Classics, 2005), p. 389.
34. Gaston Roupnel, *Siloë* (Paris: Librairie Stock, 1927).
35. Bachelard, *Intuition of the Instant*, trans. Eileen Rizo-Patron (Evanston: Northwestern University Press, 2013), p. 6.
36. Rutgeerts, ‘Revisiting Rhythmanalysis’, p. 93.
37. Ibid.
38. Bachelard, *Intuition of the Instant*, p. 39.
39. Ibid.
40. Ibid.
41. Ibid.
42. Ibid., p. 51.
43. Ibid., p. 41.
44. Ibid.

45. Ibid., p. 28.
46. Ibid., p. 31.
47. Bachelard, *The Dialectic of Duration*, trans. Mary McAllester Jones (Manchester: Clinamen Press, 2000).
48. Ibid., p. 29.
49. Rutgeerts, 'Revisiting Rhythmanalysis', p. 96.
50. Bachelard, *The Dialectic of Duration*, p. 130, emphasis in the text.
51. Rutgeerts, 'Revisiting Rhythmanalysis', p.96.
52. Ibid.
53. Deleuze and Guattari, *A Thousand Plateaus,* p. 313.
54. Ibid., p. 313. The quote from Bachelard is from the *La dialectique de la durée,* in Ibid., p. 547n4.
55. Ibid., p. 312.
56. Ibid., p. 313.
57. Ibid., p. 348.
58. Ibid., p. 300.
59. Ibid., p. 349.
60. Deleuze, *Bergsonism*, trans. Hugh Tomlinson and Barbara Habberjam (New York: Zone Books, 1991).
61. See amongst others, Valentine Moulard-Leonard, *Bergson Deleuze Encounters* (New York: SUNY, 2008), Robinson, *Deleuze, Whitehead, Bergson*; Keith Ansell Pearson, *Philosophy and the Adventure of the Virtual* (London: Routledge, 2002).
62. Deleuze and Guattari, *A Thousand Plateaus*, p. 348.
63. See Lacoue-Labarthe, *Typography*.
64. Lacoue-Labarthe, 'The Echo of the Subject', in *Typography*, pp. 139–207.
65. Ibid., p. 140.
66. Ibid., p. 141.
67. Ibid., p. 151.
68. Ibid.
69. Ibid., p. 196.
70. Ibid.
71. John Martis, *Philippe Lacoue-Labarthe: Representation and the Loss of the Subject* (New York: Fordham University Press, 2005), p. 44.
72. Ibid.
73. 'The Echo of the Subject', p. 195.
74. 'Introduction', in *Typography,* p. 31.
75. Ibid., p. 202.
76. Cited in Ibid., p. 140.
77. Ibid., p. 202.
78. Ibid.
79. Ibid., p. 203.
80. Rutgeerts, 'Revisiting Rhythmanalysis', p. 91.
81. Bachelard, *The Intuition of the Instant*, p. 41.
82. Rebecca Wallbank, 'The Not-So-Silent Reading: What Does It Mean to Say that We Appreciate Rhythm in Literature?', in *The Philosophy of Rhythm,* p. 371. This chapter also presents a comprehensive overview of the literature.
83. Bergson, *Matter and Memory,* p. 207.

84. ‘Reminiscences of Childhood [Life in Russia: The Sisters Rajevski]’, in *Biography and Autobiography,* trans. Louise Von Cossel (London: Walter Scott, 1895 [1889]), pp. 167–317, p. 242.
85. Bachelard, *Intuition of the Instant*, p. 6.
86. ‘The Echo of the Subject’, p. 196.
87. Although translation is an important issue to consider, it goes beyond the limitations of this paper, but I have discussed it elsewhere in my work on Kovalevskaya’s meta-archive. See Maria Tamboukou, ‘Traces in the Archive: Re-Imagining Sofia Kovalevskaya’, *Life Writing*, 19.3 (2022), pp. 341–56.
88. *A Russian Childhood*, p. 83.
89. Rutgeers, ‘Revisiting Rhythmanalysis’, p. 91.
90. Ibid.
91. *Matter and Memory*, p. 208.
92. *A Russian Childhood*, p. 98.
93. *Matter and Memory,* p. 207.
94. ‘Bachelard, Bergson, Emmanuel: Mélodie, rythme et durée’, *Archives de Philosophie*, 75.2 (2012), p. 296.
95. ‘Revisiting Rhythmanalysis’, p. 91.
96. There was an air of freedom in the 1860s in Russia, particularly among the younger generation, who strongly came to believe that scientific knowledge would end the dark ages of humanity and would open up the road to social revolution. See Ann Hibner Koblitz, ‘Science, Women, and the Russian Intelligentsia: The Generation of the 1860s’, *The History of Science Society*, 79.2 (1988), pp. 208–26.
97. *The Dialectics of Duration*, p. 148.
98. Iulia Lermontova (1847–1919) was Kovalevskaya’s close friend. They studied together in Germany and she became the first woman in the world to get a PhD in Chemistry from the University of Göttingen in 1874.
99. in Sofe Vasilevna Kovalevskaiia, *Memories and Letters* [Vospominaniia i pis’ma] (Moscow: AN SSSR, 1951), p. 235.
100. Anna Vasilyevna Korvin-Krukovskaya (1843–1887) was a socialist and feminist revolutionary. After following her sister Sofia in Europe, she eventually settled in Paris, where she got involved in the radical circles through Victor Jaclard, who she eventually married.
101. There were many young men in Russia’s radical circles of the 1860s, who were committed to support women in their struggle to equality. One way to do this was through consenting to enter fictitious marriages, thus offering ‘their wives’ the opportunity to take control of their lives and pursue university degrees abroad.
102. See Tamboukou, *Women, Education, the Self: A Foucauldian Perspective* (Basingstoke: Palgrave Macmillan, 2003).
103. ‘Different Spaces’, in Michel Foucault, *Aesthetics, Method and Epistemology, the Essential Works of Michel Foucault, 1954–1984*, ed. Paul Rabinow (Harmondsworth: Penguin, 1998), Vol. 2, pp. 175–85.
104. Ibid., p. 177.
105. Kovalevskaya, *Poems and Plays,* 55.
106. Here, as well as elsewhere in her poems it would have been interesting to study the poetic metre of her verses, but this again goes well beyond the scope and limitations of this paper.
107. *Time and Free Will*, p. 15.

108. Ibid.
109. Bergson, *Laughter: An Essay on the Meaning of the Comic,* trans. Cloudesley Brereton and Fred Rothwell (Temple of Earth Publishing, 2001 [1911]), p. 21a.
110. See Kochina, *Love and Mathematics*, p. 121.
111. *The Nihilist Girl*, p. 139.
112. Karl Weierstrass (1815–1897) is often cited as the father of modern analysis. He became a professor of mathematics in Berlin, without finishing his university degree and perhaps his unorthodox academic career might have influenced his willingness to take up Kovalevskaya's supervision outside the formal university procedures.
113. Weierstrass, cited in Kochina, *Love and Mathematics*, p. 118.
114. Gösta Mittag-Leffler (1846–1927) was a Swedish mathematician. He founded the journal Acta Mathematica and the Mathematics Institute of the Swedish Academy of Sciences that bears his name.
115. Anna Carlotta Leffler (1849–1892) was a Swedish writer, active within the women's movement, and sister of Gösta Mittag-Leffler. She wrote many stories and theatrical plays and became Kovalevskaya's friend and co-author.
116. *Poems and Plays,* p. 75.
117. Ibid., p. 88.
118. 'Revisiting Rhythmanalysis', p. 88.
119. 'Questions on Geography' in Michel Foucault, *Power/Knowledge: Selected Interviews and Other Writings, 1972–1977*, ed. Colin Gordon (New York: Pantheon Books, 1980), pp. 63–77, p. 70.
120. *Time and Free Will,* p. 90.
121. Ibid., p. 111.
122. Bachelard, *The Dialectc of Duration*, p. 110, emphasis in the text.
123. Ibid.
124. Ibid., p. 117, emphasis in the text.
125. Maksim Maksimovich Kovalevsky (1851–1916) was an established sociologist, president of the International Institute of Sociology and member of the Russian Academy of Sciences.
126. Kovalevskaya, *Memories and Letters*, p. 168.
127. 'Bachelard, Bergson, Emmanuel', p. 298.
128. Kovalevskaya, *Memories and Letters*, p. 174.
129. See Kochina, *Love and Mathematics,* p. 228.
130. See, Rock S. Smith, *Gaston Bachelard: Philosopher of Science and Imagination* (New York: SUNY Press, 2016).
131. Kovalevskaya, *Memories and Letters*, p. 279.
132. Here it is important to note that there is a rich body of literature exploring links and entanglements between poetry and mathematics, most notably in the philosophical work of Alain Badiou and Barbara Cassin, but engagement with this literature goes well beyond the scope and limitations of this paper. See also Sarah Hickmott, *Music, Philosophy and Gender in Contemporary French Thought: Nancy, Lacoue-Labarthe, Badiou* (Edinburgh: Edinburgh University Press, 2020).
133. *The Dialectic of Duration*, p. 119.
134. Ibid.
135. Ibid.
136. Kovalevskaya, *Memories and Letters,* p. 314.
137. Ibid.

138. See Tamboukou, 'Traces in the Archive'.
139. 'The Echo of the Subject', p. 195.

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