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Melville's Measures

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Melville's Curves: Mathematics and the Melvillean Imagination. Measuring a Cycloid in *Moby-Dick*

Federico Bellini

1 Many critics have held an enduring conviction that Herman Melville's scientific knowledge was scarce.[1] Since Melville was forced to interrupt his studies at an early age, they have applied to the author what Ishmael says of himself in *Moby-Dick*, that "a whale-ship was my Yale College and my Harvard" (112). Accordingly, they have been led to believe that Melville's competence in mathematics and science was superficial or at best amateurish. However, recent research by Meredith Farmer has uncovered that this was not the case (Farmer 2016). Even though he did not attend college, Melville was lucky enough to get an education in this field far above the average of his time. In his early teens, as he attended the Albany Academy, he happened to be one of the pupils of Joseph Henry, a prominent scientist who would later become the first Secretary of the Smithsonian, and who at the time was teaching "Mathematics and Natural Philosophy" at the institution. Henry, a brilliant scientist and an inspiring pedagogue, adopted a revolutionary approach focused on involving the students in hands-on experiments in order to facilitate instruction by means of direct experience. As shown by Farmer, Melville proved particularly receptive to Henry's teachings, which had a profound and longstanding impact on the young boy. Melville's fascination for mathematics and the sciences remained a major component of his imagination when, several years later, he turned to writing. Indeed, as Zachary Turpin has noted, Melville's "enthusiasm for mathematics was life-long and appears in his stories and poems, his letters, and each of his novels" (18).

2 This reevaluation of a pivotal aspect of Melville's biography calls for a reassessment of the role of science and mathematics in Melville's imagination. In this essay I intend to contribute to this endeavor by analyzing one specific and hitherto disregarded mathematical reference in chapter XCVI of *Moby-Dick*, "The Try-Works." There Ishmael mentions the cycloid, a curve that was at the center of a very lively debate among some

leading 17th-century thinkers. In the first part of this essay I will show how it is only in the light of the peculiar geometrical properties of the cycloid that Ishmael's playful reference can be understood, thus testifying to the author's profound understanding of these mathematical notions and, more crucially, of their philosophical import. Indeed, on top of being a fascinating geometrical construct, the cycloid played a pivotal role in the history of early modern philosophy. The investigation on its properties led to the invention and development of calculus, which in turn was at the center of what Gilles Deleuze has famously identified as the "baroque" philosophy of post-Cartesian thinkers such as Leibniz and Spinoza. Building on this, the second part of my essay will show how Ishmael's mention of the cycloid can also be read as a playful reference to a philosophical worldview according to which nature appears as a continuum of indefinitely foldable matter within which personal identity dissolves—a view that Melville presents as at the same time fascinating and highly problematic.

3 By highlighting such a problematic dimension, I want to both embrace and partially depart from some of the conclusions reached by the recent new materialist, non-anthropocentric and impersonalist approaches to Melville's work. These have insistently emphasized how Melville's implicit philosophy blurs the boundaries between human and non-human, inner and outer world, organic and inorganic forces, dropping "from conceptual oppositions to experiential adjacencies" (Sanborn 13). Such a philosophy, accordingly, problematizes the notion of subjectivity in Melville by presenting a radical relational ontology in which individual identities are always already dissolved in fields of forces made up of transindividual relations. While I agree that one can indeed find several aspects of Melville's thought as it is embodied by his literary works that are compatible with this "new materialist" view, I consider that taking it as its only component rather than a part of a more complex and shifting whole would be highly reductive. By contrast, Melville seems to consistently conjure up this view only to play it against the opposite idea of an altogether stable identity based on one's sentient, limited, and mortal body.

4

5 The goal of this analysis is not to pinpoint what is supposed to be intended as the ultimate implicit philosophy of *Moby-Dick*, but rather to investigate the ways in which alternative views are constantly played against each other, juxtaposed and intertwined so as to generate the dynamic tension that is at the core of Melville's imagination. The tension between incompatible worldviews that fuels the author's creativity projects itself onto the text, where it is reflected at all textual scales: from the structure of the whole plot of the novel to the style of a single sentence, from recurring imagery to individual tropes and figures. Accordingly, even the most minute detail, such as the reference to the cycloid here analyzed, can reproduce on a smaller scale the same density of meaning of the whole work. Such a metonymic or fractal mode of reading, which is inspired by old-fashioned structuralism and based on historically-informed close reading, works egregiously when applied to an author that proves to share with Emerson the belief that "a principle of self-similarity operates throughout nature, at all scales" (Windolph 36), and whose work reflects a taste for intricate but regular patterns. Reading *Moby-Dick* in this way also means rehabilitating a hermeneutic approach to literature that aims at "understanding Melville" as the goal of one's engagement with the text rather than using the text to "think with Melville about questions that relate to current political or philosophical matters of concern" (Farmer

& Schroeder 38). While the latter approach, identified by Meredith Farmer in her introduction to the collection *Ahab Unbound* as typical of the most recent wave of new materialist criticism, is certainly legitimate, I do think that the former can still prove rewarding. As for any true work of art, one is never done with understanding and aesthetically appreciating a text such as *Moby-Dick*, and this makes it, in itself, still relevant to us and our times.

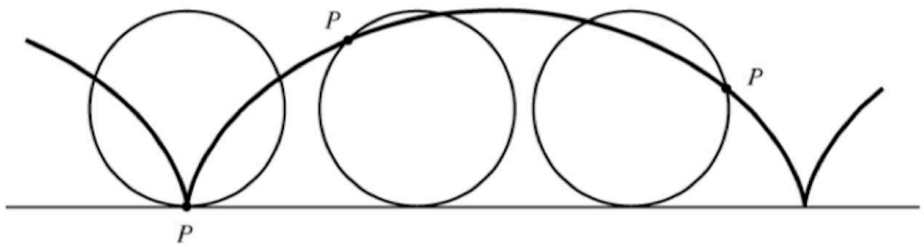
The Cycloid; or, on How Geometry can be Harmful to One's Toes

6 Chapter XCVI of *Moby-Dick*, titled "The Try-Works," describes the process by means of which the blubber of the whale is boiled in two large cauldrons, the try-pots, in order to extract the oil. It opens with a description of the pots and it is in this context that the cycloid is mentioned for the first and only time. It happens as Ishmael is explaining to the reader how the pots are kept clean scraping a heavy "soapstone" against their interior surface. It is one of several allusions to repetitive and tedious tasks appearing throughout the novel—such as the observation from the mast-head in chapter XXXV or the mat-making process in chapter XLVII—that starkly contrast with the more active and dramatic aspects of the whale hunt. As he is immersed in such activities, Ishmael indulges in deep thoughts, at the same time serious and jocose, that often encapsulate revealing references. In this case, Ishmael's "profound meditations" take a mathematical turn:

> It was in the left hand try-pot of the Pequod, with the soapstone diligently circling round me, that I was first indirectly struck by the remarkable fact, that in geometry all bodies gliding along the cycloid, my soapstone for example, will descend from any point in precisely the same time. (422)

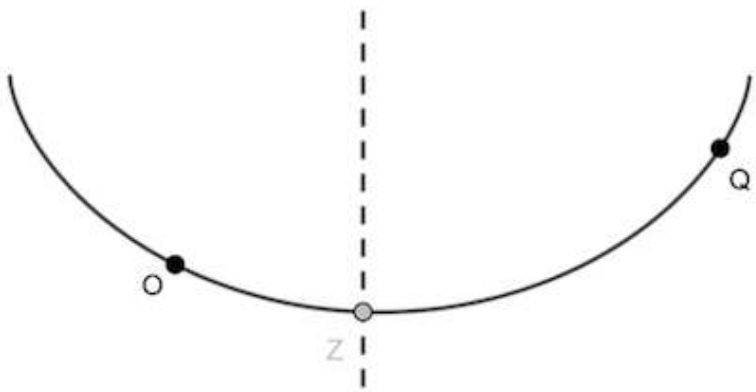
7 Here, Ishmael's philosophical meditations are condensed in the fleeting reference to the properties of the cycloid. This curve, probably not as popularly known as other curves such as the parabola or the hyperbola, is one of the most simple examples of a "roulette," that is, a curve generated by a point attached to a curve as it rolls along a line. In particular, a cycloid is the curve drawn by one point (P) on a circle as the latter rolls on a straight line (see illustration n° 1). As Sarah Hart writes in her valuable overview of Melville's mathematical references, the soft curve thereby generated could indeed approximate "the curved shape of a trypot's cross-section" (15), and this is surely what Ishmael is suggesting, even though he certainly could not be sure whether it was indeed a cycloid rather than, say, an arc of parabola, or a catenary, or any other apparently similar curve. The reason why the narrator prefers to identify the shape of the try-pot with the cycloid becomes clear only once the reader is reminded—in case he was not already aware of them—of some interesting mathematical properties of this curve. It is only then that Ishmael's witty remark starts to make sense.

Figure 1



8 The cycloid, which was first defined in the 16th century, became one of the most exciting topics in mathematical debates during the second half of the 17th century as it was discovered to possess several fascinating properties. In the quoted passage, Ishmael is ostensibly referring to a property of the cycloid that was first described in 1659 by the Dutch mathematician Christiaan Huygens (1629-1695) who, as he was working on ways to perfect his pendulums, discovered that a frictionless object, placed anywhere on a slide shaped as the concave side of the cycloid, would always descend in precisely the same time. This is due to the fact that the steeper inclination on the further end of the curve makes the object accelerate faster, compensating exactly for the longer length of the trajectory. Accordingly, if the objects O and Q in illustration n°2 were let fall at the same time, they would get to the bottom point Z synchronously. Because of this property, the cycloid is referred to as "tautochrone," a term invented by Huygens literally meaning "the same time."

Figure 2



9 It is this type of mathematical references that forces us to accept that Melville must have had access to a mathematical education above the standards of the time. Cycloids were not—and still are not—part of the standard school requirements, and were not discussed in any of the books we know Melville read. Zachary Turpin suggests that he might have read about the cycloid in the introduction to one of the editions of Euclid's *Elements* available in English at the time, such as Robert Potts's edition printed in 1845 (31). However, as Sarah Hart convincingly shows, the information he would have found there is insufficient to explain the reference, since neither the definition nor the properties of the cycloid are given (17). It is more likely, as Hart argues, that Melville's source was his brilliant teacher Joseph Henry.

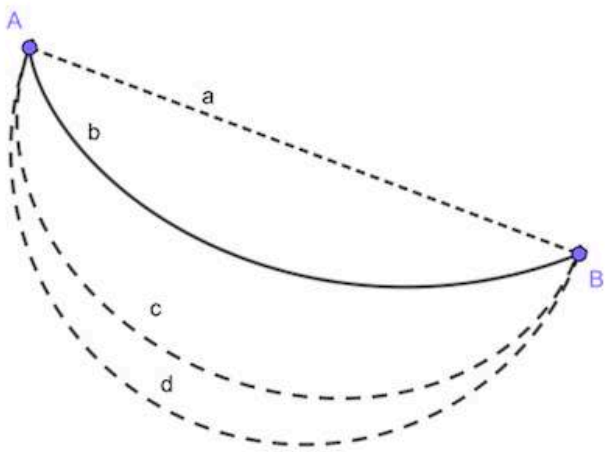
10 Regardless of the way Melville learned about the properties of the cycloid, what is most relevant is the function this reference serves in Melville's novel and in his creative process. Turpin comments on the passage as follows: "Given that Ishmael is 'first struck' by this solution while cleaning the try-pot, he essentially solves the problem [of the tautochrone] singlehandedly, and accidentally." (23-24) According to Turpin, then, here Ishmael is displaying his pride over solving the problem empirically, through the mere observation of the soapstone sliding down the try-pot. Such an outstanding exploit would obviously not just be exaggerated, but straightforwardly impossible—among other reasons because, as I mentioned above, Ishmael had no way of knowing whether the section of the try-pot was indeed exactly a cycloid or not—and it is accordingly qualified as "clearly a joke on Melville's part, but [...] also a declaration that he, like Ishmael, has a keen mathematical understanding" (24).

11 Turpin is certainly right in claiming that the passage is "clearly a joke" but, like other commentators, he seems to have missed what the joke is actually about. Even though, as it is well known, jokes are not funny when explained, this is what I set myself to do since, as it is often the case with Melville, even the most ironic or apparently superficial detail is imbued with a more profound meaning, a meaning that comes to the surface once it is considered within the network of references and symbols that surrounds it. Moreover, as Justine Murison has recently argued in reference to *The Confidence-Man*, humor and jokes often play a pivotal role in Melville's works, as they invite the reader to pause and thus to appreciate the full complexity of the text and of its multiple dimensions.

12 So, what is the joke the narrator is trying to make here? Is the reference to the tautochrone property of the cycloid sufficient to explain it? This is what Ishmael is ostensibly referring to as he tells that he has been "indirectly struck" by the fact that any object "will descend from any point in precisely the same time." However, since Ishmael is only using one soapstone, and thus cannot compare different trajectories simultaneously, how can he be sure that each time he lets it go it descends in the exact same time? Moreover, and most importantly, if this were the point of the joke, what would be funny about it? It would at best be a way of showing off his mathematical knowledge.

13 To fully understand and appreciate the joke, one needs to be aware of a second property of the cycloid, which was discovered only a couple of decades after Huygens identified the curve as a tautochrone. In 1696 the Swiss mathematician Johann Bernoulli challenged the most brilliant scientists of his time from the pages of *Acta Eruditorum*, the first scientific journal to be published in the German-speaking world, with a question that can be paraphrased as follows: given two points A and B on a vertical plane, which path will take in the least time a frictionless object, falling by its own gravity, from the former to the latter (see illustration n° 3)?

Figure 3



14 As Galileo had already showed (and as any skater would intuitively guess) the required trajectory will not be the shortest, that is, the segment of a straight line passing from the points A and B (line *a*). The quickest trajectory is in fact a curve that is shaped in such a way that the faster acceleration allowed by the steeper inclination in the first part of the journey compensates for the longer path (in the image, lines *b*, *c* or *d*). But which exact curve should it be? Galileo had speculated it might be an arc of a circle, but the supposition was not accurate. When he publicly posed the question, Johann Bernoulli had already found the answer but, in a remarkable example of the way the arena of scientific periodicals was stimulating competitiveness and exciting challenges among the thinkers of the time, he left six months to his opponents to prove their skills. The intellectual battle he triggered involved the most important European intellectuals of the time and earned the cycloid the title of "Helen of Geometry" for combining beauty with the power to stimulate rivalry. As Hart has speculated, one can easily imagine how a teacher like Joseph Henry might have used the whole story as a motivational anecdote to inspire his most talented students, among whom was Melville. Even though it is highly unlikely that Melville knew the complex mathematical technicalities connected to the issue, he must have had a good awareness of their gist and of their importance in the history of mathematics.

15 The solution to Bernoulli's problem was, once again, the cycloid (line *b* in the illustration). Several of the leading mathematicians of the time—including Newton, who allegedly solved the problem in one night and haughtily submitted the answer anonymously—got to the correct answer and offered various demonstrations, which Bernoulli published alongside his own. He made up the term "brachistochrone," literally meaning "the shortest time" and modeled after Huygens's "tautochrone," in order to describe the new property of the curve.

16 It is only in the light of the brachistochrone property that Ishmael's joke can be fully appreciated. What Ishmael is slyly alluding to here is not just that, because of the cycloidal shape of the try-pot, the soapstone will always get to the bottom in the same

time, but also that this time will be the shortest. Accordingly, no matter how high the sailor is holding the soapstone, if it slips from his hands it will always slide to his naked feet at the bottom of the pot very quickly, too quickly for him to jump and avoid getting hurt. Thus, Ishmael is "indirectly struck" by the mathematical notion by being very much *directly* struck by the soapstone.

17 As anticipated, nothing makes a joke less funny than explaining it, especially when the explanation involves this kind of arduous mathematical notions. However, taking this tortuous path was needed not simply because it proves the extent of Melville's familiarity with mathematics, but also because it hides, like many details in *Moby-Dick* do, a "little lower layer" (164) of meaning. In order to get it, though, one has to take one more detour into the history of 17th-century mathematics. Even before Bernoulli had posed and solved the brachistochrone problem, the fact that the quickest time of descent between two points in the conditions above mentioned was a curve had puzzled many brilliant minds. It was meditating on similar issues that Pierre de Fermat (1601-1665) formulated the principle that was later named after him and which "served as the inspiration for the imaginative proposal and solution of the brachistochrone problem" (Goldstine 2) by Johann Bernoulli. This principle, also known as the "principle of least time," was used to describe the phenomenon of refraction of light and was groundbreaking in the study of optics, disproving previous theories advanced by René Descartes. Leaving the specific applicational aspects aside, the reason why this principle had such a profound impact on the history of philosophy and science alike is that it was grafted onto the more general metaphysical principle according to which "nature operates by means and ways that are easiest and fastest" (Goldstine 1). This principle crosses out the ostensibly intuitive notion that assumes that nature always acts along the shortest paths, an intuition based on a vision of the universe as an abstract space where objects only move along straight lines, without friction, acceleration, or gravity acting upon them. Claiming that nature prefers to follow "ways that are easiest and fastest," instead, implies introducing a cosmological worldview where objects are perpetually moving along curvilinear trajectories and are immersed in a field of forces where they are constantly attracting or repelling each other. Such a vision would variously develop throughout the following centuries, but was already contained *in nuce* in Fermat's principle.

18 The desire to describe and measure the curvilinear "easiest and fastest ways" of nature led thinkers such as Huygens, Bernoulli, Leibniz and Newton to inaugurate one of the most momentous revolutions in the history of mathematics, that is, the invention of what came to be known as calculus. The revolution that the invention of calculus brought about in the field of mathematics is indeed an integral part of the broader philosophical and cultural innovations of the 17th century, a time when scientific and philosophical practices and discourses were deeply intertwined. As Gilles Deleuze claimed in his book *Le Pli* (*The Fold*), the advent of calculus offered philosophy a view of the universe that perfectly corresponds to the baroque arts of the time. The "baroque mathematical physics having as main object the curve" (7, my translation), prepared by Fermat, sketched by Huygens, and developed by Leibniz, Newton and their contemporaries, describes nature's predilection for curves, interconnectedness, and flux over straight lines, independence, and fixity.

19 Considering references such as the one to the cycloid, one is led to accept that Melville, on top of having a not-so-superficial awareness of the discipline itself, was also aware

of the metaphysical implications that lurked behind these apparently dry mathematical considerations. Could Ishmael's tongue-in-cheek reference to the cycloid serve as a way to allude to these issues? Could the "profound mathematical meditation" he is indulging in as he is in the try-pot also have a correspondingly deep philosophical dimension?

Anything but Straightforward: Melville's Curvilinear Ontology

20 Considering the important role that the "Helen of Geometry" played in the history of mathematics and its philosophical resonances, Melville's reference to the cycloid chimes in with the importance that curves of all types—parables, ellipses, circles, spirals—play in *Moby-Dick* and Melville's oeuvre in general. Melville's imagination is characterized by a preference for curves over straight lines, acceleration over uniform speed, waves over particles, tension over stasis, relation over detachment, and attraction over reaction.[2] Movements take place within a field of forces where objects and people draw curvilinear trajectories, accelerating as they get closer and closer to their goal or destiny, like Ishmael caught in the vortex generated by the sinking Pequod. In his *Herman Melville and the Politics of the Inhuman*, Michael Jonik has recently masterfully described this aspect of Melville's implied ontology in terms of his creative relationship to Spinozism. Certainly, as Jonik writes, "Melville is by no means a straightforward Spinozist" (9): the references to Spinoza should be understood in light of his partial knowledge of the author and of the variety of philosophical references one can find in his work. However, Spinoza offered Melville an image of nature corresponding to the "baroque mathematical physics" Deleuze finds encapsulated in the thought of his contemporary Leibniz. In this sense Spinoza and Leibniz can be brought together in their common attempt to move beyond Cartesian ontology in the direction of a vision of nature as infinitely flexible and indefinitely foldable, a seamless cloth that corresponds, at its core, to what applied calculus is based on: the assumption that nature can be interpreted as a continuum and can thus be theoretically divided indefinitely into smaller and smaller elements.

21 The curvilinear ontology described by Deleuze in reference to Leibniz and inspired by the mathematical innovation of the 17th century corresponds to Spinoza's relational ontology as described by Jonik insofar as they both present nature as indefinitely foldable, a field of tensions in which all that *is* is constantly in its becoming along curvilinear trajectories. This is not surprising, considering that Spinoza's own imagination was imbued with the new mathematics of his time. It is enough to remember that one of the fields in which these theories had found an exciting testing ground was optics, and as an expert lens-grinder Spinoza dealt with them on a daily basis. Moreover, among the scientists and mathematicians that he associated with throughout his life was Christopher Huygens, the solver of the tautochrone problem of the cycloid and, according to Deleuze, the first to have developed the "baroque mathematical physics" grounded on the analytic study of curves.

22 Spinoza offered Melville a vision of nature as characterized by continuity, with no gaps, no fissures, no void, where everything is tightly connected in a holistic cosmic network, and where every being is but a different expression of universal extension. In such a holistic cosmos, no object can be completely autonomous. As Jonik puts it, "Spinoza's

relational ontology informs *Moby-Dick*'s manifold inquiries of composite bodies and immanent forms of materiality" (6). Accordingly, characters are not described as individual agents, but "are given to persistent processes of instantiating transindividual relations," since the idea of nature as an indefinitely foldable continuum ideally encapsulated in calculus leads to the collapse of "discrete individual[ity]" (6). If everything is part of the universal flux and only exists as part of a relational ontology, no individual body or subject can stand alone. Such a curvilinear ontology allows no discontinuity, in the same way that each individual point of the line can only be considered in relation to its immediate surroundings.

23 In order to back up this idea Jonik refers to two lesser known essays by Charles Olson: "Equal, That Is, to the Real Itself" and "The Materials and Weights of Herman Melville." In these essays, written after the publication of his successful book *Call me Ishmael*, Olson holds that "notions of spatiality borrowed from non-Euclidean geometry, topology, and quantum physics can be used to interpret Melville's prose" (50). Melville's subversive understanding of space, expressed in the "proliferation of conic projective spaces in the novel, not the least of which its famous vortex" (55), is related to the "Copernican turn" brought about by Melville's near contemporaries, the "nineteenth-century mathematical thinkers such as Janos Bolyai, Nikolai Lobachevsky, Bernhard Riemann" (51). Melville, Olson claims, "not knowing any of this but in it even more as an American, down to his hips in things, was the first practicer [...] of the new equation, quantity as intensive" (quoted in Jonik 51). Such a leap, even though fascinating, can hardly be convincing. Jonik is rightfully more cautious in ascribing Melville's "knowledge of geometry to a purported *Zeitgeist* or to his peculiar intuitive sense of spatiality as American," (54) and prefers to trace Melville's allegedly non-Euclidean sense of space and his "relatively vanguard sense of projective geometry" (54) back to the entry on "Projections" in the *Penny Cyclopaedia* (ed. 1841, vol. 19, 40) where some aspects of the new frontiers of the field are hinted at. However, this explanation seems to say at the same time too much and not enough about Melville's sense of geometry: too much because "non-Euclidean geometry," emptied of its actual meaning, ends up being used as a mere catchphrase to describe the prominent role played by curves in Melville's imagination as an example of "a subversive geometry, a geometry in transformation, a geometry 'fully invested'" (58); not enough because among such curves there are some, such as the cycloid, that do not have much to do with projection as an alternative view to describe conic sections as presented in the *Penny Cyclopaedia*.

24 The recent investigations in Melville's education give us the possibility to better appreciate the actual extent of the author's mathematical competence and thus make sense of his understanding of space and nature, skirting the need to appeal, as Olson does, to generic rhabdomantic powers that would make Melville subconsciously aware of the mathematical innovations of his own and future times. Understanding the role played in Melville's thought and imagination by his awareness of the philosophical revolution brought about by the invention of calculus can instead allow for a better appreciation of his work. Calculus can be seen as part of a constellation of references connected to a vision of nature as a continuum of fluid matter in which all bodies and subjectivities are but ephemeral and partial configurations in the "turbulent, irregular flows and concatenation of forces characteristic of vortices" (Jonik 60). This constellation is formed by such diverse thinkers as Plato, Goethe, Spinoza, and the Transcendentalists who, notwithstanding the differences among their individual

thoughts, served Melville as stand-ins for the same philosophical view, which he labels indifferently as romantic, idealist or pantheistic.

Continuities and Discontinuities

25 Melville's ability to conjure a vision of nature as a foldable continuum into which the I and the World, life and the inorganic realm, mind and matter blend into one another has recently received significant attention by critics, especially among those inspired by those "philosophies vaguely and often inadequately identified," as Branka Arsić and K. L. Evans suggest in their introduction to *Melville's Philosophies*, "by the terms 'materialist turn,' 'post-humanism,' 'the ontological turn,' 'the aesthetic turn,' or 'ecocriticism'" (Arsić 2017, 3). Apart from the already mentioned book by Michael Jonik, which, as Paul Hurh observes, provides, "the most extensive and necessary treatment of [*Moby-Dick*] from this perspective, raising to view how characters are shot through with materiality" (1785), many other critics, before and after, have made of this notion the cornerstone of their interpretations of Melville's work. Sharon Cameron, for example, has alleged in relation to *Billy Budd* that Melville "treats persons as if they were not governed by a set of constraints that differentiate them from other phenomena, as if [...] a person were not different from a stone or a manifestation of light." (182) Cameron's point seems to be that Melville's characters cannot be pigeon-holed based on established taxonomies (good vs. bad, etc.) because these are constantly mixed up so that "no character has properties allowed to be discrete" (194). This explains Melville's interest in Schopenhauer's philosophy, since there he found confirmation of his idea that no individual exists as such, that is, separate from the rest, because "inanimate matter, plants, animals, and humans all contain the same 'innermost essence'" (197), since they are but different expressions of the same blind will. Similarly, Branka Arsić has repeatedly highlighted the relevance of Melville's meditation on impersonality, distilled in its purest form in Bartleby, who represents "the impersonal beyond the difference between death and life" (Arsić 2007, 107). Pilar Martínez Benedí has focused on how Melville complicates the opposition between body and mind, addressing not just "the relations, interactions, or reciprocal influences between the two fixed and delimited categories, [but also] the instabilities of their contours" which come to light in such scene as "The Mast-Head" chapter in *Moby-Dick*. Colin Dayan advocates for the necessity to "push beyond the limits of personality" (51), since Melville "presses and dissolves distinctions so that all kinds of things, incorporeal or physical, are put into relation," and she substantiates these claims highlighting how the author often ascribes anthropomorphic features to animals and things and vice versa. Paul Hurh endorses this view, while at the same time questioning the ethical outcomes of such "dissolution of boundaries into a flat ontology of non-hierarchical relation," and thus suggesting to reintroduce "a possible cleave in the materialist continuum" (1786) in terms of differences of scale, epitomized by the clash between the human body and the bulk of the whale. Whereas "flat materialist ontology," he suggests, leads to a blurring of boundaries that inhibits all possible ethical stances, "the reintroduction of scale as a site of hard boundaries offers the possibility of grounding [...] an explanation for multiple or exclusive ethical systems" (1795).

26 As this overview shows, one can certainly identify such a "materialist" worldview in Melville's work, but this does not mean that it is the only one. On the contrary, even

though Melville was clearly fascinated by this idea, he seems at times to conjure it up only to later step back from it. While he dares imagine "a world of open relations and new collectivities," he also "reveals its dubieties and its risks" (Jonik 65), and in so doing he demystifies the idea of an inescapable intertwinement of all beings in which identity melts away, both from an ontological and a political point of view. Accordingly, even though at times he seems to embrace the ideas of the thinkers belonging to the above-mentioned constellation (Plato, Goethe, Spinoza, Kant, Emerson, etc.), at other moments they are referred to disparagingly. For example, in *Pierre*, Melville famously chastises those philosophers who deceive themselves into believing to have found out the "talismanic secret" allowing for a reconciliation between the world and the self:

> Plato, and Spinoza, and Goethe, and many more belong to this guild of self-impostors, with a preposterous rabble of Muggletonian Scots and Yankees, whose vile brogue still the more bestreaks the stripedness of their Greek or German Neoplatonical originals. (208)

27 Here, of course, the obvious reference is to Melville's ambiguous reaction to what he refers to as Goethe's saying "Live in the all" in a famous and much commented upon letter to Hawthorne. On the one hand he admits that "there is some truth in" it, and that he too has experienced this "all feeling" whereby identity melts into the continuum of nature: "You must have felt it, lying on the grass on a warm summer's day. Your legs seem to send shoots into the earth. Your hair feels like leaves upon your head." (*Correspondence* 194) On the other, he rejects Goethe, here represented as an advocate of pantheism or idealism at large, offering as a damning counter-argument the persona of "a fellow with a raging toothache." What could the invitation to "live in the all" mean for the poor man, forced as he is by the pain to focus on his own body?

28 The contrast between the image of the person experiencing the "*all* feeling" as they lie on the grass and that of the "fellow with a raging toothache" synthesizes Melville's ambiguous stance in relation to the "pantheist" idea of nature as a foldable continuum and its related condemnation of individuality. This same contrast is at the heart of a motif that is repeated at various points throughout *Moby-Dick*. The motif, almost a Warburgian *Pathosformel*, is characterized by a fixed pattern: first Ishmael starts imagining nature as an infinite network of relations or as a flux and he is tempted to lose himself into it; then he steps back to regain a more critical view and reclaim his personal identity and the solid consistency of individual bodies and of his own in particular. Often, the first aspect is associated with the immersion in dull and repetitive activities and the second with a sudden experience of pain or fear that reawakens the subject, calling him to action. For example, in chapter XXXV, "The Mast-Head," Ishmael is lost in pantheistic reveries during his watch and risks being violently brought back to life—and death—by a fall, one of several "figurations of fallenness and thrownness [that] supply Melville with a projective force through which identity is alternately dissolved and constituted" (Greiman 1801). A similar pattern is repeated in chapter XLVII, "The Mat-Maker," in which Ishmael's "weaving and weaving away" with Queequeg while meditating on how "chance, free will, and necessity—nowise incompatible—[are] all interweavingly working together" (215) is interrupted by Tahstego's cry from the masthead. Again, in chapter XCIV, "A Squeeze of the Hand," Ishmael is intertwining his fingers with his mates, immersed in a reverie of sailors "squeezing [themselves] into each other" as a symbol of naive universal brotherhood, but the bubble is burst by the following disturbingly symmetrical image of sailors chopping off their toes while engaged in a different part of the same production

process (Bellini 29-30). In "The Try-Works," Ishmael, as he is steering by night, starts daydreaming staring into the fire of the try-works and is suddenly brought back to himself just in time to prevent the Pequod from capsizing. A variation on the same motif, this time with a different protagonist, is to be found in chapter LXXVIII "Cistern and Buckets": Tashtego, while standing on top of a dead whale's head, is collecting sperm with a bucket when he slips into the head and would die were it not for Queequeg's prompt intervention. Here, too, the dissolution of identity is described as an enticing temptation, a "very precious perishing; smothered in the very whitest and daintiest of fragrant spermaceti," assimilated to the idea of losing one's identity into the indefinite continuum of nature, and explicitly connected to the constellation of idealist-pantheist-transcendentalist thinkers in the final question: "How many, think ye, have likewise fallen into Plato's honey head, and sweetly perished there?" (344).

29 On a larger scale, the whole plot of the novel can be said to follow this pattern: a melancholy young man with a head full of Plato, prone to daydreaming and sterile reveries, is lured into committing himself to a suicidal mission and gives up his identity to submit to Ahab's dominance, but eventually undergoes a traumatic experience that brings him back to himself. He thus undergoes a "transformation from an aimless melancholy youth into a philosophically mature thinker and artist" (Anderson 31), in possession of the psychological strength to reclaim his fragile but nonetheless substantial individual identity. On a smaller scale, then, Ishmael's fleeting joke about the cycloid can also be seen to reproduce the same motif: immersed in profound meditation as he is cleaning one of the try-pots, immersed in metaphysical reveries and exalted into a sense of brotherhood with the fellow sailor cleaning the other cauldron, he is suddenly awakened to the real world when the heavy soapstone hits his feet.

30 What connects all of these passages is the opposition between, on the one hand, a symbol of nature as a self-contained metaphysical unity in which subjective and objective, human and non-human, individual and collective blend into each other and, on the other, the re-assertion of the difference between these opposed concepts. As shown by Harrison Hayford (2003), Melville's works are characterized by systematic forms of duplications, parallelisms, and juxtapositions of mutually exclusive views. Paul Hurh has recently developed this argument in his book *American Terror*, claiming that this "back-and-forth dynamic" by means of which Melville "poses the deepest questions within a flux of voices and mutually exclusive positions," generates a "dialectical logic" (168) that never leads to the stasis of a definitive synthesis. Hurh exemplifies this process referring to chapter LXXIII of the novel, where the narrator's comparative analysis of the heads of the sperm whale and the right whale serves as a way to allegorically juxtapose "Locke's empiricism [and] Kant's transcendental idealism" (172). In a similar way, Samuel Otter counterbalances the whale and the squid as opposite but symmetrical images: the former representing "the elusive epitome of form" (83) that invites to be chartered even though no map can give it full justice; the latter symbolizing the overwhelming formlessness of the pulsating forces that hide behind the surface of life. The combination of the two elements, one might add, interestingly parallels Kant's distinction between the mathematically sublime, triggered by our imagination's incapacity to comprehend objects of immense magnitude, and the dynamically sublime, generated by man's confrontation with the overwhelming powers of nature.

31 According to the tendency of Melville's imagination to combine and balance opposite philosophical views, the curvilinear ontology and its political reflection onto what Jonik has defined as Melville's "politics of the inhuman" is also consistently presented in a dialectic tension with its opposite. Ishmael's voyage embodies the exploration of the blurring of boundaries only to then reaffirm the centrality of the individual, subjective, and profoundly human experience. Such centrality corresponds to the centrality of the human body, and of Ishmael's body in particular, which, even though part of the network of materiality, is also at the same time the autonomous seat of one's individuality. Melville seems to suggest that if Nature is a continuum, flexible and indefinitely foldable, then the subject is a paradoxical discontinuity within this continuum, a tangent point to the curve of Nature. This discontinuity is precisely located where one's body, from being merely an organ, a clogwheel, a fragment within the whole of nature, becomes the surface of inscription of an individual sense. An inscription that also passes through the bruises produced by the soapstone on Ishmael's feet, whose body's survival is, in the end, the only condition of possibility of our approximation to the story told in *Moby-Dick*.

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NOTES

1. This essay is dedicated to the memory of my father, who taught me to look at nature with both rigor and wonder. Thanks are due to Elena Strona for drawing the illustrations.

2. Christopher Windolph has identified a similar tendency in Emerson, in whose works one can find an opposition between, on the one hand, the straight line as "an abstract human structure that has no natural analogue," a biased "epistemological and metaphysical device" (21) that testifies to the human being's self-imposed alienation from nature, and on the other the "metaphysical primacy of regular and irregular curve" (22) that characterize "the fundamental reality of nature, which is not linear, but curved" (21), and which the artist aims at imitating in his works.

ABSTRACTS

In this essay I reflect on the role mathematics plays in Melville's works and imagination moving from one specific mathematical reference in chapter XCVI of *Moby-Dick* "The Try-Works." Here Ishmael mentions the cycloid, a peculiar geometrical construct that was at the center of mathematical and philosophical debates during the 17th century. In the first part of my essay I show how it is only in the light of some of its properties that Ishmael's playful reference to the cycloid can be understood, thus testifying to the author's profound understanding of these mathematical notions. Moreover, Melville must have also been aware of the pivotal role the cycloid played in the history of early modern thought: the investigation into its properties was at the basis of the invention of calculus, which in turn was at the center of the philosophy of post-Cartesian thinkers such as Leibniz and Spinoza. Building on this, in the second part of my essay I intend to show how Ishmael's mention of the cycloid can be seen as a reference to a philosophical worldview according to which nature appears as a continuum of indefinitely foldable matter, a view in which Melville conflates such diverse thinkers as Spinoza, Plato, Goethe or the Transcendentalists and which he presents as both fascinating and problematic. Once the cycloid episode is read in this light and put in relation to a series of structurally similar scenes throughout the novel, it can be interpreted as the representation of this ambivalent position, one of many instances of Melville's ability to bring together and keep alternative worldviews in creative tension.

Cet essai s'intéresse au rôle que jouent les mathématiques dans les œuvres et l'imagination de Melville à partir d'une allusion mathématique dans le chapitre XCVI de *Moby-Dick*, « The Try-Works ». Ismaël y mentionne la cycloïde, une construction géométrique qui était au centre de nombreux débats mathématiques et philosophiques au 17e siècle. La première partie de l'article montre comment l'allusion humoristique d'Ismaël à la cycloïde ne peut être comprise qu'à la lumière de certaines de ses propriétés, témoignant ainsi de la compréhension profonde qu'avait Melville de ces notions mathématiques. En outre, il devait également être conscient du rôle central que la cycloïde a joué dans l'histoire de la pensée moderne : l'étude de ses propriétés a conduit à l'invention du calcul infinitésimal, qui a été à son tour au centre de la philosophie de penseurs post-cartésiens tels que Leibniz et Spinoza. Je montre dans la deuxième partie de l'article comment la mention de la cycloïde par Ismaël peut être considérée comme indicative d'une vision philosophique du monde selon laquelle la nature apparaît comme un continuum de matière indéfiniment pliable, un point de vue dans lequel Melville range des penseurs aussi différents que Spinoza, Platon, Goethe ou les transcendantalistes, et qu'il présente comme à la fois fascinant et problématique. Une fois l'épisode de la cycloïde lu sous cet angle et mis en relation avec une série de scènes structurellement similaires tout au long du roman, il peut être interprété comme la représentation de cette position ambivalente, l'un des nombreux exemples de la capacité de Melville à rassembler et à maintenir des visions du monde alternatives dans un état de tension créative.

INDEX

Keywords: Herman Melville, Moby-Dick, mathematics, geometry, calculus, philosophy, ontology, cycloid, curves
Mots-clés: Herman Melville, Moby-Dick, mathématiques, géométrie, calcul infinitésimal, philosophie, ontologie, cycloïde, courbes

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