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MATHEMATICS TO COPE WITH THE WORLD

A Pragmatist Reading of Quine and Rorty

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Abstract

This article examines the divergent yet converging perspectives of W.V.O. Quine and Richard Rorty on the ontology of mathematics. While Quine grounds mathematical entities in the indispensability of abstract objects for scientific theories, Rorty rejects representationalist commitments, constructing mathematics as a contingent linguistic practice. The study reconstructs Quine's criterion of ontological commitment, his holistic epistemology, and his treatment of mathematics as an indispensable component of the web of belief, contrasting them with Rorty's anti-foundationalist account of mathematics as a pragmatic tool devoid of ontological import. The analysis emphasizes their respective views on the functional role of mathematics, highlighting a shared pragmatist orientation that, beneath their surface disagreement, converges in situating mathematics as a practice for coping with and structuring experience rather than as a reflection of a pre-given reality. The article argues that their apparent opposition between realism and anti-realism masks a deeper convergence: both conceive mathematics as a constructed and adaptable device for generating conceptual possibilities and enabling action.

Keywords: Philosophy of Mathematics, Ontological Commitment, Pragmatism, Anti-Representationalism, Quine, Rorty

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La matematica per affrontare il mondo
Una lettura pragmatista di Quine e Rorty

L'articolo esamina le prospettive divergenti e, al contempo, convergenti di W.V.O. Quine e Richard Rorty sull'ontologia della matematica. Mentre Quine fonda gli enti matematici sull'indispensabilità degli oggetti astratti per le teorie scientifiche, Rorty respinge ogni

impegno rappresentazionalista, concependo la matematica come una pratica linguistica contingente. Lo studio ricostruisce il criterio di Quine per l'impegno ontologico, la sua epistemologia olistica e la sua trattazione della matematica come componente indispensabile all'interno della rete delle credenze, mettendoli a confronto con l'impostazione anti-fondazionalista di Rorty, che interpreta la matematica come uno strumento pragmatico privo di portata ontologica. L'analisi mette in rilievo le rispettive concezioni del ruolo funzionale della matematica, evidenziando, al di là del disaccordo superficiale, una convergenza su un orientamento pragmatico che riconosce nella matematica una pratica finalizzata ad affrontare e strutturare l'esperienza piuttosto che un riflesso di una realtà già esistente. L'apparente opposizione tra realismo e antirealismo nasconderebbe quindi una convergenza più profonda: entrambi concepiscono la matematica come un dispositivo costruito e adattabile per generare possibilità concettuali e rendere possibile l'azione.

Parole chiave: Filosofia della matematica, impegno ontologico, pragmatismo, anti-rappresentazionalismo, Quine, Rorty.

> *Cognition, language, myth and art: none of them is a mere mirror, simply reflecting images of inward or outward data; they are not indifferent media, but rather the true sources of light, the prerequisite of vision, and the wellsprings of all formation*[1].
> (Ernst Cassirer)

1. Introduction: A Pragmatical Lens on Mathematical Practice

Imagine a mathematician, hunched over equations late into the night, not gazing upon a pre-existent Platonic realm, but instead, meticulously crafting a new language for describing nature, creating ways to shape and organize human experience, and ultimately, constructing new ways to interact with the world. As Charles Sanders Peirce wrote, mathematics «makes constructions in the imagination according to abstract precepts, and then observes these imaginary objects, finding in them relations of parts not specified in the precept of construction»[2]. If Peirce is right, the symbolic language of mathematics is more than just a way to express a system of ideas about the actual world: it is a system that creates a *space*

[1] E. Cassirer, *The Philosophy of Symbolic Forms, Volume I: Language*, Yale University Press, New Haven 1980, p. 93.

[2] C.S. Peirce, *Collected Papers*, edited by C. Hartshorne & P. Weiss, Volume I: *Principles of Philosophy* and Volume II: *Elements of Logic*, Harvard University Press, Cambridge (Massachusetts) 1960, p. 109.

of possibilities for our actions and experiences. This generative aspect embedded in the creation and manipulation of mathematical symbols raises a fascinating question: is mathematics primarily a discovery of pre-existing truths, or is it a purely human construction, a device shaped by our needs, habits, and practices, where its value lies exclusively in its applications rather than its ability to depict its own reality? Perhaps, more than a mere instrument, math provides an area to explore the very limits of our capacity to bring worlds into existence through language itself. This question lies at the heart of the perceived philosophical chasm separating W.V.O. Quine and Richard Rorty, particularly concerning the *ontological status* of mathematics and the very nature of mathematical *truth*, where one emphasizes its ontological indispensability for scientific knowledge, and the other dismisses any ontological commitment to focus on its role as a social practice.

Quine's commitment to mathematical entities, derived from his indispensability argument and encapsulated in the thesis of the ontological commitment, grounds the existence of *abstracta* in their role within the «web of belief»[3] that constitutes scientific knowledge, suggesting a form of epistemological realism: «Irrefragability, thy name is mathematics. Mathematics is where the proofs are»[4]. Quine's thesis has led Putnam's *Philosophy of Logic*[5] to defend a realist account of mathematical entities by arguing that logic itself, which is essential to mathematics and science, requires acknowledging the existence of abstract objects, and that their usefulness and applicability within scientific theories (especially, physics) makes it coherent to grant their existence. Quine's position can be sharply contrasted with Rorty's anti-representationalist stance, which rejects any ontological notion of a mind-independent mathematical reality. This divergence has been characterized as a fundamental opposition between realism and anti-realism, and, under this shape, is one of the core issues in contemporary philosophy of mathematics[6]. Quine's holistic epistemology, detailed, among others works, in *Two Dogmas of Empiricism*[7], and inspired, essentially, from Carnap's doctrine of the physical world in the *Aufbau*[8], posits that «our statements about the ex-

3 W.V. Quine, J.S. Ullian, *The Web of Belief*, Random House, New York 1970.

4 W.V. Quine, *The ways of paradox and other essays*, Harvard University Press, Cambridge (Massachusetts) 1976, p. 24.

5 H. Putnam, *Philosophy of Logic*, Harper & Row, New York 1971.

6 Cf. P. Benacerraf, H. Putnam, *Philosophy of Mathematics*, Cambridge University Press, Cambridge 1983; S. Shapiro, *Philosophy of Mathematics: Structure and Ontology*, Oxford University Press, Oxford 1997; M. Leng, *Mathematics and Reality*, Oxford University Press, Oxford 2010.

7 W.V. Quine, *Two Dogmas of Empiricism*, «The Philosophical Review», 60, 1951, pp. 20-43, reprinted in W.V.O. Quine, *From a Logical Point of View: Nine Logico-Philosophical Essays*, 3rd edition, Harvard University Press, Cambridge (Massachusetts) 1980, pp. 20-46.

8 R. Carnap, *The Logical Structure of the World. Pseudoproblems in Philosophy*, Eng. trans. by R.A. George, University of California Press, Berkeley 1967.

ternal world face the tribunal of sense experience not individually but only as a corporate body»[9], which seems to solidify his commitment to a realist ontology wherein mathematical entities are *indispensable* for a scientific description of "the external world". In a nutshell: we ought to have ontological commitment to all and only the entities that are indispensable to our best scientific theories, and *if* mathematical entities are indispensable to our best scientific theories, *then* we ought to have ontological commitment to mathematical entities[10]. Apparently, there is nothing else to say.

In contrast, Rorty's pragmatism, elaborated in works such as *Philosophy and the Mirror of Nature*[11], *Contingency, Irony, and Solidarity*[12], and *Objectivity, Relativism, and Truth*[13], suggests that language, including mathematics, is primarily a means for social interaction, rather than a portrayal that accurately reflects any true fact about the world. Rorty's concept of «final vocabularies» emphasizes that even scientific and mathematical frameworks are ultimately *contingent* sets of descriptions that serve our purposes, but are always susceptible to being replaced by other descriptions, and therefore not indispensable at all. This perspective is rooted in a pragmatist understanding of language as a mechanism for communication and problem-solving, echoing the ideas of philosophers of the classical American tradition, like, for instance, John Dewey and William James[14]. Rorty's anti-foundationalist stance thus rejects the idea of an objective and universal grounding for knowledge, and also a pre-given logical structure to which the language is meant to adhere.

This difference accentuates the perceived opposition between their approaches, particularly in the field of mathematical ontology, and in how each one understands the nature of mathematical validity, where one side searches for a form of *objective validation* and the other for a *socially constructed endorsement*. This paper challenges this orthodox interpretation, arguing that despite their apparent divergence, a shared functional emphasis of mathematics as a crucial mechanism for engaging and coping with the world serves as common ground. Such a functional intersection suggests a less polarized account than conventionally assumed and is grounded in recent investigations into the very possibility of a traditionally conceived epistemology from the point of view of naturalism and anti-representa-

9 W.V. Quine, *Two Dogmas of Empiricism*, cit., p. 41.

10 Cf. M. Colyvan, *The Indispensability of Mathematics*, Oxford University Press, Oxford 2001.

11 R. Rorty, *Philosophy and the Mirror of Nature*, Princeton University Press, Princeton 1979.

12 R. Rorty, *Contingency, Irony, and Solidarity*, Cambridge University Press, Cambridge 1989.

13 R. Rorty, *Objectivity, Relativism, and Truth*, Cambridge University Press, Cambridge 1991.

14 Cf. G. Brodsky, *Rorty's Interpretation of Pragmatism*, «Transactions of the Charles S. Peirce Society», 17, 1982, pp. 21-38.

tionalism[15]. This investigation aims at indicating a deeper convergence, wherein both Quine and Rorty ultimately perceive mathematics as embedded within our conceptual apparatus, justified by its instrumental effectiveness in solving specific theoretical and applied problems, a perspective developed, among others, by Robert Brandom[16] through the notion of the function of concepts, emphasizing the importance of inferential practices within a community of language users in the constitution of our understanding of the experience. The analysis will start by inspecting Quine's ontological commitments and his approach to the nature of mathematics, which, as we will see, are more nuanced than the common reading would imply. The study will move to Rorty's anti-foundationalism, emphasizing his interpretation on the role of mathematics in a pragmatic context. The paper will then explore a reading of their views that highlights their pragmatic commonality, arguing that their differing positions derive from varying philosophical emphasis rather than an ontological incompatibility on the nature of mathematical practice. We will thus propose a reading of the two authors which stresses the intriguing dimension they share, a dimension where meaning is found in the consequences of our actions and the evolving habits of thought.

2. Quine's Web: The Indispensable Device and the Corporate Body

Quine's ontological framework, articulated through the criterion expressed most notably in *On What There Is*[17], «to be assumed as an entity is, purely and simply, to be reckoned as the value of a variable»[18], serves as a crucial entry point to his ontology of mathematics. This criterion, coupled with his adherence to the canonic notation of quantified logic as the appropriate symbolization to represent scientific theories and the indispensability thesis, sometimes known as the "Quine-Putnam argument"[19], is often seen as a direct route to a realist interpretation of mathematical entities. Indeed, this interpretation assumes that because mathematics is indispensable for our most successful scientific theories, and those theories inherently quantify over mathematical objects, such objects are, from an ontological point of view, necessary: «Classical mathematics […] is up to its neck in commitments to

15 Cf. S. Gross, N. Tebben, M. Williams, *Meaning Without Representation: Expression, Truth, Normativity, and Naturalism*, Oxford University Press, Oxford 2015.

16 R. Brandom, *Articulating Reasons: An Introduction to Inferentialism*, Harvard University Press, Cambridge (Massachusetts) 2000.

17 W.V. Quine, *On What There Is*, «The Review of Metaphysics», 2, 5, pp. 21-38, reprinted in W.V. Quine, *From a Logical Point of View*, cit., pp. 1-19.

18 Ivi, p. 15.

19 Cf. H. Putnam, *Philosophy of Mathematics: Selected Writings*, Cambridge University Press, Cambridge 2012.

an ontology of abstract entities»[20]. Existence in Quine's terms is, in fact, quantification: Quine's ontological commitment stems from his adoption of first-order logic as the medium for the ultimate clarification, by elaborate paraphrase, of the true *logical form* of our sentences. The mere act of quantifying over mathematical variables (e.g., «there is a number *x* such that...») is what necessarily implies their existence within a chosen conceptual structure[21]. Existential quantification is, then, both the criteria for and the expression of ontological commitment.

The reading of Quine as a realist seems also supported by his holism, the idea that our beliefs about the world are not isolated but rather form an interconnected web[22]. According to his holistic perspective, scientific theories and even mathematical truths are not assessed separately, but as parts of a larger system. This means that our understanding of mathematical questions is entangled with our understanding of physics, biology, geology, and all other scientific domains, including disciplines such as history and geography. This web of belief is not a rigid structure; rather a field of force that is constantly being revised, negotiated, and adjusted based on new experiences and observations. It is through this interconnectedness that Quine argues for the indispensability of mathematics; it is not just about individual mathematical claims, but about mathematics' crucial role in the entire web that constitutes our grasp of data. Despite his pragmatism, Quine seems here to emphasize that mathematical entities are *essential* components of our best scientific theories. This underscores, *prima facie*, a tension between a purely instrumental account of mathematics and Quine's belief that mathematical objects are necessary for our attempts to make sense of the state of affairs through science. This tension is also explored, in the same terms, by Hartry Field[23] who, despite embracing nominalism about mathematical entities, understands the force of Quine's indispensability argument and its associated ontological commitment and actively avoids quantifying over mathematical entities, trying to sidestep the conclusion that they are necessary parts of the universe.

A more nuanced understanding emerges when we consider, for instance, the mathematical foundations of "quantum field theory" (QFT). QFT employs complex mathematical constructs such as Hilbert spaces, path integrals, and operators to describe the behavior of elementary particles and their interactions. The adoption of this framework, that involves highly sophisticated mathematical apparatus, has resulted in extremely accurate predictions related to phenomena such as the

[20] W.V. Quine, *From a Logical Point of View*, cit., p. 13.

[21] Cf. P. Valore, *Fundamentals of Ontological Commitment*, De Gruyter, Berlin-Boston 2016.

[22] W.V. Quine, *From a Logical Point of View*, cit., pp. 42-46.

[23] Cf. H. Field, *Science Without Numbers: A Defence of Nominalism*, Princeton University Press, Princeton (New Jersey) 1980.

anomalous magnetic moment of the electron, as well as the discovery of the Higgs boson. According to Quine, the reliance on such abstract mathematics, while pointing to a view where such entities are necessary within our cognitive scheme, does not entail a pre-existing universe that is represented in our concepts, but rather, it supports a framework that was created with certain scientific purposes. Moreover, the success of mathematical modeling in various settings, from weather prediction to financial markets, provides a consistent affirmation of this indispensability, showing how math can anticipate scientific phenomena and demonstrating how our concepts have the capacity to create new ways of forging the field of action.

Quine's ontology, therefore, is not a kind of mystical undertaking to transcend the physical dimension, but a construction that stems from the demands of his holistic framework, that, while seeming realist, is ultimately based on its practical character and it is *nominalist in spirit*. While Quine acknowledges the indispensability of mathematical terms in our best scientific theories, his concept of «paraphrase away» indicates a way of understanding this necessity, aiming to reconstruct the framework in a way that could, ideally, avoid a direct ontological commitment, even if this task is, in practice, not easily accomplished.

The ontology of mathematics is then a conceptual habit we've developed, a way of thinking that has proven its worth. It would be inaccurate, therefore, to portray Quine as a simple Platonist; rather, we should stress his constructive and linguistic attitude, that has led to an *extensional* Platonism: in this regard, Quine's perspective fundamentally diverges, for instance, from Gödel's Platonism. Quine's focus does not center on the existence of abstract objects, but on their crucial role within our conceptual structure: the question is not whether abstract entities exist, but what they are for. Consequently, mathematical entities are not endorsed for their own sake, but rather due to their constructed necessity and functional role within the comprehensive system that shapes and frames our conceptualization of the world, enabling us to gain a better understanding and manipulation of reality. At the end of the day, even natural science itself, for instance fundamental physics, is a convenient myth, similar, in principle, to the belief in Homer's gods, just more *efficacious* «as a device»:

> Physical objects are conceptually imported into the situation as convenient intermediaries – not by definition in terms of experience, but simply as irreducible posits comparable, epistemologically, to the gods of Homer. […] In point of epistemological footing the physical objects and the gods differ only in degree and not in kind. Both sorts of entities enter our conception only as cultural posits. The myth of physical objects is epistemologically superior to most in that it has proved more efficacious than other myths as a device for working a manageable structure into the flux of experience[24].

[24] W.V. Quine, *From a Logical Point of View*, cit., p. 44.

To further complicate this analysis, Quine's thesis of the indeterminacy of translation, articulated in *Word and Object*[25], refines this *action-oriented* understanding by demonstrating that there is no single, uniquely correct way to map language onto the world. This insight suggests that our acceptance of abstract entities (like any other entity) is less about their ontological status and more about adopting vocabularies that prove effective in facilitating thought and action. Quine expands on this idea in *From Stimulus to Science*[26], where he underscores the interconnectedness of our beliefs within a network where even mathematical truths are linked to our scientific and empirical observations, further emphasizing the constructivist nature of our cognitive scheme reacting to the stimulation offered by the environment. And, in *The Roots of Reference*[27], he offers the theoretical background to articulate his naturalized epistemology and the indispensable role of math within such framework, remarking how all knowledge stems as a natural phenomenon and is rooted in our interface with experience, with concepts and words acquiring meaning through observable interactions, in a social and behavioral context. Quine's commitment to a naturalized epistemology entails a deep understanding of mathematics not as something gained through exclusively a priori analysis and aimed at essences apart from empirical investigation, but as a necessary condition for empirical investigation itself, even when highly stratified in abstraction, with a constructive basis rooted in our actual *praxis*.

3. Rorty's Rejection of Ontology: A Language to Shape Human Experience

Rorty's anti-foundationalism and his rejection of representationalism[28] are central to his philosophy, as he argues against the idea that language, including mathematical language, serves as a mirror of nature or reflects some objective, external realm independent of our practices. Drawing from the classical pragmatist perspective, Rorty sees language primarily as a means for social interaction, used to engage with our environment, foster communication, and solve practical problems within a specific community[29]. As Rorty posits in *Objectivity, Relativ-*

[25] W.V. Quine, *Word and Object*, MIT Press, Cambridge (Massachusetts) 1960.

[26] W.V. Quine, *From Stimulus to Science*, Harvard University Press, Cambridge (Massachusetts) 1995.

[27] W.V. Quine, *The Roots of Reference*, Open Court, La Salle (Illinois) 1974.

[28] Cf. R. Rorty, *Philosophy and the Mirror of Nature*, Princeton University Press, Princeton 1979; Id., *Consequences of Pragmatism*, University of Minnesota Press, Minneapolis 1982.

[29] N. Hernández, *Consequences of Rorty's Pragmatism in Science*, «European Journal of Pragmatism and American Philosophy» [Online], 9, 2, 2017, pp. 1-13, [https://doi.org/10.4000/ejpap.1074].

ism, and Truth[30], pragmatism rejects the very idea of a theory of truth, offering, instead, a theory of «warranted assertibility» linked with the social practices that constitute the shared agreements within a specific community of language users. He also rejects the possibility of any objective justification, clearing the space for contingent practices with limited purposes.

If we expand this conception of language and truth in a consistent epistemological (or anti-epistemological, if you wish) theory, we get that, from a Rortyan perspective, a search for a correct depiction of reality becomes *irrelevant*, and the emphasis shifts from *correctness* towards the practical *effectiveness* of our linguistic practices. For Rorty, there are no descriptions of the world that are accurate, but only practices that are advantageous and fruitful within a certain context, and that evolve and change over time. Drawing on Quine's critique of *Two Dogmas* and Sellars' critique of the "Myth of the Given", Rorty rejects the idea of any privileged vocabulary or a "God's-eye point of view" and any notion of unmediated access to reality and argues that all interpretive frameworks, including mathematical systems, are contingent and subject to revision:

> Just as Quine suggests that we throw out the whole cluster of concepts (e.g., "synonymous", "conceptual") which are invoked to make us think that we understand what "analytic" meant, so antirepresentationalists suggest that we throw out the whole cluster of concepts (e.g., "fact of the matter", "bivalence") which are used to make us think we understand what "the determinacy of reality" means[31].

In particular, given this anti-representationalist stance, *ontological commitments* in the traditional sense become also irrelevant, and the possibility of an independent field of mathematical entities is dismissed.

Mathematics, therefore, from Rorty's practice-based viewpoint, is a convenient utensil with no objective depiction of reality, and a human construction with no extra-human grounds for justification. This interpretation is exemplified by his reading of the development of non-Euclidean geometries during the 19th century, which demonstrates the existence of several internally consistent mathematical frameworks, each having distinct axioms, which can model the world from a different point of view. For Rorty, the choice of geometry is not a question of picking the right representational tool but rather a matter of adopting the specific formal construction that is more helpful for our goals:

30 R. Rorty, *Objectivity, Relativism, and Truth*, Cambridge University Press, Cambridge 1991.
31 Ivi, p. 6.

> We shall answer the questions 'What are you talking about?' and 'What is it that you want to find out about?' by listing some of the more important beliefs which we hold at the current stage of inquiry, and saying that we are talking about *whatever these beliefs are true of*. The model here is the familiar contextualist claim that a non-Euclidean space is whatever certain axioms are true of[32].

Rorty's view reflects the contingent and pragmatic process through which communities, groups and societies invent strategies to cope with their environments, aligning with a constructivist interpretation of knowledge as shaped by purposes and evolving habits. In particular, Rorty rejects that there is any fixed, intrinsic nature of our objects to be discovered, such as essences. This applies also to mathematical entities, which don't have any intrinsic characteristic that makes them special candidates for representation. In *A World Without Substances or Essences*[33], Rorty offers two ways to refute that mathematical entities have essences: *a*) multiplicity of descriptions, and *b*) non-uniqueness of axiomatic descriptions:

a) Rorty observes that a number like 17 can be described in countless ways through mathematical operations involving other numbers. For instance, 17 can be expressed as 16+1, 20-3, 2×8+1, or the square root of 289, and so on. However, none of these descriptions can be considered more fundamentally essential to 17 than any other;

b) Any attempt to define an essential property of 17 must specify all of its relations with all other numbers, which would require citing the axioms of arithmetic and set theory that outline how all numbers relate to each other. However, those axioms don't uniquely describe 17; they are equally true of every number: «They are equally the essence of 1, or 2, of 289, and of 1,678,922»[34].

In synthesis, Rorty's instrumentalism places mathematics among other apparatuses we use to act. The application of mathematical languages, then, is not akin to exploring another sphere of essences but rather an exercise in using a particular set of linguistic games within our vocabulary, which develop as the increase of relational concepts *happens* through their practical application and their ability to cohere with other concepts and practices. In this light, mathematics is an evolving set of possible interventions in the field of action, a contingent system that gains its meaning through its role in addressing the challenges of experience.

Rorty's rejection of representationalism, however, does not diminish the importance of mathematical modelling but shifts its justification from a meta-

[32] Ivi, p. 96.

[33] R. Rorty, *Philosophy and Social Hope*, Penguin Books, Harmondsworth 1999, pp. 47-71.

[34] Ivi, p. 53.

physical foundation to its effectiveness and success. This perspective aligns with a constructivist account that emphasizes the human creation of tools: mathematics gains its power through its adaptability and its impact on our habits and our capacity to act.

4. A Pragmatic Convergence: Mathematics as a Tool for Coping with the World

A comparative analysis reveals a profound convergence between Quine and Rorty, a unity that is overshadowed by the apparent divergence in their ontological commitments.

The pragmatic shift we are proposing here, in our reading of both Quine and Rorty, reorients the focus of philosophical inquiry away from traditional ontological debates about the status of mathematical objects and toward a deeper understanding of mathematics as an expedient for action, «a device for working a manageable structure into the flux of experience»[35], to use Quine's words again. By foregrounding its practical dimensions, the long-standing opposition between realism and anti-realism can be reconfigured: both philosophers recognize mathematics as a crucial element of our conceptual scheme and our language creations, one that is integrally linked to actual practices.

While Quine seems deeply rooted in a realist agenda, his consistent emphasis on the operative role of mathematics in scientific inquiry unveils a more nuanced functional dimension. In particular, as we have seen, his pragmatism surfaces in his rationale for accepting abstract objects: not because they exist independently of language and cognition, but because they are essential to the web of beliefs that enables us to comprehend and organize our experiences within a framework that is inherently cultural and constructed. Although he upholds the existence of mathematical entities as dictated by his criterion of ontological commitment, Quine ultimately interprets these entities as *posits*, prioritizing their job in addressing both theoretical and practical tasks and conceiving the act of referring not as a process of representation, but a way of relating and interacting. This reading has important ramifications in his exploration of the operational implications of logical systems and highlights how his views extend beyond a strictly ontological framework, in any traditional sense[36]. The proven reliability of mathematical predictive models underscores their indispensable

[35] W.V. Quine, *From a Logical Point of View*, cit., p. 44.

[36] Cf. P. Valore, *The way-out from logical empiricism as a way-in to ontology: A chapter in meta-metaphysics*, in G. D'Anna, L. Fossati (eds.), *Categories. Histories and Perspectives 2*, Olms, Zurich-New York 2019, pp. 189-204.

role within our most coherent and effective scientific theories and applications, thereby exemplifying its necessity within our constructed interactions through ideas, languages and actions. Mathematics reveals structures previously inaccessible through traditional methods, with transformative implications for disciplines such as medicine, neuroscience, and materials science. These diverse applications demonstrate that mathematics operates not merely as a theory but as a *myth* through which we actively construct new ways of understanding and manipulating reality, especially through physics: «This higher myth is a good and useful one, in turn, in so far as it simplifies our account of physics. Since mathematics is an integral part of this higher myth, the utility of this myth for physical science is evident enough»[37]. From this vantage point and in a way that resonates with Rorty's anti-representationalism, mathematics is not embraced because it maps on a given domain but because it constitutes an indispensable tool that shapes our interaction with events occurring or potentially occurring in our surroundings. Through the continuous practice of constructing and reconstructing, mathematics exemplifies how languages do not simply describe reality but actively participate in its creation: *via* habitual engagement and iterative refinement, we carve out our understanding of the experience.

In a parallel yet distinct manner, we saw that Rorty's anti-representationalism does not diminish the significance of mathematical practices, in a way that resonates with Quine's justification. Rather, Rorty redescribes the significance of mathematics, framing it as an instrument "justified" by its efficacy, its adaptability, and its capacity to facilitate meaningful action. As Rorty frequently underscores, the pragmatist notion of truth does not rest on representational fidelity but, instead, on the capacity of concepts to work effectively within contingent and historically situated practices. From this point of view, the hands-on convenience of mathematics for physicists, engineers, and other practitioners provides sufficient validation for its sustained use, thereby rendering metaphysical postulates about an independent mathematical realm unnecessary. His stance on mathematics is illuminated by his broader pragmatist outlook on knowledge in general, which centers on the primacy of community as the locus of justification. As he argues in *Consequences of Pragmatism*[38], the meaning and utility of concepts emerge from their deployment within specific communal contexts, entrenched in achievements and purposes. In this sense, Rorty's position aligns also with Kuhn's insights into the historical shifts of scientific paradigms, further accentuating the cultural character of his interpretation of mathematics. This is how Rorty explains that distinct

[37] W.V. Quine, *From a Logical Point of View*, cit., p. 18.

[38] R. Rorty, *Consequences of Pragmatism*, University of Minnesota Press, Minneapolis 1982.

mathematical frameworks have been devised to address particular struggles and to tackle problems arising in diverse historical and practical settings. For Rorty, mathematical practices derive their value exclusively from their capacity to resolve difficulties and foster innovation – a perspective that aligns also with Wittgenstein's conception of mathematics as a series of language games. In synthesis, Rorty underscores mathematics' role as one among many tools through which humans reshape their environment and expand their horizons of possibility.

If now we go back to the alleged antagonism between realism and anti-realism in philosophy of mathematics, we are able to offer a new reading of the opposition. We saw that Quine's commitment to mathematical ontology arises from its profound functional vitalness within the intricate agenda through which humanity seeks to render the world intelligible: «The totality of our so-called knowledge or beliefs, from the most casual matters of geography and history to the profoundest laws of atomic physics or even of pure mathematics and logic, is a man-made fabric»[39]. Rooted in a naturalized epistemology, his approach transcends mere abstraction, embodying a methodological instrumentalism wherein mathematical constructs are valued for their unparalleled capacity to orchestrate coherent and powerful engagement with the manifold complexities we encounter. In apparent contrast, Rorty's anti-representationalism reconceptualizes the indispensability of mathematical practices, framing them within the fluid, contingent, and socially mediated arenas of human activity. Despite their different vocabularies and philosophical emphases, both Quine and Rorty agree on the undeniable practical opportuneness of mathematics in confronting and reshaping the precarious cultural edifice we built. Their shared perspective elevates mathematics to the status of an essential implement, not only for grappling with the immediate challenges but also for opening portals to possibilities that lie beyond the horizons of current understanding.

Their divergences, then, emerge not from a fundamental dissonance regarding the essence of mathematics but from the nuanced priorities that define their intellectual landscapes. Quine's naturalistic orientation, grounded in the empirical rigor of the scientific enterprise, underscores the indispensability of abstract objects as foundational pillars of coherent theoretical frameworks. Rorty's anti-foundationalism eschews metaphysical presuppositions, insisting on the socially contingent and ever-revisable nature of justification. And yet, in their respective approaches, both thinkers illuminate mathematics as a dynamic, evolving, and profoundly human-centered exercise – a testament to the creative interplay between thought and action.

[39] W.V. Quine, *From a Logical Point of View*, cit., p. 42.

5. Conclusion: Reimagining Math Beyond Ontology, Toward Creation of Possibilities

This paper has sought to dismantle the notion of an unbridgeable chasm between Quine and Rorty regarding their perspectives on mathematics. While traditional interpretations cast Quine's realist ontology and Rorty's anti-representationalism as irreconcilably opposed, a deeper analysis has revealed a striking functional overlapping in their approaches. Both thinkers view mathematics not as a gateway to eternal truths but as a dynamic gear fashioned and refined through a collective effort. By emphasizing this shared pragmatic dimension, we can reframe the philosophy of mathematics, moving beyond traditional ontological disputes and instead highlighting the generative and adaptive role of mathematical modeling in shaping our understanding and interaction with the contingent order.

Ultimately, both Quine and Rorty perceive mathematics as a language and a cognitive scheme – an intricate and evolving medium through which we engage with the complexities of existence and extend the boundaries of thought and action. Their perspectives meet on a shared understanding of mathematics as a *crucial apparatus*. This perspective resonates with a Peircean notion of inquiry, wherein meaning and validity emerge through the practical consequences of concepts and their integration into communal habits of thought.

This pragmatic convergence invites a reimagining of mathematics, one that transcends the polarized debates of realism and anti-realism, with implications also on teaching and learning mathematics[40]. By attending to its procreative and adaptive qualities, we can appreciate mathematics as an active participant in the ongoing manufacture of new modes of understanding and engaging with the realm of options of acting and responding to tasks.

In this light, the metaphysical debates surrounding the ontological status of mathematical objects recede in importance. By reframing mathematics as an act of formation and transformation, deeply embedded in the shared and adaptive processes of human thought, we embrace a vision that is neither static nor transcendent. What truly matters is not whether mathematics uncovers a preordained cosmic order, but how it is able to create *possibilities* through the ever-changing challenges of existence.

Mathematics enables us to cope with the world. Here, we might glimpse a test for the power of language itself: how much we can create, model and understand through formal constructions. Mathematics becomes an expression of creativity, a constellation of evolving habits and practices that both shape and

[40] Cf. G.T. Bagni, *Richard Rorty (1931-2007) and his legacy for mathematics educators*, «Educational Studies in Mathematics», 67, 1, 2008, pp. 1-2.

are shaped by the space of reasons we inhabit. As Quine and Rorty's perspectives converge, they remind us that mathematics derives its profound significance not from passively revealing a hidden order, but from its power to actively create and reimagine the fabric of what we call "reality".