nóema
Rivista online di filosofia

ISSN 2239-5474 n. 16 (2025)

doi: 10.54103/2239-5474/29294 Saggi

WHAT BECOMES OF MATHEMATICS IN DELEUZE'S PHILOSOPHY?

Andrea Colombo

ORCID: 0000-0002-2680-8652

Dipartimento FISPPA, Università degli Studi di Padova (ROR: 00240q980)

Contacts: andrea.colombo@unipd.it

Abstract

This article reconstructs the complex relationship between mathematics and philosophy in Gilles Deleuze's work, showing that mathematical concepts play a consistent and systematic role in his metaphysical project. Drawing on the French epistemological tradition of Brunschvicg and Lautman, Deleuze treats mathematics not as a formal language, but as a privileged site for thinking the real through its virtual structure. Through a reading of *Difference and Repetition*, *A Thousand Plateaus*, *The Fold*, and *What Is Philosophy?*, the article shows how mathematical models help Deleuze describe processes of actualization and singularity. However, in his final work with Guattari, Deleuze explicitly distinguishes philosophy from science: while science constructs functions that slow down chaos, philosophy creates concepts that reopen it. The article argues that this division is not a break with Deleuze's earlier texts, but their coherent outcome. Philosophy is not mathematical, but it can extract the virtual from mathematics—because mathematics, like art and science, belongs to the real that philosophy thinks.

Keywords: Gilles Deleuze; mathematics; virtuality; epistemology; immanence.

Che ne è della matematica nella filosofia di Deleuze?

Questo articolo ricostruisce il rapporto tra matematica e filosofia nell'opera di Gilles Deleuze, mostrando come i concetti matematici svolgano un ruolo coerente e sistematico all'interno del suo progetto metafisico. Facendo riferimento alla tradizione epistemologica francese di Brunschvicg e Lautman, Deleuze tratta la matematica non come un linguaggio formale, ma come un luogo privilegiato per pensare il reale attraverso la sua struttura virtuale. Attraverso una lettura di *Differenza e ripetizione*, *Mille piani*, *La piega* e *Che cos'è la filosofia?*, l'articolo mostra come i modelli matematici permettano a Deleuze

© Andrea Colombo

Published online: 19/11/2025

Milano University Press

Licensed under a Creative Commons Attribution-ShareAlile 4.0 International

di descrivere processi di attualizzazione e singolarità. Tuttavia, nella sua ultima opera scritta con Guattari, *Che cos'è la filosofia?*, Deleuze distingue esplicitamente la filosofia dalla scienza: mentre la scienza costruisce funzioni che rallentano il caos, la filosofia crea concetti che lo riaprono. L'articolo sostiene che questa distinzione non rappresenta una rottura rispetto ai testi precedenti, ma ne costituisce invece l'esito coerente. La filosofia non è matematica, ma può estrarre il virtuale dalla matematica – perché la matematica, come l'arte e la scienza, appartiene al reale che la filosofia pensa.

Parole chiave: Gilles Deleuze; matematica; virtualità; epistemologia; immanenza.

1. Not the Same Thing: Mathematics and Philosophy in Deleuze

In recent decades, Deleuze's engagement with mathematics has attracted considerable scholarly attention[1]. From calculus and the fold to topology and catastrophe theory, a wide range of mathematical concepts have been mobilized to illuminate Deleuze's philosophy. Many of these interpretations tend to emphasize the continuity between mathematical and philosophical thought, suggesting that Deleuze saw them as pursuing fundamentally similar tasks. For instance, Manuel DeLanda has emphasized the relevance of Deleuze's ontology for the sciences, arguing that Deleuze's concepts – particularly those of multiplicity, singularity, and the virtual – offer valuable tools for thinking about complex systems, dynamics, and emergent phenomena in physics and biology[2], while Alain Badiou, from a critical perspective, has emphasized the mathematical ambition of Deleuze's ontology[3]. This perspective has been further explored in interdisciplinary works such as the volume edited[4] by Sarti, Citti, and Piotrowski, which brings together

[1] S. Duffy, *Deleuze and the History of Mathematics. In Defense of the "New"*, Bloomsbury, New York 2013; A. Colombo, *Immanenza e molteplicità. Gilles Deleuze e le matematiche del Novecento*, Mimesis, Milano-Udine 2023; M.J. Ardoline, *Deleuze, Mathematics, Metaphysics. Difference and Necessity*, Edinburgh University Press, Edinburgh 2024; A. F. de Donato, *Morfogenesi del concetto. Matematica e stile a partire da Gilles Deleuze*, Orthotes, Napoli 2024.

[2] M. DeLanda, *Intensive Science and Virtual Philosophy*, Bloomsbury, New York 2002. DeLanda offers a realist and scientific interpretation of Deleuze's philosophy, particularly by reframing Deleuzian concepts – such as multiplicity, singularity, and the virtual—in terms of dynamical systems theory and non-linear science. While distancing himself from Deleuze's more explicitly metaphysical vocabulary, DeLanda emphasizes the material and epistemological potential of Deleuze's thought for contemporary science, especially in fields like physics, biology, and complexity theory. This line of interpretation culminates in DeLanda's development of a new assemblage theory, where Deleuzian ontology is reformulated into a framework for modeling the structure and evolution of social, biological, and physical systems. See M. DeLanda, *Assemblage Theory*, Edinburgh University Press, Edinburgh 2016.

[3] A. Badiou, *Deleuze. The Clamor of Being*, University of Minnesota Press, Minneapolis 1999; see also D.W. Smith, *Mathematics and the Theory of Multiplicities: Badiou and Deleuze Revisited*, «The Southern Journal of Philosophy» XLI, 2003, pp. 411-449.

[4] A. Sarti, G. Citti, D. Piotrowski, *Differential Heterogenesis. Mutant Forms, Sensitive Bod-*

mathematicians and semioticians to investigate the concrete mathematical implications of Deleuze's thought. The result of this recent scholarship is often an interpretation of Deleuze's philosophy as a kind of advanced mathematical speculation, or even as a metaphysical continuation of mathematics by other means.

However, this reading becomes more problematic when confronted with *What Is Philosophy?*, Deleuze and Guattari's final collaborative work. There, the relationship between mathematics and philosophy is not one of continuity but of *difference in kind*. Far from fusing the two disciplines, Deleuze insists on a sharp distinction between philosophy, science, and art, each of which constructs its own distinct plane and deals with a different mode of thought. How should we understand this shift? And what becomes of mathematics when it is no longer a model or a partner, but a field external to philosophy's own conceptual practice? These are the questions this article sets out to explore.

To address these questions, we will proceed in three stages. First, we will examine why Deleuze so frequently employs mathematical concepts throughout his philosophical work. From *Bergsonism* to *Difference and Repetition*, from *Logic of Sense* to his studies on Leibniz, mathematics appears as a privileged site for the articulation of problems that escape ordinary conceptual representation. Rather than being decorative or merely metaphorical, these mathematical references play a structural role in shaping Deleuze's understanding of singularities, multiplicities, and differential relations. Indeed, one of the most distinctive features of Deleuze's thought is the persistence of mathematical language across his entire philosophical corpus: from the earliest texts to the last, mathematical concepts form a constant thread, to which we will return through specific examples.

Second, we will situate this use of mathematics within a specific intellectual tradition – that of twentieth-century French epistemology. The influence of thinkers such as Léon Brunschvicg, Albert Lautman, and Jean Cavaillès provides Deleuze's philosophical practice with a conceptual rigor often overlooked by his more speculative interpreters. By invoking this tradition, we do not refer merely to a few isolated theories, but to a broader conception of rationality – what the French tradition would call *pensée mathématique* – that unites the development of mathematical structures with the historical and conceptual conditions of scientific

ies, Springer 2022. This volume investigates the conceptual and mathematical implications of Deleuze's philosophy, particularly in relation to the notion of morphogenesis. The contributors develop the idea of "differential heterogenesis" to describe processes of continuous variation and transformation, drawing on Deleuzian concepts such as multiplicity, singularity, and intensive individuation. Rather than applying mathematics in a technical sense, the volume articulates a philosophical use of mathematical notions – such as topology and differential geometry – as tools for thinking dynamic, non-reductive processes of becoming and sensitive embodiment. See also A. Sarti, *Intensities and Morphogenetical Events*, «Foundations of Science», 2025, https://doi.org/10.1007/s10699-025-09985-0.

thought. In particular, Lautman's theory of the dialectics of mathematical ideas offers a key to understanding how Deleuze approaches mathematics not as a set of ready-made structures, but as a dynamic field of problems and transformations.

Finally, we will return to *What Is Philosophy?* to show that the apparent rupture it introduces—the sharp distinction between philosophy and science – should not be seen as a rejection of Deleuze's earlier mathematical interests. On the contrary, it is the logical consequence of a philosophical orientation already present in the 1960s: the idea that philosophy is a discipline of virtuality, capable of extracting and transforming concepts from other domains *without* becoming identical to them.

Ultimately, this article argues that for Deleuze, philosophy can virtualize mathematical structures – that is, think their conditions, mobilize their internal problems, and displace their functions onto a conceptual plane of immanence. But the inverse is not true: mathematics cannot virtualize philosophy. This asymmetry defines the specificity of philosophical thought. While mathematics produces functions and relations within a scientific plane, philosophy operates by creating concepts that open up new modalities of sense. As Deleuze and Guattari write:

> It is pointless to say that there are concepts in science. Even when science is concerned with the same "objects" it is not from the viewpoint of the concept; it is not by creating concepts. [...] Science needs only propositions or functions, whereas philosophy, for its part, does not need to invoke a lived that would give only a ghostly and extrinsic life to secondary, bloodless concepts. The philosophical concept does not refer to the lived, by way of compensation, but consists, through its own creation, *in setting up an event that surveys the whole of the lived no less than every state of affairs*[5].

Deleuze clearly distinguishes between science and philosophy: science proceeds by functions and models, while philosophy creates concepts that engage with the virtual dimension of problems. This separation, however, is not a matter of hierarchy. It reflects two different modes of addressing the real – each with its own consistency and necessity.

2. The Differential Problem: Deleuze and the French Epistemological Legacy

One widespread critique, especially among scientifically-minded commentators, is that Deleuze's use of mathematics is superficial or incoherent. Perhaps the most notorious version of this charge is found in Alan Sokal and Jean Bricmont's *Fash-*

[5] G. Deleuze, F. Guattari, *What Is Philosophy?*, Columbia University Press, New York 1994, pp. 33-34.

ionable Nonsense, where Deleuze is accused of abusing mathematical terminology for rhetorical effect[6]. Yet such critiques fail to recognize the theoretical and historical consistency of Deleuze's engagement with mathematics. As we will show, his references are neither arbitrary nor metaphorical: they are grounded both in a rigorous philosophical framework – rooted in the notion of the virtual – and in a deep familiarity with the French epistemological tradition, particularly the work of the Brunschvicg school and his students, Lautman, Cavaillès, and Bachelard.

The pervasive presence of mathematics in Deleuze's philosophical work does not stem from a fascination with scientific prestige, nor from a desire to legitimize his metaphysics through formal abstraction. Rather, it reflects a deep epistemological orientation: the conviction that certain forms of mathematics can be mobilized to challenge classical metaphysical frameworks and to contribute to the formation of a new image of thought. This section will trace the role of mathematics across three key moments in Deleuze's œuvre – *Difference and Repetition* (1968), *A Thousand Plateaus* (1980), and *The Fold* (1988) – showing how, in each case, mathematical structures are used not to subordinate philosophy to science, but to think beyond the limits of classical thought and to articulate new modes of conceptual production.

In the third chapter of *Difference and Repetition*, entitled *The Image of Thought*, Deleuze engages Kant on seemingly unfamiliar ground: the nature of problems. Drawing on his earlier *Kant's Critical Philosophy* (1963)[7], Deleuze claims that although Kant identifies the problematic character of Ideas as the motor of dialectical thought, he ultimately subordinates problems to their possible solutions, measuring their legitimacy by their solvability. As Deleuze writes,

> Kant still defines the truth of a problem in terms of the possibility of its finding a solution: this time it is a question of a transcendental form of possibility, in accordance with a legitimate use of the faculties as this is determined in each case by this or that organisation of common sense (to which the problem corresponds)[8].

This move, according to Deleuze, creates a vicious circle in which the transcendental field is saturated by its actual expressions, thereby undermining the gen-

6 A. Sokal, J. Bricmont, *Fashionable Nonsense: Postmodern Intellectuals'Abuse of Science*, Picador, New York 1999, pp. 154-168.

7 G. Deleuze, *Kant's Critical Philosophy. The Doctrine of the Faculties*, The Athlone Press, London 1984. For further discussion of Deleuze's critique of Kant, see also G. Rametta, *Il trascendentale di Gilles Deleuze*, in *Metamorfosi del trascendentale. Percorsi filosofici tra Kant e Deleuze*, edited by G. Rametta, Cleup, Padova 2008; A. Sauvagnargues, *Deleuze. L'empirisme transcendantal*, PUF, Paris 2010; D. Voss, *Conditions of Thought: Deleuze and Transcendental Ideas*, Edinburgh University Press, Edinburgh 2013.

8 G. Deleuze, *Difference and Repetition*, Continuum, London 1997, p. 161.

erative power of the problem itself. In contrast, Deleuze insists that problems possess an internal imperative that defines their truth independently of any solution. It is this imperative – this differential element – that constitutes the genetic power of thought: «Problems are tests and selections. What is essential is that there occurs at the heart of problems a genesis of truth, a production of the true in thought. Problems are the differential elements in thought, the genetic elements in the true»[9].

The term "differential" thus becomes central to Deleuze's redefinition of the transcendental. It is at once mathematical and metaphysical: the condition for the emergence of novel forms of experience. While Kant ties the transcendental to the *a priori* forms of sensible intuition, Deleuze ties it to the *differential conditions* of actualization –conditions that are not merely epistemic but ontological. In this respect, mathematics plays a structural role. Differential calculus, the concept of singularities, and the theory of multiplicities are not decorative but indispensable: they allow Deleuze to formulate a transcendental field as a space of divergent series and problematic multiplicities.

But the most significant moment in this construction comes when Deleuze invokes an unexpected name: Albert Lautman. Lautman (1908–1944) was a French philosopher and mathematician who played a crucial role in twentieth-century French epistemology[10]. A student of Léon Brunschvicg and a close associate of Jean Cavaillès, Lautman combined a rigorous mathematical education with a speculative, metaphysical approach to the foundations of mathematics. His work focused on the structure of mathematical theories, the genesis of new mathematical concepts, and the role of dialectical Ideas in organizing fields of knowledge. Lautman is cited by Deleuze as one of the few thinkers to have conceived a radically new theory of the problem[11]. For Lautman, problems are not merely epistemic obstacles or practical questions – they are ontological structures that precede and condition the emergence of solutions. They function as what he

[9] Ivi, p. 162.

[10] For further insights into Lautman's work, his connection to the French epistemological tradition, and his engagement with the mathematics of his time, see also J. Petitot, *Refaire le 'Timée': Introduction à la philosophie mathématique d'Albert Lautman*, «Revue d'histoire des sciences» 40, 1, 1987, pp. 79-115; F. Zalamea, *Philosophie synthétique de la mathématique contemporaine*, Helmann, Parigi 2018; M. Castellana, *The epistemology of the mathematical 'dedans' in Albert Lautman's early writings*, «Annals of Mathematics and Philosophy», 2025, pp. 1-28.

[11] G. Deleuze, *Difference and Repetition*, cit., pp. 163-164: «Nowhere better than in the admirable work of Albert Lautman has it been shown how problems are first Platonic Ideas or ideal liaisons between dialectical notions, relative to 'eventual situations of the existent'; but also how they are realised within the real relations constitutive of the desired solution within a mathematical, physical or other field. It is in this sense, according to Lautman, that science always participates in a dialectic which points beyond it - in other words, in a meta-mathematical and extra-propositional power - even though the liaisons of this dialectic are incarnated only in effective scientific propositions and theories».

calls "dialectical Ideas": virtual structures that organize the field of mathematical thought and give rise to concrete systems of notions. In Lautman's words,

> the intrinsic reality of mathematics appeared to us to reside in its participation in the Ideas of this dialectic which governs them. We do not understand by Ideas the models whose mathematical entities would merely be copies, but in the true Platonic sense of the term, the structural schemas according to which the effective theories are organized[12].

This conception of mathematics as governed by a higher dialectic – one that remains virtual but becomes actualized in theories – aligns perfectly with Deleuze's project. But Deleuze explicitly mobilizes Lautman *against* Kant. Whereas Kant acknowledges the problematic nature of Ideas only to constrain them within the bounds of legitimate usage and possible resolution, Lautman insists on the autonomy of the problem as such. For Lautman, problems are not true because they can be solved; they are true because they structure a field of possible new solutions. Deleuze radicalizes this position: not only are problems ontologically primary, but they also constitute the very condition for the genesis of the real. Whereas Lautman maintains that the dialectic of Ideas and notions becomes visible only in mathematics, Deleuze shifts the focus to philosophy as the discipline uniquely capable of extracting this problematic structure from every domain of reality. For Deleuze, it is philosophy – not mathematics – that becomes the site in which the virtual problematic is preserved, reactivated, and extended beyond its scientific formulations. Philosophy becomes the creative discipline that thinks the genesis of sense from within the problem itself. This move reflects Deleuze's deeper inheritance from the French epistemological tradition, whose foundation lies in the work of Brunschvicg. For Brunschvicg, mathematics does not simply apply logical deduction but reveals the historical transformation of rationality itself[13]. This dynamic view conceives reason as an evolving force, dissolving the static distinction between subject and object in favor of a continuous process of becoming. Lautman inherits this orientation, identifying in mathematics the privileged domain where this transformation manifests through the dialectic of problems and Ideas. Deleuze, in turn, carries this legacy into philosophy, where the problematic is no longer confined to the mathematical domain but becomes the condition for engaging with reality as such.

[12] A. Lautman, *Mathematics, Ideas and the Physical Real*, Continuum 2011, p. 199.

[13] See A. Gualandi, *Brunschvicg, Kant e le metafore del giudizio matematico*, «Discipline filosofiche» XVI, 2, pp. 169-202; A. Michel, *Jean Cavaillès in the legacy of Léon Brunschvicg: Mathematical philosophy and the problems of history*, in «Revue de métaphysique et de morale» 105, 2020/1, pp. 9-36.

Thus, Deleuze radicalizes Lautman's thesis: if mathematics actualizes dialectical problems, philosophy is the practice that virtualizes them. The history of mathematics for Lautman becomes, in Deleuze, the history of philosophy understood as the history of the virtual. As Deleuze writes in *Difference and Repetition*, «Problems are always dialectical. [...] What is mathematical (or physical, biological, psychical or sociological) are the solutions. It is true, however, that on the one hand the nature of the solutions refers to different orders of problem within the dialectic itself; and on the other hand that problems – by virtue of their immanence, which is no less essential than their transcendence – express themselves technically in the domain of solutions to which they give rise by virtue of their dialectical order»[14]. But only philosophy can think the problem as such, as a differential condition of thought.

This is why Deleuze's use of mathematical concepts must be understood not as a conflation of disciplines, but as a philosophical operation: a way of extracting from mathematics a structure of genesis that philosophy alone can render intelligible as such. It is the beginning of the long path that leads, in *What Is Philosophy?*, to the claim that philosophy does not communicate with science, but reterritorializes it, extracting the virtual from its functional organization and transforming it into a concept. In this sense, the mathematical legacy in Deleuze is not about transdisciplinary fusion, but rather how the discipline enters into an asymmetrical relationship with philosophy which assumes the tasking of thinking through what science cannot: the genesis of sense, the power of the virtual, and the differential ground of thought itself.

If *Difference and Repetition* opened the way for a new theory of problems – drawing on Lautman's dialectics of the Idea to counter Kant's tendency to flatten the transcendental into the actual, thereby foreclosing the emergence of genuine novelty – Deleuze's project gradually shifts focus. In that first phase, mathematics is deeply connected to the virtual and the genesis of the actual: problems are ontological structures, and the differential calculus provides the key model for expressing their internal structure and resolution With *A Thousand Plateaus* (*Mille plateaux*, 1980), however, mathematics begins to serve a different role. It remains ever-present, but its use is no longer primarily tied to the problem–solution dynamic. Instead, it becomes a tool for describing the relations among actual entities themselves. The mathematical terminology – borrowed from topology, geometry, and fractal theory – is now used to articulate spatial and material dynamics: smooth and striated spaces, multiplicities, abstract machines. Lautman remains in the background, but the focus shifts toward Bernhard Riemann,

[14] G. Deleuze, *Difference et Repetition*, cit., p. 179.

whose conception of differential manifolds offers a new way of thinking the heterogeneity and internal tensions of space. In this new framework, mathematics ceases to function as the language of virtual genesis and instead becomes the diagram of immanent, material processes.

> We have on numerous occasions encountered all kinds of differences between two types of multiplicities: metric and nonmetric; extensive and qualitative; centered and acentered; arborescent and rhizomatic; numerical and flat; dimensional and directional; of masses and of packs; of magnitude and of distance; of breaks and of frequency; *striated and smooth*. Not only is that which peoples a smooth space a multiplicity that changes in nature when it divides – such as tribes in the desert: constantly modified distances, packs that are always undergoing metamorphosis – but smooth space itself, desert, steppe, sea, or ice, is a multiplicity of this type, nonmetric, acentered, directional, etc[15].

It is here that Riemann becomes decisive. A 19th-century mathematician (1826-1866) working at the intersection of geometry, physics, and philosophy, Riemann revolutionized the understanding of space by introducing the concept of *manifolds*–continuous, n-dimensional structures capable of undergoing intrinsic variation[16]. His work opened the door to non-Euclidean geometries and influenced later developments in general relativity, but for Deleuze and Guattari, Riemann's true significance lies in the way his thought allows one to conceive of space not as a fixed container, but as a dynamic and differentiated field that gives form to various structures. It is, in other words, the geometric translation of the virtual-actual dynamic, the problem-Idea-solutions structure already developed in *Difference and Repetition*—seen here in its immanent and dynamic aspect, without referring solely to its transcendental genesis.

Riemann's notion of n-dimensional multiplicities, originally formulated to describe spaces that cannot be reduced to Euclidean geometry, is taken up as an ontological model. For Deleuze and Guattari, the multiplicity is no longer a

15 G. Deleuze, F. Guattari, *A Thousand Plateaus. Capitalism and Schizophrenia*, University of Minnesota Press, Minneapolis 1987, p. 484.

16 As M. DeLanda convincingly argues, *Intensive Science and Virtual Philosophy*, cit., pp. 3-4: «The term "manifold" does not belong to the analytical geometry of Descartes and Fermat, but to the differential geometry of Friedrich Gauss and Bernhard Riemann […] The idea of studying a surface as a space in itself was further developed by Riemann. Gauss had tackled the two-dimensional case, so one would have expected his disciple to treat the next case, three-dimensional curved surfaces. Instead, Riemann went on to successfully attack a much more general problem: that of N-dimensional surfaces or spaces. It is these N-dimensional curved structures, defined exclusively through their intrinsic features, that were originally referred to by the term "manifold". Riemann's was a very bold move, one that took him into a realm of abstract spaces with a variable number of dimensions, spaces which could be studied without the need to embed them into a higher-dimensional (N+1) space». A more detailed analysis of Deleuze's engagement with Riemann can be found in A. Plotnitsky, *Manifolds: on the concept of space in Riemann and Deleuze*, in *Virtual Mathematics: the logic of difference*, edited by S. Duffy, Clinamen Press, Bolton 2006, pp. 187-208.

static structure but a dynamic field, a space of variation without predetermined form. From this idea, they extract two fundamental operations: n – 1 and n + 1[17]. The formula n – 1 does not refer to a numerical subtraction but to a conceptual operation: the subtraction of unity. The unity – the One – is not a starting point but a result, and a false one at that. By subtracting the One from the multiple, Deleuze and Guattari emphasize the immanence of the manifold: a plane of consistency where no origin, no essential center, governs the system. This operation expresses a refusal of hierarchical structures, such as trees or arborescent logic, which always presuppose a foundational unity. In contrast, the rhizome, as a form of growth, connection, and transformation, is the spatial expression of n – 1: a multiplicity that resists centralization and generates connections only through local, transversal linkages. The formula n + 1 = x points to the opposite operation: actualization. While the plane of consistency (n – 1) defines the field of virtuality – where singularities coexist without fixed position or metric – n + 1 describes the emergence of a new dimension, a concrete instantiation, a singular event (x) that cannot be predicted from the structure of the multiplicity itself. This is consistent with Deleuze's principle, first articulated in *Difference and Repetition*, that «solutions do not resemble the problems they solve». The actual is not a realization of the virtual in the form of resemblance, but a transformation of its structure in a singular, unpredictable direction. Together, these two movements – n – 1 and n + 1 – redefine how Deleuze and Guattari approach mathematics in *A Thousand Plateaus*. No longer a theory of ideal structures (as in Lautman), mathematics becomes an *ontology of consistency and event*: the virtual is given as a plane, and the actual as the emergence of singularities. This marks a decisive break: mathematics is no longer the privileged expression of the virtual but the medium through which space becomes expressive, dynamic, and conflictual. What Riemann defined as an abstract manifold is reinterpreted as the battlefield of reality, where different kinds of space – smooth and striated – compete for territorial dominance.

17 G. Deleuze, F. Guattari, *A Thousand Plateaus*, cit., pp. 17-21: «*The multiple must be made, not by always adding a higher dimension,* but rather in the simplest of ways, by dint of sobriety, with the number of dimensions one already has available— always n - 1 (the only way the one belongs to the multiple: always subtracted). Subtract the unique from the multiplicity to be constituted; write at n - 1 dimensions. *A system of this kind could be called a rhizome*. […] Let us summarize the principal characteristics of a rhizome: unlike trees or their roots, the rhizome connects any point to any other point, and its traits are not necessarily linked to traits of the same nature; it brings into play very different regimes of signs, and even nonsign states. The rhizome is reducible neither to the One nor the multiple. It is not the One that becomes Two or even directly three, four, five, etc. It is not a multiple derived from the One, or to which One is added (n + 1). It is composed not of units but of dimensions, or rather directions in motion. It has neither beginning nor end, but always a middle (milieu) from which it grows and which it overspills. It constitutes linear multiplicities with n dimensions having neither subject nor object, which can be laid out on a plane of consistency, and from which the One is always subtracted (n - 1)».

A Thousand Plateaus is, in this sense, a radicalization of the philosophical ambitions of *Difference and Repetition*. But here, ontology is no longer cast in terms of genesis or transcendental structures: it is spatialized, materialized, and pluralized. The smooth space, which resists measurement and totalization, becomes the ontological figure of heterogeneity. Striated space, by contrast, imposes metric order and codification. Drawing again from Lautman – particularly his reflections on topology and mathematical intuition – Deleuze and Guattari describe Riemannian space as tactile, rhythmic, and patchwork-like[18]. But the Lautmanian model is no longer used to describe the genesis of mathematical structures; it is now used to describe the very structure of reality itself. In this new framework, mathematics is no longer a representation of the virtual, *but a tool for navigating the actual*. Deleuze and Guattari do not discard the language of the virtual; rather, they realize it – transforming it from a metaphysical reserve into a lived, spatialized force. What was a dialectical structure in Lautman becomes, in *A Thousand Plateaus*, a nomadic physics – a theory of how multiplicities move, fold, resist, and intersect.

The shift that began in the mid-1970s – when Deleuze's attention moved from the transcendental structure underlying the real to the singular and material dynamics that compose it – finds its first consolidated form in *A Thousand Plateaus* (1980) and is then further developed in the two volumes on cinema (1983, 1985). However, it is in *The Fold: Leibniz and the Baroque* (*La Plie*, 1988) that this new theoretical direction reaches its most refined and complete formulation.

Already the title signals a transformation: Deleuze turns to the concept of the fold not simply as a metaphor but as a way of thinking the immanence of the outside within thought itself. The fold describes a continuous process by which the outside is interiorized – not subordinated, but co-constitutive. It is through this operation that thought gains consistency, not as a representation of reality, but as a participant in its becoming. The fold thus becomes a transcendental function, one that unites the interior and the exterior without assigning precedence to either. It reflects Deleuze's long-standing project: to access the productive, differential force that lies outside of structured conceptual frameworks. If *A Thousand Plateaus* was an experimental and performative work, *The*

[18] G. Deleuze, F. Guattari, *A Thousand Plateaus*, cit., p. 485: « *In short, if we follow Lautman's fine description, Riemannian space is pure patchwork*. It has connections, or tactile relations. It has rhythmic values not found elsewhere, even though they can be translated into a metric space. Heterogeneous, in continuous variation, it is a smooth space, insofar as smooth space is amorphous and not homogeneous. We can thus define two positive characteristics of smooth space in general: when there are determinations that are part of one another and pertain to enveloped distances or ordered differences, independent of magnitude; when, independent of metrics, determinations arise that cannot be part of one another but are connected by processes of frequency or accumulation. These are the two aspects of the nomos of smooth space».

Fold is its theoretical counterpoint – a reflective account of the conditions under which such experimentation becomes possible. In this book, Deleuze redefines philosophy itself: no longer the search for foundational structures, but the active navigation of singularities[19]. The concept regains its force only when it folds itself into the chaos of the world, drawing from it a creative tension rather than imposing order. The central question becomes: how can one think the plane of immanence, the space where concepts, singularities, and events are all co-emergent?

Leibniz is the key figure in this new metaphysical orientation. Not because of his theological commitments – indeed, Deleuze deliberately detaches him from the postulate of a divine harmony – but because of his capacity to think singularities, infinitesimal variations, and the differential structure of the real. Leibniz is reinterpreted as a precursor of a radical, anti-structural metaphysics. In his reading, Deleuze finds a productive ambiguity: on the one hand, the presence of pre-established harmony; on the other, a proliferating multiplicity of monads and perceptual micro-events. The latter becomes the ground for a new kind of empiricism – what Deleuze had already begun to sketch as transcendental empiricism – freed from any overarching unity or totalizing framework.

This reinterpretation leads Deleuze to formulate the concept of the *chaosmos* – a blend of chaos and cosmos – that describes the generative field in which all reality unfolds. The *chaosmos* is not a structure, nor is it a pure disorder: it is the field of singular speeds, inflections, and folds, where zones of order emerge temporarily and are constantly reshaped. These "islands" of relative stability are not imposed by a higher law, but arise from local configurations of intensity and curvature. The key operation here is no longer the dialectic or even the topology of abstract Ideas, but the fold, derived from both baroque architecture and mathematical catastrophe theory – especially the work of René Thom[20], whose notion of the *fold* becomes central for Deleuze's metaphysical project. The fold is a singularity of curvature, an inflection point that carries no extrinsic coordinates. As Bernard Cache remarks[21] (and Deleuze emphasizes), inflection is an intrinsic

[19] G. Deleuze*, The Fold. Lebniz and the Baroque*, The Athlone Press, London 1993, p. 79: «For with Leibniz the question surges forth in philosophy that will continue to haunt Whitehead and Bergson: not how to attain eternity, but in what conditions does the objective world allow for a subjective production of novelty, that is, of creation? The best of all worlds had no other meaning: it was neither the least abominable nor the least ugly, but the one whose All granted a production of novelty, *a liberation of true quanta of "private" subjectivity*, even at the cost of the removal of the damned. The best of all worlds is not the one that reproduces the eternal, but the one in which new creations are produced. the one endowed with a capacity for innovation or creativity: a teleological conversion of philosophy».

[20] G. Deleuze, *The Fold*, cit., p. 16: « Rene Thom's transformations refer in this sense to a morphology of living matter, providing seven elementary events: *the fold*; the crease; the dovetail; the butterfly; the hyperbolic, elliptical, and parabolic umbilicus».

[21] B. Cache, *Earth Moves: The Furnishing of Territories*, MIT Press, Boston 1995.

singularity – neither high nor low, neither left nor right, neither regression nor progression. It is the pure event of form, the virtual made visible in the real, but never entirely actualized.

In *The Fold*, mathematics is no longer the science of the virtual, as it had been in the Lautmanian phase. It is now a topological and physical logic of becoming, a way of tracing the tensions and curvatures through which singularities arise. Deleuze draws from a different mathematical genealogy: from Huygens to Thom, from Klee's active line to Riemann's spaces of variation. The aim is no longer to identify structural regularities, but to map the genesis of forms as they fold, unfold, and refold – without relying on a transcendental unity[22]. Here, Deleuze's interest in mathematics converges with his attention to the arts – painting, music, cinema, architecture. These disciplines are not illustrative; they are generative. They express what philosophy cannot yet articulate: the silent experience of form in motion, the reality of time without fixed concepts. Art does not stabilize; it folds. And through this folding, it makes visible the outside of thought, the zone from which philosophy itself must draw.

In this way, *The Fold* marks a subtle but important return to the notion of the virtual – a concept that had been largely abandoned in *A Thousand Plateaus*, where mathematics was used to trace real, spatial, and material dynamics. Now, however, the virtual reappears, but no longer as a detached transcendental realm. It is reintegrated into the very logic of dynamics first explored in *A Thousand Plateaus*. The fold becomes the point of conjunction: where virtuality and actuality meet, where the form is not merely actualized but continuously varied and inflected. The virtual is no longer a reservoir of ideal structures; it is the differential movement within the fold itself – a force of variation that is at once conceptual and material, transcendental and immanent. Thus, in *The Fold*, the virtual becomes something else entirely. It is no longer a pre-structured domain of problems (as in Lautman), but the event of form, the moment in which the real turns on itself and gives rise to a singularity. Even the purest inflection – the moment of genesis—is already materially marked. It has already been affected by the *chaosmos*, by the pressure of forces that act before we perceive them. The virtual becomes the already-past of the event: not a structure, but the trace of what has folded.

This is why Deleuze's use of mathematics at this stage is profoundly immanent. It no longer refers to a transcendental domain of Ideas but to the real conditions under which form emerges and collapses. Thom's catastrophe models, Leibniz's infinitesimals, Riemann's spaces of variation – these are not conceptual ornaments. They are the names of a physics of immanence, a metaphysics of

[22] See C. D'Aurizio, *Una filosofia della piega. Saggio su Gilles Deleuze*, Mimesis, Milano-Udine 2024.

singularities *without any foundation* – not even a transcendental one. In *The Fold*, Deleuze imagines a Leibniz without God – a Leibniz in whom the monads no longer reflect the same world but instead generate divergent ones. This post-theological Leibniz becomes a vehicle for thinking the radical productivity of the singular, the irreducible plurality of worlds, and the death of any metaphysical center. The monads become nomads. Concepts cease to represent; they begin to fold and generate. With this shift, the virtual is no longer the domain of latent Ideas. It becomes the field of forces without form, of events without essence, of creation without origin. And it is precisely this transformation that prepares the way for Deleuze's final work – *What Is Philosophy?* – in which thought is no longer grounded in representation or abstraction, but in the creation of concepts on the plane of immanence.

Up to this point, we have traced – albeit necessarily in broad strokes – how Deleuze's engagement with mathematics is both profound and systematic, and how it fits squarely within his metaphysical project. In continuity with the French epistemological tradition, Deleuze does not treat mathematics as a closed formal system, but as a privileged language for thinking processes of actualization. From *Difference and Repetition* to *A Thousand Plateaus* and *The Fold*, mathematical figures are not marginal metaphors: they serve to construct a philosophy of radical immanence, one in which the virtual is not opposed to the real but constitutes its dynamic, generative ground. Mathematics helps articulate this immanence, offering a way to describe singularities, multiplicities, topological spaces, and nonlinear structures of becoming. And yet, in Deleuze's final major work, *What Is Philosophy?*, written with Guattari, a stark division is introduced between philosophy and science – including mathematics. Concepts and functions are assigned to entirely different planes of thought. How should we understand this apparent rupture? What does this decisive distinction mean, and how does it relate to the trajectory we have followed so far? It is precisely to this question that we now turn.

3. The Divergence of Philosophy and Science

In *What Is Philosophy?*, Deleuze and Guattari open with a question posed, as they say, «at midnight, when there is no longer anything to ask»[23] . It is the question of a lifetime, one that arises at the limits of thinking and marks the culmination of Deleuze's philosophical trajectory. Rather than a definitive conclusion, this book is a conceptual testament – a final radicalization of thought, which gathers four decades of philosophical experimentation and projects them toward

[23] G. Deleuze, F. Guattari, *What Is Philosophy?*, cit., p. 1.

a future Deleuze himself would not live to see. Deleuze and Guattari answer their question from the outset: «Philosophy is the art of forming, inventing, and fabricating concepts»[24]. In other words, the task of philosophy is not to discover truths, solve problems, or offer representations, but to create. And what it creates is not knowledge in the scientific sense, but concepts – intensive, non-discursive multiplicities that articulate the real in ways science cannot.

A concept, they argue, is not a generality, nor a proposition, nor a model. It is a singular, intensive multiplicity composed of heterogeneous elements that cohere without losing their differences. Concepts are defined by their "components," each of which can be a concept in its own right. These components interact through a process of *coalescence*, forming a unique consistency that is neither spatial nor temporal but purely intensive. As they put it: «As whole it is absolute, but insofar as it is fragmentary it is relative. It is infinite through its surveyor its speed but finite through its movement that traces the contour of its components»[25]. This idea is not new in Deleuze's work. Already in *Difference and Repetition* (1968), the "Idea" was defined as a multiplicity (n-dimensional) whose components determine its structure, and whose actualization is guided by differential relations. What *What Is Philosophy*? does is to radicalize this insight and shift it onto a fully philosophical terrain: no longer confined to mathematics, the multiplicity now becomes the very element of conceptual thought.

Moreover, a concept does not float freely – it exists only on a plane of immanence. This plane is not a representation or a foundation; it is a dynamic field of consistency that precedes and sustains thought. Unlike scientific models, which slow down chaos to produce functions, the plane of immanence maintains infinite speed. It is the site of virtuality itself. In contrast, science does not produce concepts. It constructs functions, composed of functives – variables and constants organized through models of reference. These models slow down the chaos of the real, translating it into structured frameworks. As Deleuze and Guattari note, science «approaches chaos in a completely different, almost opposite way: it relinquishes the infinite, infinite speed, in order to gain a reference able to actualize the virtual»[26]. This is not a failure of science, but its condition of possibility. Science creates diagrams that stabilize the real; philosophy creates concepts that intensify it.

> When the limit generates an abscissa of speeds by slowing down, the virtual forms of chaos tend to be actualized in accordance with an ordinate.

[24] Ivi, p. 2.

[25] Ivi, p. 21.

[26] Ivi, p. 118.

> And certainly the plane of reference already carries out a preselection that matches forms to the limits or even to the regions of particular abscissas. But the forms nonetheless constitute variables independent of those that move by abscissa. This is very different from the philosophical concept: intensive ordinates no longer designate inseparable components condensed in the concept as absolute survey (variations) but rather distinct determinations that must be matched in a discursive formation with other determinations taken in extension (variables). Intensive ordinates of forms must be coordinated with extensive abscissas of speed in such a way that speeds of development and the actualization of forms relate to each other as distinct, extrinsic determinations[27].

At the end of the passage cited here, Deleuze and Guattari add a footnote citing Nicole Oresme (1323–1382), whose example – well known through Pierre Duhem's historical studies – proves particularly illuminating. In his *De Uniformitate et Difformitate Intensionum*, Oresme devised a way to geometrically represent variations of motion, treating qualitative changes (like heat) as if they were quantities. By plotting variations along a horizontal line (longitude) and representing intensity at a given point with a vertical (latitude), he created what we might call an early mathematical model of variation. For instance, a triangle representing uniformly decreasing speed could be equated in area to a rectangle, modeling constant motion. This triangulation turns motion itself into a measurable form – transforming the virtuality of change into a system of reference. This is precisely what Deleuze and Guattari mean by scientific referentiality: a fragment of chaos is extracted, frozen into a model, and then analyzed. Mathematics, especially in its topological form, is the first operation that makes this possible – it is «the function of slowing down chaos», or, more accurately, of organizing it into calculable potential.

But this is not what philosophy does. If mathematics defines the potential for scientific reference, philosophy works with virtuality itself, without reducing it to a model. The virtual is not latent structure – it is the field of problems, of events, of differential singularities that never fully actualize. Deleuze had already stated in *Difference and Repetition* that the Idea (in Lautman's sense) is not a concept, but a "problematic multiplicity" that organizes its solutions. Now, in *What Is Philosophy?*, this problematic field becomes the proper domain of the concept: «real without being actual, ideal without being abstract»[28]. Hence, philosophy does not model, it virtualizes. It does not refer to external structures; it composes new internal consistencies. And this is why, even though *A Thousand Plateaus* and *The Fold* used mathematical models (Riemannian manifolds,

[27] Ivi, p. 121.

[28] Ivi, p. 156.

catastrophe theory), *What Is Philosophy?* marks a turning point: philosophy reclaims its autonomy, not by rejecting science, but by clarifying its own mode of engagement with the real.

Thus while science produces functions organized by models and composed of functives (variables, constants, parameters), philosophy produces concepts that arise on a plane of immanence and engage with the virtual. While science slows down the chaos to extract referential structures, philosophy intensifies it – creating singularities of sense that have no model, no referent, and no fixed coordinates. As Deleuze and Guattari conclude: «Concepts are not waiting for us ready-made, like heavenly bodies. There is no heaven for concepts. They must be invented, fabricated, or rather created and would be nothing without their creator's signature»[29]. And in creating them, philosophy does not explain the world – it adds to it.

The trajectory we have followed, from *Difference and Repetition* to *What is Philosophy?*, passing through *A Thousand Plateaus* and *The Fold,* leads us to a decisive insight: Deleuze does not use mathematics as a scientific method, nor does he abandon it in favor of poetic intuition. Rather, he virtualizes mathematical structures – extracting from them a problematic power that philosophy alone can unfold beyond the limits of formal modeling or referential function. Mathematics, for Deleuze, is neither a foundation nor a metaphor: it is one of the ways in which reality expresses its singularities. In this sense, the philosophical concept is not mathematical, but it can resonate with mathematical structures insofar as both emerge from the same immanent field of real conditions.

This is why both extremes – those who place Deleuze entirely within mathematics, and those who sever him completely from it – miss the mark. The first approach risks reducing his thought to a formalist epistemology; the second ignores the strategic ways in which Deleuze draws on mathematics and science to construct concepts that do not belong to science, but allow us to think reality in new ways. For Deleuze, philosophy engages directly with the real, and it is precisely this that distinguishes it from science: science produces models, representations, and functions; philosophy invents concepts that make zones of indetermination and transformation thinkable.

To fully grasp this point, one can look at how *What is Philosophy?* itself conceives the history of philosophy. In the chapter *Geophilosophy*, Deleuze and Guattari reflect on the birth of philosophy in ancient Greece. They argue that philosophy emerges not from a given cultural identity, but from a rupture with transcendence, from the affirmation of an immanent thought that begins

29 Ivi, p. 5.

with the invention of concepts. However, this movement toward immanence is always threatened by its own reversal: by the mirages of transcendence that emerge from within philosophy itself. As a result, the history of philosophy is not linear or cumulative, but a field in which the virtual must be continually reactivated – where the problematic dimension of thought is reopened each time a new concept emerges.

Philosophy, then, is defined not by its capacity to represent, but by its ability to *generate* events: to create concepts that resonate with reality, to open new dimensions of experience. This is what distinguishes philosophical concepts from scientific functions. While science slows down chaos to produce referential models composed of variables and funtives, philosophy does not refer; it composes. Its concepts are intensive, incorporeal, non-discursive – and above all, creative. They produce real effects not by representing reality, but by transforming the conditions under which reality becomes thinkable.

In this light, the final section of *What is Philosophy?* draws together many of the threads Deleuze had already developed in his earlier work. Lautman reappears explicitly, as Deleuze and Guattari distinguish the three disciplines – art, science, and philosophy – by the way each one relates to chaos. Art renders chaos perceptible through affects and percepts; science slows chaos down through reference and function («as Lautman demonstrates for mathematics insofar as the latter actualizes virtual concepts»[30]); philosophy, in turn, gives consistency to chaos by constructing concepts that virtually reconfigure zones of experience, including those of art and science themselves.

In this sense, Deleuze's transcendental empiricism can be understood as a radicalization of Lautman's notion of the problem. *Philosophy becomes the discipline that not only virtualizes the actual, but intervenes across the borders of other domains, extracting from them their own problematic tensions*. While mathematics, for Lautman, exhibits within itself the dialectic between Ideas and concrete theories, Deleuze assigns to philosophy the task of reactivating this dialectic within all regions of experience – not just in science, but in aesthetics, politics, ethics, and more.

The final implication is crucial: mathematics and science are not external to philosophy – they are part of the real. And because they belong to the real, philosophy can extract their virtual power, *without becoming scientific*. This treatment of science and mathematics as ontological regions, rather than mere formal languages, is the clearest sign of Deleuze's debt to the French epistemological tradition – especially Brunschvicg and Lautman, whose influence runs through

30 Ivi, p. 217.

Difference and Repetition and re-emerges in *What is Philosophy?*. In affirming the power of philosophy to think the virtual, to compose new events out of existing structures, Deleuze offers not a philosophy of science, but a philosophy through science, one that takes mathematical and scientific productions seriously as expressions of reality – while insisting that only philosophy can grasp their problematic horizon.

In short, the history of philosophy becomes the history of those moments when the virtual breaks through – when concepts, like mathematical problems in Lautman, reveal the internal tension of a reality that is never exhausted by its representations. This, finally, is the point of Deleuze's engagement with mathematics: not to subordinate philosophy to formal models, but to show that philosophy alone is capable of making the virtual consistency of reality a matter of thought.