Ontology Interrupted:
Prigogine, Stengers and the Abdication of Physics

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Abstract

The work of physicist Ilya Prigogine has exposed a radical asymmetry at the heart of physics: different mathematical conceptualisations of the same problem produce *equally valid but not equivalent* representations of matter and the universe. This article examines the philosophical implications of this asymmetry, proposing that the impact of Prigogine's methodological innovation cannot be constrained within the epistemological perimeter but explodes into an ontological problem that brings a challenge to the image of philosophy in its entirety. The argument departs from Isabelle Stengers' position, who – both as Prigogine's collaborator and independently – has interpreted this non-equivalence of the syntax of physics' formulations via the Deleuzean notion of counter-actualisation, and has entrusted philosophy with the task of speculating upon this epistemological divergence as an ontological problem. It will suggest instead that the local asymmetry shown by Prigogine's inside the practice of physics bars the convergence of physics and philosophy onto one onto-epistemological ultimate. It will show in detail how these impossibility and finitude cannot be considered as the object of ontological investigation, but have instead an impact on ontology's very logic. That is, they radically disrupt the hierarchy still implied in the distinction between language and matter, demanding that philosophy abandons any claim of acting as a meta-discourse for science and instead conceives of itself and of its task as a practice.

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Prigogine and Stengers

The study of dissipative structures developed by physicist Ilya Prigogine, exposes a radical *asymmetry* at the heart of physics. Seeking to reconcile the incompatibility of dynamics with the second law of thermodynamics, through a reconceptualisation of the problem via statistical mechanics, Prigogine demonstrated that the symmetry between the present and the boundary conditions, as inherited from the formulations of Newton and Hamilton, is the product of an arbitrary idealization.[2] The discovery that large dynamic systems are *non-integrable* (that is, irreducible to a finite set of independent and self-sufficient elements from which the evolution of the system could be predicted) makes them open to more than one possible solution for the same initial conditions and therefore temporally asymmetric.[3] This bars any form of reducibility of the present to an initial state, and raises questions for the epistemological abstraction towards the intelligible unity of the real, as well as the transition towards the image of an ontological ultimate.

Prigogine addressed this problem in collaboration with Isabelle Stengers.[4] The question they raise revolves around the epistemological presuppositions

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[2] For a detailed and technical exposition of dissipative structures and self-organisation Cf. Grégoire Nicolis and Ilya Prigogine, *Exploring Complexity; an Introduction*, (New York, NY: Freeman and Company, 1998).

[3] Prigogine developed the notion of non-integrability, which was first formulated by Henri Poincaré regarding the calculation of the famous 'three-body problem'. From this, Prigogine built his problem articulating the interpretation of entropy and temporality through a statistical formulation, instead of accepting the notion of a finite and weak observer that was adduced to explain them within the classical framework.

[4] Ilya Prigogine and Isabelle Stengers co-authored two major works on the reconceptualization of physics that leads to complexity theory: *Order out of Chaos, Man new Dialogue with Nature* (London: Harper-Collins, 1984) and *Entre le Temps et l'Éternité*, (Paris: Fayard, 1988), (Between Time and Eternity). It must be noted that *Order out of Chaos* (originally titled *La Nouvelle Alliance*, 1979) was considerably reworked by the authors in occasion of the English translation, to update the conclusions to the new findings at both theoretical and experimental level. The version referred to here is the English translation. *Entre le Temps et l'Éternité* instead has not been translated into English. The article refers to the Italian translation: Cf. Ilya Prigogine and Isabelle Stengers *Tra il Tempo e L'Eternità*, trans. Carlo Tatasciore (Torino: Bollati Boringhieri, 2014). A considerably reworked version of this text, reflecting the "important progress in the mathematical formulation of our approach" was published in English authored by Prigogine alone (Stengers appears only as a collaborator), Cf. Ilya Prigogine, *The End of Certainty, Time, Chaos and the New Laws of Nature* (New

implicit in the mathematical formulations at play in structuring the world as represented by equivalences, thus taking the question to the root of the image that physics has projected of matter, nature, and of itself.[5]

The problem this poses is twofold. On the one hand, non-integrability reveals an empirical impossibility internal to physics. Prigogine demonstrated that in systems far from equilibrium there exist conditions where chronological reducibility – albeit ideal – is not possible and the idealised trajectory of dynamics must be replaced for probability as the primary unit of physics (in fact this is the case for most systems). This amounts to the impossibility of *convergence* onto one totalising description, leading to an epistemological impasse that coincides with the demise of the a priori space of consistency shown by Gödel's incompleteness.[6] On the other, this marks a much broader and more disruptive asymmetry. Crucially, as Stengers emphasises, the fact that the demonstration of non-integrability is built by adopting an alternative mathematical model (statistical mechanics) exposes a *divergence* at

York, NY: The Free Press, 1996), VII. Since *Entre le Temps et l'Éternité* highlights epistemological issues that in the *End of Certainty* leave the precedence to more technical, but no less important information: both texts appear here as separate works. Comparing the French and the English versions of Stengers' *Cosmopolitics,* it becomes evident that this work has also undergone the same process of manipulation while translated from French to English, reflecting the evolution and refinement of Stengers' thought. The differences, however, are minor and do not justify referring to both versions. The article will therefore refer only to the English translation. Cf. Isabelle Stengers, *Cosmopolitics*, Vol.1 and 2, trans. Robert Bononno (Minneapolis, MN: University of Minnesota Press, 2010).

[5] This equivalence, they claim, is intrinsic to the mathematical syntax adopted in the conceptualisation of natural processes. In the formulation of mechanics that Hamilton developed from Newton, the boundary conditions and the present were conceptualised as the two terms of an equation balancing on the "=" equal sign. This implied that any moment or point in the evolution of the system had to be equivalent and therefore reducible to the initial boundary conditions, thus making the process reversible and producing a clash with the necessity of entropy stated by the second law of thermodynamics. Temporality, organization, as well as life and knowledge, would be nothing but the by-products of finite approximations - illusions. A perfect measurement instead, albeit only ideal, would in principle allow both logical and temporal reversibility. Cf. Stengers, "In The Name of The Arrow of Time: Prigogine's Challenge," *Cosmopolitics*, Vol.2, 105-204.

Moreover, for Prigogine this problem is not limited to dynamics but persists also in quantum mechanics: "From the point of view defended by Ilya Prigogine, dynamics and quantum mechanics are both equally unsatisfactory, for one reduces the difference between past and future to the imperfection of our understanding, and the other to the act of measurement, or the act of awareness." The reconceptualisation proposed by Prigogine involves both branches of physics and shows that temporal irreversibility is intrinsic to matter at both levels. Cf. Stengers, *Cosmopolitics*, Vol.2, 101.

[6] Cf. Kurt Gödel, *On Formally Undecidable Propositions of Principia Mathematica and Related Systems*, trans. B. Meltzer (Mineola, NY: Dover Publications, 1992); and Ernest Nagel and James R. Newman, *Gödel's Proof* (New York, NY: New York University Press, 1986).

ontological level: different mathematical formulations of the same problem produce *equally valid but not equivalent* representations of reality.[7] This divergence turns the binary paradigm that shapes the question of knowledge along the dimensions of an object 'in itself' versus to an object 'for us' inside out, bringing to the fore an ontological asymmetry that pivots on the relevance of the methodology adopted for the conceptualisation of the problem and the syntax through which it is formulated.

For Stengers, this non-equivalence challenges certainty and the absolute legitimacy of scientific claims, in favour of more delicate claims of *validity*.[8] Indeed, in Prigogine's work physics is found grappling with diverging images of matter, where different conceptualizations can coexist.[9] While this does not entail a dualistic opposition but recasts the problem in terms of compatibility between heterogeneous models, nevertheless the authority that universality lends to the claims of physics becomes precarious. As Stengers points out, Prigogine's work has left science in a *fragile* state where with universality also the paradigm of certainty, the principle of identity and determinism have lost the authority necessary to support truth claims.[10] The non-equivalence deriving from Prigogine's reconceptualisation therefore becomes an ontological problem that forces physics to *abdicate* and to *withdraw* the universal claims it attaches to its objects. Indeed, this fragility goes as far as to affect the continuity postulated by ontology between the present and the ultimate. In other words, as certainty is the epistemological expression of the absolute, fragility is the epistemological expression of incompleteness, the irreducibility to the *same* of incommensurable descriptions produced by the very syntax of representation.

Stengers addresses this ontological asymmetry following Deleuze and Guattari. Developing a new concept for the problem of non-equivalence emerging

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[7] Cf. Prigogine and Stengers, "The Identification of the Real," in *Order out of Chaos*, 57-78 and Stengers, "The Science Wars," in *Cosmopolitics*, Vol.1, 1-83.

[8] A position closer to contemporary physics than absolute certainty and able to include quantum mechanics would be d'Espagnat's notion of "weak objectivity," which nevertheless remains within the perimeter of the possibility of thinking an ultimate object of knowledge that is challenged here. Cf. Bernard d'Espagnat, *On Physics and Philosophy,* (Princeton: Princeton University Press, 2006), 320-323; and Stengers, Cosmopolitics, Vol.2, 142-159 and 427n6.

[9] Cf. Grégoire Nicolis and Ilya Prigogine, "Prologue: Science in an Age of Transition," in *Exploring Complexity*, 1-3.

[10] Cf. Stengers, *Cosmopolitics*, Vol.1, 1-13.

from the *practice* of physics – she suggests – is the *speculative* task of philosophy.[11] This article wants to pause Stengers' interpretation and focus instead on the tension between the local impossibility exposed by non-integrability and the general openness of non-equivalence. It will look at the consequences that the demise of an absolute language (mathematic or otherwise) has for the relationship between physics and ontology and the position they claim. This seems all the more relevant as the speculative path chosen by Stengers appears at risk of contradicting her very admonition against seeking a universal meta-language able to represent the heterogeneity of contingent and historical events. To understand how this problem unfolds in Prigogine and Stengers' work, it is necessary to unravel some folds of their argument in detail.

Not a new universality

The demonstration of non-integrability operated by Prigogine does not introduce a new truth. Irreversibility does not constitute a new universal, and irreducibility must not be grasped as a fundamental truth regarding the real.[12] The heterogeneity of chaotic behaviours studied by Prigogine cannot be unified into a continuous and homogeneous ontological description.[13] The universe is instead open and plural (some regions of the universe are reversible and symmetric, while most are not).[14] The openness that Prigogine revealed results from a demonstration of impossibility where the image of physics is undone without being rebuilt in any new solid way. This crucial point pivots on the fact that the demonstration is developed inside physics, rather than from a third Archimedean point external and neutral. This has an immediate effect also for ontology: Prigogine and Stengers emphasize how "there is no longer any universally valid law from which the overall behaviour of the

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[11] For the task of philosophy referred to here Stengers follows closely the discussion of science and philosophy proposed in *What Is Philosophy*. Cf. Isabelle Stengers, "Deleuze and Guattari's Last Enigmatic Message," *Angelaki* 10 no. 2 (2005): 151-167.

[12] Cf. Prigogine and Stengers *Order out of Chaos*, 285; and Prigogine and Stengers, *Tra il Tempo e L'Eternità*, 139.

[13] Prigogine was very clear about this: "the fact that there are bifurcations everywhere does not constitute a continuity." Cf. 22nd *Solvay Conference* held in Delphi, Greece, November 24-29, 2001. Last modified April 29, 2011, accessed on June 6, 2016, https://www.youtube.com/watch?v=MnD0IlBvgO4.

[14] Cf. Prigogine and Stengers, *Order out of Chaos*, 257.

system can be deduced. Each system is a separated case."[15] This loss constitutes a severance with the modern paradigm of thought. Eliminating the three key concepts of *universality*, *law* and *deduction,* which upheld a linear image of ontology, drags identity as well as the authority of concept (as the definition and a priori perimeter of the present) into the collapse and leaves an open gap in the boundary of the system. In fact, the processes of emergence described by Prigogine cannot be idealised outside their local heterogeneity or be thought without the openness of their temporal horizon. Not only the law emerges as local and heterogeneous, but its emergence also requires site-specific forms of negotiation to assert itself where conditions allow it. Yet, these conditions are unable to necessitate the event of emergence. Thus the last victim of Prigogine's reconceptualisation is the notion of *necessity* associated with the notion of law.[16] Fragility undermines the image of physics as the model with which all other forms of knowledge should comply. The scientific fact displays a peculiar form of coherence, a truth that does not "transcend history," but one that can only be constructed "within history." Physicists, Stengers writes, "have lost any theoretical argument for claiming any privilege, whether of *extraterritoriality* or precedence;" that is, any privileged access to truth.[17]

Non-equivalence as Counter-actualisation

Then, one should ask what did Prigogine and Stengers demonstrate if their results do not constitute a new universal truth. Fragility must not be grasped as a failing of physics overcome by relativism. Stengers interprets the problem of non-equivalence through a Deleuzean prism. The loss of absolute legitimacy marks a movement of *counter-actualisation*: the divergence from the state of affairs accepted as real in conjunction with the emergence of the possibility of other models for thought and other methods that allow matter to speak. This casts the epistemological problem of representation in the light of the actual-virtual regime proposed by Deleuze (the

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[15] Cf. Prigogine and Stengers, *Order out of Chaos,* 144-145.

[16] On this loss of *necessity* of the law Cf. John Holland, "Closing," in *Emergence, from Chaos to Order* (New York: Basic Books, 1998), 221-248; and Stengers, "The Law of Chaos?" in *Cosmopolitics*, Vol.2, 176-191.

[17] Cf. Stengers, *Cosmopolitics*, Vol.1, 3.

syntax of the conceptualisation acts as a differentiator for the ontological horizon of the possible).[18]

What is more, for Stengers, the rationality that sciences deploy as their absolute authority is established "polemically," projecting as the other of science, not only myth and the dogma of religion, but also, most importantly, other possible methods of measurement able to claim that their facts are also valid. In this sense for Stengers there is no distinction between physics and other sciences, as they all present themselves as the true language that can speak on behalf of nature and condemn the rest as opinion. In this light, for Stengers, the experiment that confers authority to physics through the invention of the mathematical representation of matter and its behaviours is an *event* where the possibility of measurement "brings a new Being into existence."[19] Not only is it the case that truth claims are dependent on the syntax that pronounces them, but the practice of physics expresses an intrinsic creativity where the epistemological problem of method becomes an ontological question of existence.[20] Stengers describes this event as a *factish*; not a fact nor illegitimate like a fetish, but the "truth of the relative" (which is not the same as the relativity of truth) championed by the new figure of the "non relativist

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[18] Stengers refers directly to Deleuze and to Deleuze and Guattari, in particular to the figure, or psycho-social type, of the "idiot" (Dostoyevsky's *Idiot*) and the move to counter-effectuate the order of things that this type engenders; Cf. Stengers, "Deleuze and Guattari's Last Enigmatic Message," *Angelaki*, 151-167. Cf. also Deleuze's analysis of Melville's character *Bartelby*, Cf. Gilles Deleuze, "Bartelby, Or The Formula," in *Essays Critical and Clinical*, trans. Daniel W. Smith and Michael A. Greco (London: Verso, 1998), 68-90. For the concept of actualisation and counter-actualisation at the centre of Deleuze's thought, Cf. Gilles Deleuze, "Twenty-First Series of the Event," in *The Logic of Sense*, ed. Constantin V. Boundas, trans. Mark Lester and Charles Stivale (London: Continuum, 2004), 169-175; and Gilles Deleuze and Felix Guattari, *What Is Philosophy*, trans. Graham Burchell and Hugh Tomlison (London: Verso, 2011). It must be noted that Stengers had developed a dialogue with Deleuze and Deleuze and Guattari's thought throughout her career. The Deleuzean notion of event provided the conceptual key for the organization of *Tra il Tempo e l'Eternità*, *The Invention of Modern Science* and *Power and Inventions*. In turn, Deleuze and Guattari in *What is Philosophy* make direct reference to the notion of chaos as presented in Prigogine and Stengers' *Tra il Tempo e l'Eternità*. Lastly, the interpretation of chaos as ontological horizon put forth in *What is Philosophy* is again adopted by Stengers in *Cosmopolitics*.

[19] Cf. Stengers, *Cosmopolitics*, Vol.1, 32; and Isabelle Stengers, "Construction," Science Under the Sign of the Event," in *The Invention of Modern Science*, trans. Daniel W. Smith (Minneapolis: University of Minnesota Press, 2000), 555-108.

[20] Cf. Stengers, "Scientific Passions" and "Culturing the Pharmakon," in *Cosmopolitics*, Vol.1, 1-13 and 28-41. It must be noted that as this issue is one of method rather than degrees of precision, it is no longer simply a Newtonian problems of approximations, but it both includes quantum mechanics and extends from physics to the entirety of science.

sophist."[21] This expresses a *constructive* logic that for Stengers replaces both determinism and relativism.[22] Accepting that the factish is true only within the domain of validity of the method of measurement that has brought it into existence (instead of expecting a universal language that can represent absolute reality) is the counter-actualisation of the image of science that Stengers sees in Prigogine's reconceptualisation.

Indeed, introducing Stengers' work Bruno Latour emphasises that her focus is ontology, rather than an argument developed within the limits of philosophy of science.[23] It is, however, a peculiar path into ontology because it stems from the obstacles encountered by physics in picturing the world according to one paradigm whose image is the homogeneity of universal convergence. The asymmetry discovered by Prigogine is the expression of a finitude intrinsic to the unit of measurement and marks an impossibility internal to physics and its mathematical models that impacts on representation in general. This is why Latour emphasises that for Stengers the non-homogeneity of the image of nature encountered by physics is a direct ontological problem. As he explains, the problem is not the epistemological opposition between a good and a bad practice of science, that of a language or a method that has misinterpreted the real, rather it stems from the intrinsic limits of the measurement that produces the scientific fact. Limits that do not simply frame the object of knowledge as the conditions of experience for the Kantian phenomenon (space and time), but structure both the object and the questions it can pose. Indeed, casting the problem of the legitimacy of truth statements including the socio-political reception of such claims (as Stengers does following Latour) the problem of knowledge is no longer unfolding between an object 'in itself' and an object 'for us,' rather it becomes the question of an argument, or event, "able to dictate its own reasons;" one which moves from the syntax of the practice (or "middle", as Stengers writes, echoing Deleuze and

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[21] The source of the notion of *factish* is Bruno Latour. Stengers develops it emphasising a materiality in the syntax and the practice of science, whose relevance for the production of knowledge becomes pivotal. Cf. Bruno Latour, "On the Cult of the Factish Gods," in *On The Modern Cult of The Factish Gods*, trans. Catherine Porter and Heather MacLean (Durham, NC: Duke University Press, 2010), 1-66.

[22] How this construction is not a solipsistic projection but a coherent logic is the focus of the entire first book of *Cosmopolitics*; Cf. Stengers, "The Science Wars," in *Cosmopolitics*, Vol.1. 1-83.

[23] Cf. Bruno Latour, "Foreword," in Isabelle Stengers, *Power and Inventions; Situating Science*, trans. Paul Bains (Minneapolis, MN: University of Minnesota Press, 1997), vii-xix.

Guattari), rather than the extremes (observer or the object).[24] It is legitimized not by the vertical roots of proper names between language and objects, but thanks to the horizontal links established in the circulation among other scientists. Nevertheless, this does not entail the collapse of epistemology entrusting the validity of scientific claims to mere sociological relations. Instead, the question shifts from one of representation and truth, to one regarding the relevance of truth claims and their methods.

This alternative brought a challenge to the notion of the universality of mathematical representation, nevertheless, Prigogine's theory -in spite of being rewarded with the Nobel Prize in 1977- has not been embraced by physicists. Physics has continued to operate inside the existing paradigm of ideal intelligibility undisturbed, disqualifying Prigogine's demonstration as an invalid method.[25] The counter-actualisation of the unique and universal method of measurement then for Stengers becomes an act of *resistance* against the rule of one interpretation (or indeed actualisation) that imposes itself not as the most successful but as the only rational one.[26] With the non-equivalence of practices the problem has shifted from questioning the truth of a claim to the authority that can support the claim. In this light, non-equivalence for Stengers will require an "ecology of practices," a "parliament" populated by "diplomats" that do not attempt to foreclose problems by imposing a universal convergence onto a uniform truth, disqualifying other possibilities as irrational and therefore non-scientific, but keeping the possibility of counter-actualisation open.[27] However, and this is the delicate but crucial point this article wants to highlight, Stengers entrusts this counter-actualising move of resistance to philosophy only, as the discipline which alone can create concepts, thus giving philosophy the task to articulate this epistemological divergence through

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[24] Cf. Stengers, in "Science Under the Sign of the Event," in *The Invention of Modern Science*, 71-88; and Stengers, "Deleuze and Guattari's Last Enigmatic Message," *Angelaki*, 151-167.

[25] Stengers comments that the scientific community has remained indifferent to Prigogine's proposal. The incorporation of probability in the fundamental description of dynamics, Stengers says, can be welcomed only among "friends" who would already be disposed to listen. Cf. Stengers, "The Arrow of Time," *Cosmopolitics*, Vol.2, 116-122.

[26] Cf. Stengers, *Cosmopolitics*, Vol.1, 1-13; and Isabelle Stengers "Wondering About Materialism," in Levi Bryant, Graham Harman, and Nick Srnicek eds. *The Speculative Turn, Continental Materialism and Realism*, (Melbourne: re.press, 2011), 368-380.

[27] Cf. Stengers, "The Curse of Tolerance," in *Cosmopolitics*, Vol.2, 303-416.

an ontological speculation.[28] This makes her argument vulnerable to be recaptured by metaphysics. If the practice of physics is opaque and the conceptualisations it constructs creative rather than purely representational, thought on the other hand is still endowed with the ability to transcend the heterogeneity of the practice of science and act as a meta-language, the discourse that can see and name the real in all its kaleidoscopic manifestations. This risks hollowing the practice of science and the very move that Stengers proposes, obscuring the relevance of its syntax and expropriating it of the products of its creativity. Instead, as will be seen next, the tension between incompleteness and non-equivalence complicates counter-actualisation, pushing it towards a stalling point.

Finitude

The initial claim of Prigogine and Stengers had played within the traditional paradigm of positive science, announcing the discovery of a new theory that, if it did not want to claim the status of a new universal law, was nevertheless a new conceptualization that aspired to replace the image that physics, modelled on the integrability of dynamics, presented of itself and of matter. Indeed, the possibility shown by Prigogine of another platform for conceptualising physics introduces an irremediable fissure in the accepted homogeneity of the claims of science, a non-equivalence where the "laws of physics" are not the same as the "laws of nature."[29] The law, the phenomena it rules, and the image it dictates are in fact built on what Stengers describes as a physico-mathematical fiction.[30] However, the demonstration of non-integrability via statistical mechanics constitutes a peculiar kind of proof. In fact, it is just the proof of the existence of an alternative possibility, a *there exists at least one instance* ('∃' in formal language) where dynamics is not integrable, and therefore not reversible and not representational. It is this proof of existence, or proof of possibility where the symmetry of dynamics' reversible processes is shown as a special case in an asymmetrical and irreversible universe. However, the

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[28] Cf. Stengers, "Deleuze and Guattari Last Enigmatic Message," 151-167.

[29] Cf. Stengers, *Cosmopolitics,* Vol.2, 201.

[30] Cf. Stengers, "The Laws of Chaos?" in *Cosmopolitics, Vol.2*, 160-175.

demonstration that there exists at least one instance where the universal statement is not the case is not an encounter with an external barrier, a perimeter that defines what is possible and what is not possible, but a positive affirmation generated inside the system. That is, while the new claim is not pronounced absolutely, it marks the emergence of a new set of constraints that define the dimensions along which the system can evolve.

In other words, the impossibility to integrate that leads to irreducibility is not obtained through a demonstration of *reductio ad absurdum*, which would still imply the knowledge of an a priori totality where all options but one are barred. It is a demonstration that undoes the authority of certainty, rather than proving a new certainty. Both Gödel's incompleteness and Prigogine's non-integrability express a finitude that could be overcome with a greater expenditure of information/energy.[31] But if consistency in Gödel's case can be proved only on the ground of a more powerful system (that is externally), therefore entering a regression to infinity (another more powerful system would be necessary to ground the first one, and so on), with non-equivalence, as Stengers highlights, such finitude is revealed as intrinsically creative; it marks the pattern upon which the coherence of the system is possible. The openness of non-equivalence allows the emergence of alternative and yet compatible possibilities where statistical mechanics does not provide a firmer ground, sublating the current system and linearly expanding the existing space of consistency. Rather, it generates an 'elsewhere' outside the linearity still implicit in Gödel's problem, departing from the issue of identity altogether.

It is particularly important to grasp the import of the source of the impossibility demonstrated by Prigogine. It is by proving non-integrability from *inside* dynamics, rather than bringing a new counter-factual proof from a position external to the discourse it is acting upon, that Prigogine induces the counter-actualisation of the very discourse of dynamics. Indeed, what is relevant in Prigogine's work is a demonstration in a way more modest than the heroic claims about the universe being *thus*. Prigogine simply shows that *something else is also possible*; that is, the current order is not absolute. This claim is gentle and yet it constitutes a counter-actualisation of the possibility of claiming absolute truth. At the same time this is a somewhat secularised form of counter-actualisation. One less interested in

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[31] Cf. Gödel, *On formally Undecidable Propositions*; and Prigogine and Stengers, "Irreversibility – The Entropy Barrier," in *Order Out of Chaos*, 257-290.

engaging with the metaphysical problem of reaching the ontological horizon or virtual limit (as Stengers' adoption of Deleuzean counter-actualisation implies) and concerned instead with the materiality and potential relevance of local choices of syntax.

A strictly scientific problem of compatibility between two theories (dynamics and thermodynamics) has exploded, shattering the boundaries of science and the frame of epistemology, to impose itself as an unavoidable ontological question. Absolute or universal claims are impossible, only finite configurations are admissible. The continuity required by ontology between the present and the ultimate is interrupted. The present is finite. Ontology is finite. Possibilities may be infinite, but cannot be unified in a continuity that would create a new ground or horizon; all configurations are local and heterogeneous, and no ultimate is possible.

Finitude is stated twice. Prigogine's reconceptualisation implies a move that is both passive and active. The impossibility of a local affirmation (incompleteness) implies the possibility of a multiplicity of positive alternatives in other incommensurable but compatible directions (ontological asymmetry), which requires a radically different approach to the problem of truth claims. One argument concerns the *object of physics*, the non-integrability of dynamic systems, and it is internal to the practice. The second, instead, concerns physics as a discourse and as an *ontological model*, and has an effect on the image that physics presents to the rest of the world, to the other discourses and practices, of linear rationality as the coherence that keeps the world together (or logic of sense). It is on the basis of this second argument that Stengers can build her interpretation of the fact of science as a constructivist event (or factish) that sees the object of science and the theory that describes it emerging simultaneously in a regime of "reciprocal capture."[32] However, this second onto-epistemological argument would not have been possible without the withdrawal imposed onto physics' universal claims by the possibility opened by the different mathematical representation developed by Prigogine.

Finitude, therefore, has a double fold: the possibility of a local plurality exposes the impossibility of a total unity; or, affirming the non-universality of the proof within physics exposes the counter-actualisation of epistemology and ontology. On the one hand, it prevents the image of an absolute object of

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[32] Cf. Stengers, "Constraints" in *Cosmopolitics,* Vol.1, 42-55; and also *Cosmopolitics,* Vol.2, 196.

knowledge or thought from reaching a conclusion or being totalised; on the other, it does not allow language to claim the authority necessary for any form of absolute representation of such an object. The reductionist paradigm is thus under a double line of attack that prevents any form of ontological continuity towards the ultimate (whether as a reduction, abstraction, or state transition identifying the limit as a virtual horizon). Here lies the crux of the argument. This double fold complicates the counter-actualisation proposed by Stengers to the point of stalling, and effectively interrupting, its transition towards the plane of immanence of ontological difference. The fact that another conceptualisation is possible cannot and must not be ontologised as a new matrix for the emergence of sense. Any such attempts would amount to nothing but a new form of ultimate reduction posing divergence as the new ontological model.

Abdication and Withdrawal

It is necessary to pause here and listen to what fragility and finitude imply for the image of physics and its relation to ontology. As Prigogine and Stengers have explained, the heterogeneity and locality of chaotic behaviours demand that physics abstain from any claims of universal extraterritoriality.[33] The relevance of this point cannot be overemphasised. Prigogine's new proposal is a demonstration that does not *impose itself* but instead *exposes* a radical openness of physics and thought when concerning ontological claims. Yet, this is not to be interpreted as vulnerability; and certainly not as a subjective weakness of epistemological nature (a finite observer and the weak hermeneutics of approximation). Rather, it must be grasped as *metastability*, or metastable equilibrium of dissipative structures, whereby the transcendental is reinterpreted as a system that is open and whose boundaries are out of focus and flexible.[34] In other words, fragility means that physics is forced to withdraw the claims that capture all territories of knowledge and practices as

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[33] "We believe that the epoch of certainties and absolute oppositions is over. Physicists have no privilege whatsoever to any kinds of extraterritoriality." Cf. Prigogine and Stengers, *Order out of Chaos*, 299.

[34] Metastable equilibrium is the logic of coherence of the *dissipative structures* that Prigogine had studied in thermodynamics. These are assemblages without a priori identity that last as long as an external flow of energy permits their internal processes to repeat. Cf. Grégoire Nicolis and Ilya Prigogine, *Exploring Complexity* Prigogine and Stengers, "The Science of Complexity," in *Order Out of Chaos*, 103-209.

deducible from dynamics. It is the notion of physics as the model science that loses its authority.[35] This amounts to an *abdication*. Yet, not in the sense of an impossibility of knowledge, rather this abdication concerns the *domain of validity* of physics and of each specific theory. It concerns the claim of totality that would supply a scientific support for idealisation both in and of ontology. Glancing at the long-range consequences of this reconceptualisation, it is possible to say that identity itself is metastable.

One of the arguments that runs through Stengers' *Cosmopolitics* is that physics is projected as the foundation for all sciences, thereby implying a linear reducibility of the macroscopic to the microscopic and implicitly demanding that the practice of other sciences not only do not contradict, but also be deducible from, physics. This axiomatic image of the laws of mechanics was also at the root of the problem of idealisation that Prigogine individuated between dynamics and thermodynamics, demanding that the latter comply with the former. At the same time, this reflects the notion of consistency that had provided a paradigm and a requirement for logic until Gödel disproved its universality. There is a parallel between this reduction of science to physics and proposing that ontology sits at the core of philosophy as the logic of *being qua being* (as abstracted and pure existence). Physics and ontology operate inside the same conceptual space. They are parallel in as much as they express the same logic of convergence, but this logic necessarily demands that they also converge onto the same ultimate, a vertex –moreover- towards which they would have a privileged access with respect to other scientific and philosophical questions. In turn this special position confers to their relationship an equally privileged status as the disciplines that can pose the ultimate question. Complexity brings a radical challenge to this convergence that ontology auspicates for itself and expects of physics, going as far as demanding a renegotiation of those critiques that already hoped to overcome a priori identity, as those moved by Heidegger and Deleuze, with particular emphasis on the re-interpretation the latter makes of sufficient reason.[36] This challenge, however, is not

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[35] Cf. Prigogine and Stengers, *Tra il Tempo e l'Eternità*, 62-64. This non-deducibility of macroscopic sciences from Physics becomes particularly relevant for the notion of emergence in biology and is emphasised –for instance- by Stuart Kauffman's work on the notion of emergence in evolutionary biology. Cf. Stuart A. Kauffman, "The Nonreducibility of Biology to Physics," in *Reinventing the Sacred: A New View of Science, Reason, and Religion* (New York: Basic Books, 2010), 31-43.

an active attack to ontology's presuppositions; it does not aim at replacing the existing paradigm. Rather its passivity constitutes a *withdrawal*: physics pulls back, denies its participation; it no longer participates in ontology's essentialist logic of transition towards the ultimate. This is particularly relevant when reduction takes place in the subtlest manner, as when the undecidability encountered by quantum mechanics becomes the inspiration or the reference for the loss of foundations or ontological difference.

With non-integrability ontology becomes twice orphaned: first as the vertex on which they should both converge is deserted by physics, then of the legitimacy and authority that this overall convergence onto the ultimate would have provided. That is, first with regard to a smooth reduction of all events to fundamental elements (material or logical axioms); then, by being deprived of physics as its twin in the discourse of reduction. There, where ontology expects a confirmation or a partner for the transition to the ultimate, physics is no longer available for support; it does not converge with ontology onto a common sense. By challenging convergence as the site of their relationship, the fragility of science becomes also the fragility of ontology. With Prigogine's alternative possibility, physics de-territorialises the geography that the ontological paradigm of consistency and commensurability had laid out for it. This withdrawal of physics leaves ontology exposed to the irreducibility of the present. Ontology cannot expect a transition to the ultimate if physics multiplies its images of matter on the basis of the syntax of its conceptualisations. Finitude cannot be empirical without being at the same time onto-epistemological. That is, there cannot be a finite object if the discourse, concept, or language that describes it is still absolute. In fact, the very existence of a finite object undoes the universality of language (mathematic or otherwise). Given Stengers' argument on the polemical aspect of scientific truth, assuming that there is one language that can express its object absolutely implies the disqualification of all other languages as unable to convey information correctly. Likewise, if there exists an absolute object that is supposed to be expressible, then there must be an absolute language that expresses it immediately and in a pure manner without gain

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[36] Cf. Heidegger, *Identity and Difference,* trans. Joan Stambaugh (Chicago, IL: University of Chicago Press, 2002); and Martin Heidegger, "The Question Concerning Technology," and "The Age of the World Picture," in *The Question Concerning Technology and Other Essays*, ed. and trans. William Lovitt (New York, NY: Harper, 1977), 3-35, 115-154. Cf. also Deleuze, "Difference in Itself" and "The Image of Thought" in *Difference and Repetition,* 36-89 and 164-213.

or loss of information. For languages less pure than absolute representation, different formulations would be expected to converge by representing compatible portions of the same truth, totalisable into one continuity. However, with the non-equivalence presented by Prigogine and Stengers, the absolute representational value of such language vanishes and with it the possibility of a homogeneous object (or concept) also crumbles as yet another arbitrary idealisation. What is disproved is not the absolute as such but, much more relevantly, the possibility of an absolute language.

What is relevant in Prigogine's work is *not what science does*, but *what it can no longer do*. Physics has abdicated. It has withdrawn the claims of extra-territoriality that demanded that its fundamental laws be satisfied at all levels of magnification and complexity as well as by all other laws.[37] Physics can no longer act as the axiom of which other sciences would be theorems. In other words, what Prigogine manages to do neither imposes a new claim as universal, nor induces a plain abdication that would allow relativism to take over (the weakness of subjective opinion). Rather, as Stengers shows, it is the demonstration that a logic exists, for without a logic there would be no coherence, and yet it is no longer possible to claim the universality or the homogeneity of such logic.[38] The laws of chaos, Prigogine repeats, emerge heterogeneously and locally.[39] The science of complexity comes upon a radical dichotomy where it is possible to describe the *necessary* conditions that permit chaotic behaviours to emerge, while it is impossible to predict when these will be *sufficient* to engender emergence.[40] Prigogine stated this

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[37] Cf. Prigogine and Stengers, *Order out of Chaos*, 299.

[38] This is the fundamental tenet of Stengers' re-elaboration of the notion of coherence following Prigogine's work. Cf. Stengers, "In the Name of the Arrow of Time: Prigogine's Challenge," *Cosmopolitics*, Vol.2, 105-204. Also for Stengers' claim Cf. "Scientific Passions," *Cosmopolitics*, Vol.1, 1-13.

[39] Prigogine insists that chance cannot be interpreted as a replacement of causality, a faceless cause, or a Deleuzean quasi-cause, because it is impossible to predict when it will present itself and cause further bifurcations and divergences. Cf. Alvin Toffler, "Foreword: Science and Change," in Prigogine and Stengers, *Order out of Chaos,* xi-xxvi. A similar interpretation is instead found in Monod's notion of chance. Cf. Jacques Monod, *Chance and Necessity*; *An Essay on the Natural Philosophy of Modern Biology*, trans. Austryn Wainhouse (London: Collins, 1972). Monod, however, makes chance into something separate and potentially opposite to order, which is not the case with complexity.

[40] Cf. J Holland, "Closing", in *Emergence*, 221-248.

very clearly: non-integrability and emergence constitutes "a return to realism [away from idealisation] but emphatically not a return to determinism."[41]

What has been destroyed by the heterogeneity of the laws of chaos is precisely the notion of the ultimate as the root of ontology and, correlatively, the notion of the surface as something that lacks the legitimacy for supporting itself, its reasons, and its relevance; that is, the contingency of the present. No other problem had yet hit representation so close to its core. The transcendental, the Heideggerian groundless, Gödel's undecidability all stopped short of removing the ultimate. At best, they took place inside the space opened by the event of the ultimate, even if this is no longer complete or total; that is, in the wake of its disappearance.[42] However, to remain within the spatial metaphors favoured by ontology, if the transition to the ground or groundless would be linear, the actualised present keeps an infinitesimally tangent point of contact with its virtual horizon. Both retain access to the ultimate and the ability to cover the ontological distance that separates it from the present, or -in the case of the virtual- the proximity of intensity and extension. With complexity instead, the ultimate faces a radical challenge and is replaced by the metastable coherence of the present, abandoning all expectations of a legitimising transition for the temporal and ephemeral emergence of coherence of open systems. Even before being negated, the ultimate becomes irrelevant for the present.

It is in the refusal of a new universal truth that the counter-actualisation reveals the extent and the shift introduced by Prigogine's demonstration of impossibility. Only on the basis of the incompleteness that this exposes, is it possible to have real creative practices: *making* sense, rather than *representing* a priori identity. Deleuze had exposed recognition as the even economy of a priori causality within a concluded perimeter defined by identity. Incompleteness instead permits both change and creativity. Yet, this is not enough. Openness is related to possibility in different terms to the ontological possible that Stengers interprets

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[41] Cf. Prigogine, *The End of Certainty*, 131.

[42] Deleuze is the thinker that has gone the furthest to break out of the linearity of this transition. His view that ground and groundless, or transcendent and transcendental, represent a false alternative because they both reflect the same image of thought is a very important step forward. Cf. Deleuze, "Series 15 of Singularities," in *The Logic of Sense*, 116-123. Stengers makes great use of the image of the "nomadic singularity" that Deleuze introduces here to explain the non-necessary emergence of the law of chaos. See for instance the metaphor of the emergence of the wave in the ocean. Cf. Stengers, "The Laws of Chaos," in *Cosmopolitics*, Vol.2, 176-191.

through Deleuze's virtual. Indeed, openness is finitude without ontological boundary; that is, without image. It has conditions (as Stengers puts it) that replace the concepts of identity, but these conditions do not have any kind of existence when they are not actual, rather they become relevant retroactively;[43] thus partially moving away from Deleuze, who poses the distinction between the present and the possible as the virtual, which is real but not actual. In other words, openness does not have an ontological status; it names the absence of identity boundaries without for this being identified as a threshold. Rather, and more simply, more and less become possible in the process; that is positively, rather than fulfilling a lack, following a trajectory, or denoting a co-existent field of potentiality tangent to the present. In fact, what denotes openness is a passage from actual to actual. Conditions emerge *as* conditions when specific patterns of the present are implemented in further iterations acquiring necessity a posteriori.

In this light, the work of Prigogine and Stengers is particularly refreshing. The withdrawal of physics does not leave the same structure in place, a vacant throne waiting to be occupied by a regent in the absence of the monarch. A regency ontology would only bring upon complexity the restoration proposed by the Speculative Realists (in fact, one should wonder why this reaction did not take place sooner).[44] Rather, the withdrawal of dynamics leaves behind a terrain that is not smooth, or in need of a new ruler, but a territory free from the capture of a universal paradigm,[45] which in this case is not simply a de-territorialized territory as Deleuze and Guattari would understand it, but is marked, striated, patterned with

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[43] Cf. Prigogine and Stengers, *Tra il Tempo e l'Eternità*, 62-64.

[44] In fact, the notion of active matter that Prigogine and Stengers propose instead of the inert matter of classic mechanics has already been reinterpreted as autonomous and not in need of human participation. See for instance the neutrino as the *ancestral object* in Meillassoux and Harmann, or the notion of *vibrant matter* proposed by Jane Bennett. While the former take an absolutist stance on the existence the thing in itself, Bennett proposes an ecology that nevertheless does not overcome a binary interpretation of ontology. Cf. Jane Bennett, *Vibrant Matter: a Political Ecology of Things*, (Durham: Duke University Press, 2010); Quentin Meillassoux, *After Finitude, an Essay on the Necessity of Contingency*, trans. Ray Brassier (London: Continuum, 2009); and Graham Harman, *The Quadruple Object* (Winchester: Zero Books, 2011).

[45] Isabelle Stengers writes of a colonization of practices by the practice of idealisation and universalisation, that is ontology, as that which organises and sets a hierarchy both arbitrarily and in its own favour; the same illegitimacy of the idealisation in linear dynamics. Cf. Stengers "Wondering About Materialism," in *The Speculative Turn,* 368-380. For the notion of smooth terrain and space Cf. Gilles Deleuze and Felix Guattari, "1440, The Smooth and the Striated," in *A Thousand Plateaus: Capitalism and Schizophrenia,* trans. Brian Massumi, (Minneapolis: University of Minneapolis Press, 2005), 474-500.

the history of development of ideas and technologies, of shifts and changes or genealogies.[46] That is, the withdrawal from the claims of homogeneity and universality, and the censorship these imposed via approximation, leaves behind a *roughness* whose pattern constitutes the dimensions of possibility of the present; its creative potential. No metaphysical possible is needed for it to operate meaningfully and produce coherence and sense. No quasi-metaphysical virtual can provide a space and a guide for it; its present organisation-distribution is sufficient. This sheds the last residues of dualism still echoing in the relation between the actual object and its virtual image. In the explanation of processes growing upon chaotic bifurcations Prigogine makes ample use of the fractal fugues described by Mandelbrot, where results become parameters for the next iteration of the system. That is, the recursive interpolations of feedback loops that take place in complex processes adopt history as their material. The matter of the present is built of genealogies rather than upon fundamental elements.[47] Here entropy produces a form of *augmentation of causality* where information increases at each iteration, thus making the present much larger than any initial boundary conditions.[48] The notion of active matter that Prigogine and Stengers propose is a feedback loop that also involves what for classic physics was the observer. Their view is not that of a matter free from its inert image, but a constructive logic that cannot conceive of matter and observers as existing separately. Not reciprocally transcendental but emerging in simultaneity, structured by the intrinsic limitations of the unit and method of measurement. On this rough terrain left behind by the withdrawal of claims of universality (of physics or ontology), patterns and genealogies no longer organised by the *Same* constitute an *all that there is* without any possibility of thinking of either its opposite (all that is not) or its ultimate. This points to a logic where coherence is both historical and metastable.

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[46] The notion of *genealogy* adopted here differs from the linear trajectory of deduction from identity that Deleuze and Guattari distance themselves from and follows Foucault's interpretation. Cf. Michel Foucault, "Introduction" and "The Discursive Regularities," in *The Archaeology of Knowledge*, trans. Tavistok Publication (London: Routledge, 2004), 3-22 and 23-88; and Gilles Deleuze and Felix Guattari, "Rhizome," in *A Thousand Plateaus; Capitalism and Schizophrenia*, trans. Brian Massumi (Minneapolis, MN: University of Minnesota Press, 2005), 3-25.

[47] For this fractal recursiveness Cf. Benoit Mandelbrot, *The Fractal Geometry of Nature* (New York, NY: Freeman, 1983). Cf. Prigogine, *The End of Certainty* 38-44; and Prigogine and Stengers, *Tra il Tempo e L'Eternità*, 72-75.

[48] Cf. Prigogine and Stengers, *Tra Tempo e Eternità*, 59.

The *scientist* claims that irreversibility is a problem generated at macroscopic level by a weak observer with limited capabilities, who is forced to approximate; while idealization permits thinking or recognising chronological reversibility as the ultimate logic or truth. The *epistemologist* individuates idealization as the problem behind reversibility and reducibility. The *philosopher* instead should ask why idealization, abstraction or transition to the limit seem so inevitable; why the reduction to the ultimate (Being or difference) constantly returns as the broadest structure that enframes thought posing ontology as the fundamental line of enquiry. This seems an image of thought ingrained to such a degree that it cannot be escaped when asking philosophical questions.

All point to the fact that the onto-theo-logical syntax, as the dimension of thought decried by Heidegger, is still with us.[49] Indeed, as long as philosophy looks at the findings of physics for reference or inspiration, it is actually blindly entering a circularity. This is not a matter of seeking proof where none can be found, for it is obvious that philosophy cannot seek proof in science without resigning to an empirical materialism, thereby also resigning autonomy and entrusting all authority to science. The problem is more insidious and far more dangerous. In fact by referring to physics in such a manner, philosophy is still referring to the image of fundamentals; it is still applying, that is, a model of reducibility which either looks at the fundamentals of matter as parallel to the axioms of logic, or looks at the transition to the limit seeking an elemental behaviour of things, which would be revealed in the projection to infinity, so that the system, the universe or logic, would reveal its real truth and essential nature; even when this is a logic of divergence towards infinite difference. With Prigogine instead, it is dynamics that had to declare that its discoveries and practice can no longer be expanded to reach all forms of contingent and historical existence (the psycho-chemical or socio-economical organizations for instance). It is physics that is forced to declare its inability to offer a continuous explanation from microscopic to macroscopic states, which can be based solely on the microscopic. Finally, it is physics that by withdrawing from the ultimate convergence with ontology tells philosophy that philosophy has misused or at least misinterpreted; that it can no longer act as its example or axiom; and that the continuity between mechanics and the coherence of

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[49] Martin Heidegger, "The Onto-theo-logical Constitution of Metaphysics" in *Identity and Difference*, 42-74.

the present has been interrupted. Physics, that is, is not imposing a new truth replacing the existing one; rather it remains silent precisely there where it used to speak the loudest.

Philosophy as a Practice

The argument presented here has examined how a problem encountered inside physics raises epistemological questions that challenge the very image of ontology, that is, both its expectations and its authority. The tension between non-integrability and non-equivalence constitutes a leap from a local incompleteness to a general openness that cannot be interpreted as a new ontological model. Indeed, the contingent impossibility at local level interrupts any passage to an abstract or unitary logic able to support sense universally and homogeneously, while non-equivalence undoes the possibility of an absolute language of representation.

Ontology displays an essential *continuity* between the present and the ultimate, which has remained unquestioned from the conservation of causality assumed by sufficient reason to the transition to the difference at the limit proposed by postmodern ontology. In this smooth passage to the ultimate, all interpretations (classic essence, modern totality, the ground and the groundless, the limit or the virtual) share the same *transitive* property: a spatialised image of thought that conceives the present and the ultimate as ontologically *simultaneous*, discussing the forms this transition may take but never questioning the continuity in itself. In this light, a "thought without image," as Deleuze invoked in *Difference and Repetition*, does not overcome the logic of transition to the ultimate, but only removes the a priori status of identity. Indeed, while identity for Deleuze is a continuous production and evaluation rather than a fixed a priori point, actual objects and their virtual images remain in a relationship where the actual is located by and points to the virtual. Here too, the transition to the ontologically ultimate as the logic that supports sense is retained. Instead, Prigogine's reconceptualisation has shown how, in the approximations necessary for the transition to an ontological horizon, the heterogeneity of each specific present is not explained but destroyed. What is more, what is idealised as a pure state is not the epistemological image of the unity of nature or the ontological ground, but rather the assumption of a smooth transition to this horizon.

The conclusions then should come in the form of an exhortation not to think or seek the ultimate; a warning against the risks of re-ontologising the non-equivalence of practices as a matrix for the emergence of sense. An exhortation, that is, to protect the heterogeneous creativity of the practice, not to rush to abstract (and therefore, foreclose) its problems and questions into one disembodied and unitary logic. Indeed, if the practice has the incredible power of bringing a new Being into existence -as Stengers wrote- it is also exposed and vulnerable to the incursions, capture and expropriation of a thought that believes it possible to think the possibility of existence independently from its contingent instantiations.

Prigogine and Stengers have built their argument on the fact that measurement is intrinsic to physics – constitutive of any observation. It is not possible to think of reality – let alone addressing it – as transcending the heterogeneous and finite determinations of the methodology and unit of measurement adopted to observe it. However, the possibility of alternative methods of measurement does not amount to a horizon of possibility from which to draw actualised events. Attempting to explain away with one homogeneous logic (counter-actualisation) the heterogeneous and contingent activities of non-equivalent practices is as arbitrary a move of idealisation as the approximations towards the boundary conditions of classic physics. Prigogine and Stengers have presented a practice of science that *constructs* its object rather than describes or represents it. As was seen, this turns inside out the ontological paradigm that shapes the question along the dimensions of an object 'in itself' versus an object 'for us'. They have shown that the pure question of the logic of existence (how there can be *something rather than nothing*) cannot be posed or thought without the radical finitude of the question regarding how can *things be organised thus rather than otherwise*. Non-equivalence shows that the hinge of presence and sense is the pattern of the heterogeneous forms of finitude of the thus/otherwise question, rather than the unique and pure event of the passage from nothing to something.[50] Indeed, in Stengers' thought, the syntax of mathematics acquires a radical relevance without, for this, demanding that this relevance assume the hierarchical position of a meta-

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[50] On this notion of unique event or *eventum tantum* Cf. Deleuze, "Twenty-First Series of The Event," in *The Logic of Sense*, 169-175.

language that envelops matter and the universe externally.[51] On the contrary, the pattern of this syntax constitutes an irreducible degree of roughness beyond which there is no smoothness but only silence.

However, entrusting philosophy with the task of speculating about the concept of non-equivalence – as Stengers had suggested following Deleuze and Guattari - reduces it to the object of ontology and leaves ontology's position untouched. Yet, the critique of the universal at the centre of Stengers' project cannot be upheld if the finite determinations of local behaviours are still addressed through a more powerful and abstract language. In fact, this move obscures the relevance of the leap exposed by Prigogine's reconceptualisation, leaving the hierarchy between thought and practice intact. Yet, this is neither a necessary nor an inevitable choice. Instead, emphasising the positive finitude expressed by the silence of physics concerning absolute claims –this is the problem this article wanted to highlight- the non-equivalence of practices exposed by Prigogine's reconceptualisation is both *less* and *more* than counter-actualisation. *Less*, because non-integrability marks a contingent and practical impossibility inside the practice of physics, where the alternative mathematical syntax adopted by Prigogine produces a chronological irreversibility. Yet this does not need to reach a purer or more abstract form of undoing, a pure horizon of possibility that is, but simply remains open. *More*, because non-equivalence marks an asymmetry that concerns ontology not as its *object* but as its *logic*. Ontology does not speak of the counter-actualisation of physics, but rather is itself counter-actualised. In other words, counter-actualisation cannot be pronounced as an ontological affirmation concerning being/sense in general –as non-integrability forbids it- but remains an epistemological problem, which in turn voids the relevance of the notion of the ontological ultimate and shifts all questions of sense and its legitimacy onto the relevance of the methodology with which they are formulated. It is in this light that ontology too loses its privileged position, its primacy as the logic of pure existence and –therefore- also its right to pronounce statements with the authority of a logic that transcends and is independent of all practices, as the thought able to speculate upon the problems of the practice, and must instead consider itself as practice as well.

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[51] Cf. Isabelle Stengers, "The Cosmopolitical Proposal," in Bruno Latour and Peter Weibel eds. *Making Things Public*, trans. Liz Carey-Libbrecht (Cambridge, MA: MIT Press, 2005), 994-1003.

This challenge invests the authority of ontology in its entirety, stepping outside the alternatives offered by transcendent and transcendental, or ground and groundless, as well as virtual models, to question instead the very privileged role that ontology awards to itself as the ultimate philosophical question. That is, non-equivalence amounts to more than counter-actualisation, because by being an internal and local interruption, rather than a negation imposed externally (which would inevitably imply a totalising viewpoint), it challenges the hierarchy that locates ontology in a position that enables it to speak on behalf of practices, giving it the privilege of naming the possible and of marking the dimensions along which this can become actual. And again, less because the resistance that Stengers invokes against a universal convergence is an eminently materialist move that exhorts us to "stay with the problem" of the practice, avoiding any logic of the same.[52] The problem, as it has emerged here, is that by entrusting philosophy with the task to carry out the move of resistance (counter-actualisation), rather than dispelling the actualised enframing of universality of the modern, the structure of abstraction of the heterogeneity of specific practices is retained. This amounts to a re-ontologisation of the problem, or in fact a return to metaphysics; a purification that cleanses the question of the very roughness that gives it specificity and relevance in the first place.

The groundbreaking innovation brought by Prigogine and Stengers' onto-epistemological asymmetry is to have voided the privileged position that the relation of ontology and physics held with reference to the real as their special object. For a truth that is constructed as a factish, there is no longer any interest or relevance in the ultimate. What is more, without ultimate, the hierarchy of the languages and practices that aim to it also vanishes. However, in this ecological regime constructive truth hollows any language of the power of making absolute claims, but not of the power of *making sense*. The task that now opens in front of the philosopher as well as the physicist is to ask how it may be possible to formulate the question of the coherence of sense without the privilege afforded to ontology and physics by their arbitrary nearness to the ultimate and without the mutually supportive relationship this has generated.

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[52] Cf. Isabelle Stengers, "The Cosmopolitical Proposal," in Latour and Weibel, *Making Things Public*, 994-1003; and Stengers, "Wondering About Materialism," in *The Speculative Turn*, 368-380.

Here, Karen Barad's notion of *diffraction* (does a claim matter? how? for whom?) seems more apt to navigate non-equivalence than the quasi-binary logic of counter-actualisation, as it offers a less metaphysical and more pragmatic key than the speculation indicated by Stengers.[53] Showing that relevance names materiality as *that which matters*, Barad reframes the question in terms of the conditions of experience. The irreducible degree of roughness of the factish constitutes a basic ontological unit – she claims – where discourse and matter constitute a continuum. However, this new ontological interpretation of the factish as a phenomenon follows Bohr rather than Kant, thus abandoning the a priori universality of the conditions of experience, but – crucially – retaining the notion of conditions as necessary for existence; hence positive finitude as constructive and creative.[54] This new understanding of the phenomenon as irreducible roughness folds into one question - not only the ontological and epistemological problems of philosophy with the practical problems of physics - but also the ethical, as well as the aesthetic and political aspects of sense. Johnny Golding names this entangled and irreducible genealogy of the present "radical matter."[55] In this light, diffraction will require to be negotiated each time, specifically orienting all philosophical questions forward; towards a future, which itself is freed from teleological tracks and attuned to the questions: what matters, how does this matter, for whom does it matter? As the conditions, or indeed the *dimensions* of the emergence of sense.

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[53] Cf. Karen Barad, *Meeting the Universe Halfway: Quantum Physics and The Entanglement of Matter and Meaning* (Durham, NC: Duke University Press, 2007).

[54] Cf. Barad, "Part II: Intra-Actions Matter," in *Meeting the Universe Halfway,*" 97-187.

[55] The concept of *radical matter* was first developed by Johnny Golding in a series of meditations on new materialities, aesthetics and war. Cf. Johnny Golding, "A Deleuzean 'something': n-1 (or the techne of curved line drawing)," *Issues in Contemporary Culture and Aesthetics*, Vol.2 (2004), 59-66; "Raw / Hide: WWW III, the prequel," in T. Barlow ed., *Positions: The War Issue*, (Durham, NC: Duke University Press, 2005), 263-283; and "The Assassination of Time (or the birth of zeta-Physics)," in Hanjo Beressem and Leyla Haferkamp eds., *Deleuzean Events: Writing | History* (Berlin: Lit Verlag, 2009), 132-145. Radical matter then became one of the central concepts of the PHD Research Methods Seminar (Centre for Fine Art Research, Birmingham School of Art – BCU), led by Professor Golding.