# Mathematical Possibilities in Modernism: Can Literature be a System?

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## Cover Page Footnote

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# Mathematical Possibilities in Modernism:
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**Synopsis**

From Aristotle's *Poetics*, literature and logic have been companions in approaching the hypothetical realm of the 'what if.' In this paper, I focus on the combinatorial possibilities of logic to see how mathematics becomes an important tool for the Modernist text's aesthetic appeal to anti-representational and self-enclosed systemic autonomy. Is mathematical discourse autonomous vis-à-vis external reality? Can literary Modernism achieve textual autonomy that goes against realistic verisimilitude by following mathematical discourse? Though literary texts often negotiate formal systems with sophisticated governing logics, can literature itself become a logico-mathematical system? I trace the dialectic of form and system in the short stories of Italo Calvino, known for his interest in mathematical discourse as an Oulipian 'proceduralist.' Calvino weaves this dialectic around political concerns like the machinic logic of modernity and technocratic capitalism. 'Numbers in the Dark' mythicizes mathematical error that goes against systemicity and leads to an opposition between logic and calculative rationality. In 'The Burning of the Abominable House,' computer becomes a narrative device to play with permutations and combinations of the real that conspire against the construction of a single reality. Evoking Oulipo's position against chance, I bring in Quentin Meillassoux's readings of Cantorian 'transfinite' to distinguish chance from radical contingency. As we shall see, this distinction speaks to the mathematical tension between system and form in the Modernist literary text.

### 1. Mathematics and Literature: Between Form and System

What is form and what is system? Are they the same or different? How do we invoke mathematical thought to consider the relation of form and system in literature? One could question the efficacy and relevance of bringing in mathematics to study literature. To set the point straight, I do not have any grand narrative of mathematics and literature to offer here. In other words, I am not making a global argument about reading *all* literary texts through mathematics. In fact, I think, a literary text must demand a mathematical reading for there to be one. In the wake of recent mathematical approaches to literature ([11, 6, 14, 10]),[1] what we are beginning to realise is that mathematics, like politics, love etc., is an embedded trope in certain literary texts. To give one example from this new critical interest, Nina Engelhardt, in her book [14] on Modernist literature and mathematics advocates exploring "the meeting of modernism and mathematics from the perspective of history of maths and with a main focus on literature, that is, on works of fiction that engage with modern maths as part of broader developments in the first half of twentieth century" (page 2). To build on this, let me say that particular literary texts that make this specific appeal to mathematics as a discourse demand mathematical reading. My lens to study literary texts that build mathematical and logical questions into them, will be philosophy of mathematics which involves philosophical extensions based on mathematical developments. Italo Calvino's manifold interest in mathematical discourse will be my historical justification for the following investigation into his texts.

I would argue that a literary text does not just *have* a form or forms. But it also takes us through a certain number of forms that are part of its narrative world. A form becomes a system when it has a clear set of unflinching rules. Form for its own part could well be a tattered entity. System on the other hand requires a certain degree of operativity and cohesion. In literary texts that use mathematical themes and structures, the question

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[1]See Steven Connor's book, *In Defence of Quantity: Living by Numbers* [11], for a cultural and literary history of numbers. See also Baylee Brits' book, *Literary Infinities* [6], for a mathematical reading of infinity in writers like Borges, Beckett and Coetzee. I would like to place my book *Beckett, Lacan and the Mathematical Writing of the Real* [10] in the same critical tradition.

is whether the texts approach mathematical structure as form or system. This will be my central question in reading mathematically oriented literary texts i.e. the Modernist short stories of Italo Calvino. I am interested in teasing out the philosophical implications of mathematical discourse as a system for literature. While form is open to deformations, including its own deformations, system is a neat and closed structure. As we shall see, forms invoked in a literary text may speak to a logic that in turn may demand a reading through philosophy of mathematics. Logic could in itself be a bridge between mathematics and literature.

To begin with the ancient relation of literature with logic, at the beginning of the ninth section in *Poetics* [1], Aristotle reflects: "[. . .] it is not the function of the poet to relate what has happened, but what may happen—what is possible according to the law of probability and necessity" (page 35). This statement foregrounds the bond between logic and literature. To go back to Aristotle's passage above, if the literary is a domain of possibilities that operates through the modal auxiliary verb, 'may,' its happenings belong in the counterfactual world. More importantly, this 'may' necessarily ties the idea of chance to the literary world of probabilities. What is the function of necessity here? Can necessity construct a system from the chance-ridden form in certain literary texts? Form may have chance in it as a component but system seems to abhor chance and randomness. This dialectical tension of chance and system in European literary modernism makes a mathematical and logical approach necessary. This happens all the more when writers become increasingly aware of the two linguistic axes of literary creativity: selection of ideas and themes wherein anything may happen to get into a text and textual combination in which a potential totality of possibilities is decided and sealed. Logic is intrinsic to this creative process. To echo Stephane Mallarmé's famous line, does this textual throw of dice abolish chance or does it locate chance by patterning it? When we make a pattern from chance, does it remain chance? What do we call such a patterned matrix of chance? Form or system? Let us follow this trail of questions.

To ground the link between mathematics and Modernist literature, if chaos (including chaos of forms, at war with one another) and system make up one dialectical pair, autonomy (the text's independence from realistic reference to external world) and verisimilitude (the text's representational dependence on external reality) form another complex couple. In European Modernism, when literary texts appeal toward autonomy, as opposed to invoking repre-

sentational correspondence with extra-textual reality, mathematics and logic become natural allies in offering literature, a model of liberative autonomy from realism. Mathematical discourse claims to be relatively autonomous vis-à-vis reality. This is the Platonic trajectory that runs through philosophy of mathematics. It situates mathematical objects in another reality. For Platonism, mathematics has an autonomous world of its own. It is not a part of our world. To give an example, the number 10 does not depend on ten apples that we encounter in the material world. The number 10 does not even exist in the phenomenal world. It has its own independent abode in the world of mathematical ideas. This supposition of mathematical autonomy becomes an important tool for the Modernist text's appeal to anti-representational and self-enclosed systemic independence.

Peter Swirski connects mathematics and literature on the basis of their shared 'autotelism' (having a purpose in itself) when it comes to their respective ways of modelling reality [24, page 51]. Mathematics and literature are not simply modelled on reality. But they themselves, actively model reality as well. Swirski's mobilization of mathematics to engage with literature has a logicist streak:

> At the bottom, mathematics is practically synonymous with logic — the same logic that guides narrative and metanarrative discourse. All math is, after all, reducible to properties of integers which are, in turn, reducible to the modified version of Peano's postulates of logic. Mathematics, in this general sense, *is* logic. [24, page 52]

This meeting of mathematics and logic resonates with generative possibilities for literature and mathematics. Oulipo's (a literary group, we will discuss in what follows) playful, late-Modernist reflexivity and proceduralism (emphasis on writing as procedure) activate this combinatorial dimension as 'potential literature.'

To radicalize Aristotle's aforementioned point that literature deals with what *may* happen, let us introduce a negation into the formula and maintain that literature deals with what may *not* happen. While probability continues to isolate what is more likely to happen, combinatorial logic and the mathematical field of 'combinatorics' are more interested in the *total* set of possibilities, opened up by a number of elements in permutations and combinations.

Among all possibilities, some are more likely than others. This is the move from the possible to the probable. According to Pierre De Laplace, probability is "the ratio of the number of favourable cases to that of all the cases possible" [12, page 1329]. In other words, probability is tied to realism as it privileges the *likely* over the *unlikely*. But combinatorics is more distant from realism because it considers the entire gamut of possibilities where there are more unlikely ones than likely ones. For example, with 5 elements, we have $1 \times 2 \times 3 \times 4 \times 5 = 120$ possible arrangements. Unless we bring in the question of probability through likelihood, all 120 are equally possible. Thus, to exorcise probability from the combinatorial field is to offer the widest possible scope to chance. Oulipians are however, clear that their programme is 'anti-chance.' Oulipian thinker Claude Berge maintains that potentiality is uncertain but not a matter of chance. Oulipians know what can happen but they do not know what will happen [20, page 17]. We can see here an opening of form that cancels out pure chance. But the uncertainty and ignorance of what is to come ensure that this form does not become a regulated system.

## 2. Oulipo and Calvino: Chance and Freedom with Forms

As a literary group, Oulipo practices 'proceduralism.' Oulipian writers set a conscious constraint from the beginning and write around that to explore how a text can be made without something as essential as the vowel 'e.' Georges Perec, the famous French Oulipian writer, composed an entire novel, *A Void* (*La Disparition* in French) without the aforementioned vowel in 1969. A poet, mathematician and founding member of Oulipo, Jacques Roubaud comments that Oulipo's idea of 'voluntary literature' is in part, a reaction against the Surrealist stress on unconscious automatism [20, page 87]. In opposition to the Surrealists' belief that psychic automatism is a pathway to creative freedom, Oulipians hold that constraints lead to freedom by realizing potential literature. Roubaud finds in Raymond Queneau's works, not only a "lively refusal of chance" but also a "refusal of the frequent equation of chance and freedom" (ibid). Oulipians make an explicit appeal toward Bourbakian set theory and David Hilbert's project of creating a sense of play in the mathematical domain when they develop analogous ideas of literary axiomatization and formalization. As David Aubin argues in [2], Bourbaki acts like a 'cultural connector' for Oulipians. The Oulipian programme of constrained textual structures comes from Bourbaki's axiomatic agenda:

[. . . ] a sufficiently explicit mathematical text could be expressed in a conventional language containing only a small number of fixed "words", assembled according to a syntax consisting a small number of unbreakable rules: such a text is said to be *formalized*. ([4, page 7]; emphasis original)

Oulipo anchors itself on the idea of having a simple constraint as the compositional principle of a text. The constraint limits combinatorial possibilities and challenges the writer to take up trajectories that she would probably not take otherwise. It is significant that Oulipians do not activate the realistic trope of probability to delimit the realm of possibilities. What they trigger instead is the logico-mathematical mode of axiomatic constraint to frame the combinatorial field. Likelihood and the associated question of reality are thus supplemented by the artificial nature of structural constraint. In their view, it is this quality that makes their aesthetic position, anti-aleatory. To return to our question, does this turn literature into a system? We will come back to this point.

Mathematical logic for Oulipo is a tool to go against chance. But as Roubaud suggests in his analysis of Queneau, the project of mathematizing language has to process two conjectures: "arithmetic applied to language gives rise to texts" and "language producing texts gives rise to arithmetic" [20, page 82]. This is a question of causality. It returns us to the Platonic debate around mathematical autonomy. Is language inherently mathematical or do we extrapolate mathematics from language? In other words, does mathematical structure cause language or language cause mathematical structure? If mathematical structures condition language, they would have to be independent of language, i.e., autonomous. We can already see how the dialectic of chance and constraint around the notion of systemicity responds to the question of autonomy. French mathematician, Henri Poincaré in his landmark essay, 'Mathematical Creation' [22], is categorical that invention in mathematics does not lie in making new combinations. For him, most of the supposed totality of combinations are "entirely sterile" and only a "small minority" is "fruitful" (page 2043). We are back to the question of choosing possibilities. Do we choose certain possibilities over others because they are more likely to take place or are more useful than others?

To come to our writer now, Italo Calvino became a full member of Oulipo in 1973 but he had been in touch with the group before that. Part of what

follows will disturb the neat chronology of Calvino's Oulipian streak and his critically accepted transition from Italian neo-realism to Oulipian experimentalism. Our reading of 'The Burning of the Abominable House' is consistent with its first Italian publication in 1973—the same year that Calvino subscribed to Oulipo in the fullest sense. But when we come to the titular story of his early collection, 'Numbers in the Dark,' the matter becomes more complex. This is a 1958 story which not only predates Calvino's Oulipian turn but also Oulipo's official inauguration as a group in 1960. The mathematical reading of this story would help us understand Calvino's prefiguration of Oulipianism in the so-called 'realistic' phase of his writing. It will also explain why joining Oulipo was perhaps an automatic choice for this mathematically minded writer. It is interesting that Anna Botta, in her article [3] on Calvino and Oulipo, does not even mention the two stories that we will be reading here. The two selected stories are low-lying in the Calvino canon, especially in the Anglophone critical context.[2] It is indeed my intention to acknowledge the importance of these stories in a discussion of mathematical thinking within European Modernism. The mathematical strand of Calvino's work is often taken for granted but it is not subjected to a rigorous analysis.[3] As we shall see, what Dani Cavallaro suggests about Calvino's 1968 work, *Cosmicomics*, is also true of some of the earlier pre-Oulipian stories like 'Numbers in the Dark.' According to Cavallaro, Calvino takes

> the idea of structure at its most rigorous and on pushing a system's organizing proclivities to their extreme. Structure is here envisaged in fundamentally geometric, mathematical and algebraic terms: it is concerned with endlessly varied and reiterated transformative operations which may be formulated in a scientific (or mockscientific) fashion. [9, page 94]

While we will return to this matrix of 'structure' or form vis-à-vis the notion of a mathematical system, let me mention some existing work on Calvino and mathematics. Illeana Moreno-Viqueira's doctoral dissertation [19] undertakes a mathematical reading of Calvino through Godel's incompleteness

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[2]Harold Bloom's edited volume [5] on Calvino as a short-story writer, for example, does not provide a reading of either stories.

[3]See [23, 15, 25, 18, 9] and so on. These English language book-length studies on Calvino contain either no mention of mathematics or just a passing reference to it.

theorem, among others. But it remains limited to his 1972 novel, *The Invisible Cities.* Kerstin Pilz passingly mentions mathematics as a 'metalanguage' in Calvino [21, page 40]. This echoes Roubaud's aforementioned conjectures on the complex causality that binds mathematics and language.

Calvino's work has recently attracted mathematicians as well. Gabriele Lolli's reading [16] of Calvino's *Six Memos* (1988) is a case in point. The mathematician reads mathematics from a literary perspective and not the other way around. Lolli connects Calvino's literary memos to mathematical discourse and reflects how his analysis of the minimalist quality of folk tales evokes the compositional shape of mathematical proofs. We will not take this critical path but rather push the question of philosophy of mathematics in Calvino. As we shall see, the philosophical dimension of mathematics as a discourse is played out here in terms of a dialectical tension between the real and the fantastic on the one hand and chance and method, on the other.

Calvino makes a significant critical move by bringing in the technological apparatus of the computer in his mathematical approach to literature. In his essay, 'Prose and Anticombinatorics,' Calvino reflects on the function of the machine in the composition of the story, 'The Burning of the Abominable House.' Before coming to this story, let me make the point that for Calvino, the computer introduces an anti-combinatorial dimension. This is not unlike what Poincaré had observed in a more general context. Calvino argues that "among a large number of possibilities, the computer selects those few realizations compatible with certain constraints" [20, page 143]. So, for Calvino, the computer narrows down possibilities rather than throwing open the entire combinatorial field. This goes well with Poincaré's previously cited point that only a "small minority" of all possible combinations turns out to be "fruitful." Calvino ends his essay on a note of affirming chance by alluding to the Pre-Socratic notion of 'clinamen' as the sudden swerve among atoms that leads to their mutual encounter. He observes that the computer does not replace the creative act of the artist. For him, it liberates the writer from 'the slavery of combinatory search, allowing him also the best chance of concentrating on this "clinamen" which, alone can make of the text a true work of art' [20, page 152].

This claim overturns the Oulipian position against chance by affirming an aesthetic of 'clinamen', i.e., an aesthetic that is open to chance. Mechanical computation here becomes the mathematical paradigm that goes against

combinatorics and opens up chance. In his essay on the writer Samuel Beckett, the French philosopher Gilles Deleuze defines the combinatorial as the "art or science of exhausting the possible, through inclusive disjunctions" [13, page 5]. Deleuze's classification of the combinatorial as an alternation between art and science ('or') is interesting. He defines it through the operation of exhaustion that can include a possibility which stands in contradiction to other possibilities, laid out by the same situation. Does the exhaustion of possibilities expose a void that opens the process to radical contingency? If through exhaustion we arrive at nothing that can happen, can everything happen from that point of the nothing? Stated differently, when all possibilities of a given scenario are exhausted, do we arrive at the freedom of a chance that has been comprehensively traversed? Can we count on chance to return once the realm of possibilities is exhausted? Calvino's short stories work with this material combinatorial rubric. They respond to the question of contingency and chance by deploying computational framework. We will see how Calvino gestures toward an alternative to conventional literary realism based on correspondence with external reality. This new possibility is generative and yet deeply political in asserting the agency of the subject amid the technocratic noise of computational mathematics.

## 3. 'The Burning of the Abominable House': Infinity between Form and System?

Calvino writes his 1973 short story 'The Burning of the Abominable House,' on a computer. He also uses the device as a theme within the narrative. The story is about a computer analyst and programmer who is hired by an insurance company to reconstruct what transpired in a burnt down boarding house. His only clue is a charred copybook with twelve entries in alphabetical order. The list of items indicates things that might have happened to the four tenants. The insurance company wants details about the accident and the narrator is put on this programming mission. The twelve entries describe action-terms such as 'blackmail,' 'drugging,' 'incitement to suicide,' 'slander,' 'snooping' etc. As the narrator speculates, each of the four tenants can be either perpetrators or victims of these actions. Even if it is taken for granted that each deed was committed by only one person and inflicted upon one other, the number of possibilities is humungous. The text calculates this set of all possibilities as "eight thousand eight hundred and seventy-four billion,

two hundred and ninety-six million, six hundred and seventy-two thousand, two hundred and fifty-six" [7, page 157]. These are not simply numbers. Each possible occurrence introduces a narrative tangent with a certain degree of probability. Some of these alternatives realistically cancel others by rendering them 'improbable' and redundant. As the narrator processes these complexities, we go back to Poincaré's point about plenitude and choice. We might have a huge number of possibilities but it all comes down to a slim set of probable ones. The narrator randomizes these combinations to see how some of the actions would fit one tenant more than others. He also observes that if one thing happens, the other cannot happen. Each possibility generates a fresh story with these characters in a two-by-two structure. The narrator thus oscillates between the probable and the possible: "who can rule out the notion that the most improbable alternative might be the only possible?" (page 159). He pictures in his mind, the unlikely and yet possible situation where 'seduction,' one of the enlisted action-terms, is performed by the old widow Roessler. As the narrator carries on with his computational narrative hypotheses, readers are constantly reminded of Skiller (evoking skill?), the insurance company representative who is coming soon to meet the narrator and discuss his findings.

As the writer's imaginative juices start flowing, it becomes clear that the improbable is also possible. This takes us from probability into combinatorics which deals with the entire set of possibilities. While speculating the unlikely makes for a fascinating leap of imagination, the narrator realizes that he must work out a "system of exclusions" (page 161). The computer is, as Calvino argues in his aforementioned piece, the narrator's anti-combinatoric companion. The narrator is convinced that it will be able to discard millions of "incongruous combinations" and keep only the "plausible concatenations." As we can see, rather than chance, the technology of computation reinforces probability wherein we continue to talk about the plausible. The pure chance aspect of the combinatorial is revised and restricted by a logic of computation. It eliminates implausible situations like tying someone first and then threatening him or knifing and strangling as well as threatening with a gun. Only one of these many possibilities could have taken place. They cannot happen together. The story depicts a struggle between the subjective agency of creativity and the mechanical world of combinations. For the machine, these are "anonymous and interchangeable" "factors and functions" but for the narrator, they are identifiable human characters in concrete scenarios.

He finally makes peace with himself by submitting to the machine's logic in which human lives are informatized: "It is information I am dealing with, not human lives, with their good and evil sides" (page 163). The story accentuates the material transformation of narrative into data and the narrator registers narrative pieces as "holes on punchcards" (page 164).

The twelve action-items fundamentally exclude the cause of the fire. We do not have a single item in the list that mentions the fire. They explain the death of the inhabitants but cannot tell us how the fire started. The story takes a whodunit turn when the narrator begins to suspect Skiller, his client and wonders whether he is the culprit, behind the accident. He is aware that if Skiller is added to the set, he becomes the fifth element of the set, after the four tenants. But in spite of this addition, the number of possibilities does not increase because he is added only as the suspected evil mastermind. In other words, he is seen in only one role, i.e. the one who burns down the house and does not perform any of the twelve action-items. If starting the fire is his sole function, all the action items remain distributed among the four tenants. Skiller is just a plus-one. His addition does not alter the total count of possibilities. The computer would not be able to think this problem through. For the machine, Skiller is the fifth element and the combinatorial would now have to be a factorial operation, involving five agents and twelve items. This would shoot up the total number of possibilities. The narrator however can and does acknowledge this situation. Herein lies his human subjectivity, as opposed to the machine that represents the technological progress of corporate capitalism. This subjective thinking supplements the machine's way of manoeuvring elements. There is a similar subjectivist reaction against technocracy when the computer gets affected by an unknown error and all data is lost. Is this a characteristically humanist and subjectivist resistance against technological domination? The story is more complicated. It allows us to read the error and the data loss as an index of the narrator's self-cancelling and doubtful imagination that has been making and unmaking narrative possibilities.

As the narrator resumes work after the data loss, he inserts one more character into the story to make the tally go up to six. This character is he, himself—the computer analyst, Waldemar. Once again, in spite of the addition of one character, the narrative possibilities do not proliferate because he sees Waldemar in a static narrative position. Waldemar, the narrator, imagines himself to be yet another tenant in the boarding house.

He also wonders if Skiller is coming in for a research inspection on the role of household factors in disasters and in the process, hatching a fire plot. These insertions are results of subjective decisions and the extra two characters after the initial four are brought in with singular roles. Waldemar, like Skiller, is not going to perform any of the twelve action items. So, the tally remains the same. This is a way of limiting the vast play of the combinatorial in which the entire field of the possible is at stake. Having said that, this is not probability either. It is not on the basis of likelihood that the narrator brings Skiller and himself into the narrative. Mathematically speaking, this self-inclusion reminds us of the set-theoretical axiom of foundation that ensures, a set cannot be added to itself as one of its elements. So, when the narrator imports himself into the programme, he must maintain himself as a discrete unit and not as an addition to the list of four victims.

The story here incorporates computer programming into the crime to give it a cybernetic dimension. Waldemar speculates whether the insurance company is conspiring to introduce useless data as 'smokescreen' to cover over the crime, each time the accident is attempted to be reconstructed. In this conjecture, the list of twelve action-items is a deliberately misleading informational "noise." Skiller's plan is to take the misleading clues to an ignorant programmer like Waldemar in order to check whether the actual causality of the crime can be established. While inserting himself into the narrative, Waldemar realizes that he is only one item in a largely unknown series. He is a cog within a gigantic and enigmatic mechanical series: "I'm stuck here inputting and outputting the data of a story I can't change. [...] Perhaps even Skiller only has an input-output function: the real computer is elsewhere" (page 168). The computer as a trope is repositioned at this narrative juncture. Previously, it was on the side of realistic probability but now, the computer becomes symbolic of infinite seriality and indeterminacy. The infinite is a figure of this limit of what can be known. It is a frontier where knowledge passes into the unknown. Is this serial notion of infinity as that which cannot be known, a question of form or system? In other words, where does infinity sit between form and system? Does it make the difference between the two? I would argue that infinity is precisely what prevents this literary and mathematical formalization from being reified into a system. As and when a form threatens to become a complete and self-sufficient system of mastery, there is an aspect of the infinite that comes and saves the day for the form. The infinitesimal form remains irreducible to system.

It would be useful to evoke the contemporary French philosopher Quentin Meillassoux's distinction between 'chance' and 'contingency' here. Oulipo makes a notable gesture toward set-theory to ground the combinatorial question. To tackle the tension between aleatorics and anti-aleatorics in Oulipo, I would evoke Meillassoux's derivations from Cantor's transfinite theory of sets on the particular question of chance. This evocation connects Calvino's story and its thesis on chance and system with the larger sphere of philosophy of mathematics. Oulipians are drawn to infinitesimal possibilities introduced by set-theory. Cantor's invention of the transfinite is a climax of this opening. For Meillassoux, Cantorian transfinite allows us to make a mathematical distinction between chance and contingency [17, page 104]. In Meillassoux's words, the transfinite makes "totalization of the thinkable" into an impossibility, when we take this totalization in an *a priori* sense. So, the transfinite denotes a "detotalization of number." Meillassoux formulates this Cantorian thesis in the following way: "the (quantifiable) totality of the thinkable is unthinkable" (ibid). In a recent book on mathematics and modernist literature, *Literary Infinities* [6], Baylee Brits has mobilized Cantor's theory of actual infinity as something that "may have *measure but not determination*" (page 3). This idea of an *indeterminate measure* is consistent with detotalization as the essence of infinity. The infinite is what can be measured but never be determined. It returns us to the tension between form and system. It is a form that through the act of measurement, moves toward systematicity. But due to indeterminacy, it never attains the condition of a system. So, infinity is the difference between form as a formalizing process and systematicity as a completion of that form. Infinity makes sure that the form remains a form and does not attain a systemic order.

In *After Finitude* [17], Meillassoux generates a reading of Cantor in which we have one axiom to support that "the possible is untotalizable" (page 105). This formulation creates a "fundamental uncertainty regarding the totalizability of the possible" (ibid). Chance is premised on totalization of the possible but Meillassoux remains sceptical about this totalization. Stated differently, chance is all about realizing all possible possibilities that do not appear likely or plausible to us. For Meillassoux, possibilities can never be totalized, thanks to infinity. He argues for the necessity of contingency. Here contingency is opened up by the detotalization of the possible. So, contingency is not totalization. It is instead a detotalization of possibilities.

As Meillassoux reflects on the 'clinamen,' (the Pre-Socratic thesis that atoms swerve by chance and meet one another), chance always "presupposes immutability of physical laws" (page 99). He goes on to say that chance itself is a law of the universe. Chance is built on condition that there are "unalterable physical laws" (ibid). For Meillassoux, it is transfinite mathematics that ultimately creates the key distinction between chance and contingency by generating uncertainty about totalization of possibilities. Contingency is the name for this mathematical detotalization. Here we have one possible answer to Calvino's particular question, if not the more general Oulipian question. If we cannot totalize the possible, we can never truly exhaust the combinatorial. It is not chance that returns here. Absolute contingency is what returns through this process of detotalization. Meillassoux's equation of chance with physical law goes against the Oulipian identification of constraint with freedom. If chance is a law in itself, it cannot lead to freedom. This seems to reinforce the Oulipian intuition that chance is a pathway to freedom. But Meillassoux's claim that chance is a law in itself turns chance into a constraint. It collapses Oulipo's juxtaposition of chance and constraint. Meillassoux's thinking foregrounds how mathematics is integral to Oulipo's quest for freedom through constraint formation that denies chance. Transfinite mathematics exudes contingency as an absolute. It jettisons the false opposition of chance and constraint. This collapse obstructs the systematicity of both mathematics and literature.

To return to Calvino's text, narrative hypotheses open up the possibility that Skiller is yet another input-output programme and the machine that lies at the root of this serial structure of crimes is somewhere else. This is a transfinite opening of contingency as a detotalization of possibilities. The moment the story accepts this conspiracy hypothesis, the twelve to the power twelve possibilities that lay in the gutted copybook are eliminated. This is where totalization fails. What we have instead is an uncertain opening of transfinite contingency. The pure chance that nestled in the copybook list of possibilities is abandoned in favour of an uncertain and contingent infinity. The computational structure of the machine has its role in this contingent schema. The contingency is thus made necessary by the ending. The story ends with Waldemar, remembering how Skiller has skilfully pre-planned Waldemar's murder by setting fire to the lab, to pass it off as arson. As someone, (perhaps Skiller) rings the door and Waldemar hears the fire brigade's sirens, he gets ready to shoot Skiller. The story ends in this suspended moment.

On the one hand, this ending consolidates the insurance company crime hypothesis. But on the other, it also complicates the same possibility by suggesting that Waldemar is the murderer of the tenants, living in Widow Roessler's boarding house. In this view, all the rest would be regarded as a concoction of his criminal imagination. This is another point of detotalization. The story both opens and closes these possibilities. It pressurizes the pure chance of the combinatorial, not with the realism of probability, but with an imaginative leap that generates a cybernetic crime narrative and at the same time, keeps it in suspension. The technologically filtered mathematical theme of computation becomes instrumental in this move from chance to contingency. We traverse this space of radical indeterminacy, that is opened by infinity as de-totalization. This notion of infinity as an impossibility of framing *all* possibilities makes the difference between form and system.

## 4. 'Numbers in the Dark': A Mathematical Mythology of Error

We will now go back in time from 1970s to late 1950s and discuss a pre-Oulipo story by Calvino. This will show how he was always driven toward mathematical themes, even before his association with the mathematically minded Oulipian writers began. If 'The Burning of the Abominable House,' featured a computer error leading to data loss, the 1958 story, 'Numbers in the Dark' is a mythologization of mathematical error. The critique of technological capitalism is prominent here. The story revolves around Paolino, a cleaning woman's son who explores the accountancy office. The little boy helps his mother emptying the bins. The story begins with a self-reflexive "geometric scenario" of the city space that takes us to the accountancy office building in "broad rectangles of unshaded light" [7, page 79]. The geography of the urban space is mapped in a mathematical way. This makes the accountancy office, an element in a larger mathematical set. As Paolino travels through geometrically neat cubicle spaces in the deserted office where machines are asleep for the time being, he comes across a skinny old man, at work on his "old adding machine" (page 86). When Paolino strikes up a conversation, he gets to know the strange story of error. This mythical history of the error suggests that the accounts can never be set right. The accountant takes Paolino through a spiral staircase to a cell where all old company ledgers are archived. He shows him the simple error made by Annibale De Canis, the company's first accountant who is widely regarded as a legendary keeper of figures.

This short story, unlike 'The Burning of the Abominable House,' situates 'error' on the side of the human, as opposed to the machine. When the accountant tells Paolino that all figures are wrong, the boy's first question is whether or not, it is a machine error. In fact, he wonders if machines can ever be erroneous. This indicates our cultural assumption about omnipotent machines and their error-free regime. The error in this case comes from the human. It is made by the so-called infallible accounting genius, De Canis. This point echoes Georges Perec's liking for Paul Klee's Oulipian formula: "Genius is the error in the system" [20, page 20]. As the witty remark suggests, the category of the genius is itself so mistaken that it can generate an error in a system. Calvino's story extends this formulation by turning the genius himself into a generator of error in the system. This is an error that delivers a lethal blow to calculative rationality and its underlying assumption of systematicity. It breaks the system apart and takes it back to a form that produces a deadlock. The model of corporate capitalism, symbolized by the accountancy office, is built on calculation as the infallible hallmark of rationality, be it the reasoning of the human or that of the machines. De Canis's error sabotages this entire system. It is a trace of dissidence that does not allow this calculative form to become a system.

The accountant tells Paolino that no one apart from him knows about this error. Now that he is old and nearing death, he wants to transmit the secret truth of the error. The error in question is a minor one of "four hundred and ten lire in addition" but its exponential growth with all following calculations is critical: "Over all these years, you know what that mistake of four hundred and ten lire has become? Billions! Billions!" [7, page 88]. So, the error is imagined to be growing more impactful, like a festering wound. It mocks the infallible precision of computing machine: "The calculating machines and electronic brains and what not can grind out numbers all they like. The mistake is right at the core, beneath all their numbers, and it's growing bigger and bigger and bigger!" (ibid). This error is an aleatory aesthetic agent. Error, is almost by definition, a matter of chance. It comes into being through the mythological act of storytelling, conducted by the old accountant. It introduces an unknown variation in the seemingly invariable domain of calculative rationality. This sabotages the edifice of the company and by extension the technocratic mechanism of capital. The accountant's increasingly expansive imagination captures this nuance of mathematics as mythology, if not fantasy:

> Half the city is built on these mistakes! No, not half the city, what
> am I saying? Half the country! And the exports and imports?
> All wrong, the whole world is distorted by this mistake, the only
> mistake in the life of Annibale De Canis, the master of book-
> keeping, that giant of accountancy, that genius! (page 88)

This is how a literary text uses a mathematical theme and turns it into a
narrative—a story of human error that gives a certain degree of poignancy to
this mythical account. It is a literary and aesthetic appropriation of mathe-
matics into the order of myth and legend. Calvino's story keeps the question
of truth in suspension. It cannot verify what the accountant says. We do
not know if he is lying. The mathematical myth seems to have a truth of its
own. It is a stroke of ironic paradox that this truth lies in error.

The mythology of this error is unmistakably subjective. It introduces inde-
terminacy and inoperativity in the monstrous world of capitalism that func-
tions through big data and gigantic numbers. This error might be induced
by chance. But it interacts with the system that it is part of. It detotalizes
possibilities by marking out a particular pattern of numerical proliferation
from four hundred and ten. This specific pattern will grow on. It has the in-
certitude of a contingent transfinite opening that connects the present short
story with the one we discussed above. When the accountant links De Canis's
error with the city-space in the quote above, we realise how the immaculate
spatial geometry of the city is corroded by this seed of destruction. The
sabotaging function of human error vis-à-vis the capitalist regime of num-
bers is made all the more insistent when the accountant leaves, with his last
sentence, ringing in Paolino's ears: "I'm sure he [Annibale De Canis] did it
on purpose!" (page 89).

The story ends on an ambiguous note with another error. We are told that
there is a phone-call from Brazil to the accountancy office at the wrong hour
when only the cleaners are there. As the narrator marks this error by noting
how they "muddled up the time difference" (page 89), we get a glimpse
of the 'world' that the old accountant had mentioned. It is a world, mis-
connected by mistakes that migrate from chance to contingency. This 'missed
call,' to use a more contemporary technological language, goes against the
systematicity of the system. The world lies suspended in these missed calls.
It is a formalization that fails on the verge of becoming a system.

## 5. Conclusion: Fantasy in Form and Literature against System

To conclude, I want to bring back questions of realism and mathematical autonomy in relation to the bifidity of contingency and method in Calvino's stories. I have argued that systematicity is used against its grain in these stories. It is mobilized to navigate from pure chance to radical contingency. In other words, systematicity here, is only a pathway to contingency. It does not construct a consistent and coherent system in any complete sense. This is a contradictory, contingent and indeterminate system, if at all. But at the same time, systemicity is an inevitable means to turn chance into contingency. To connect this *aporetic* (flawed, involving a deadlock) system with realism and autonomy is to ask whether the 'material' structures of mathematical systems can offer an alternative to realism. This would lead us into a series of questions. What is the nature of reality in these two stories? Do the mathematical structures imitate reality? Alternatively, do these stories pin a mathematical fantasy, independent of reality?

Let me follow my argument regarding the materiality of mathematical structures, that act as a supplement to realism. Seen this way, 'The Burning of the Abominable House' demonstrates how computational machinery can generate a mathematical structure that only seems to simulate reality, but actually does not. This complex cybernetic series produces a selective appropriation, distortion, and thus a complete supplementation of reality. Realistic verisimilitude (textual structure mirroring external reality) suffers here as mathematical structure institutes its own reality. As we have seen, this independence of mathematical structure is not without its own politics. It has a distinct ideological quality. Technology in its capitalist avatar instrumentalizes mathematical structures and flirts with the idea of a complete and self-reliant system. This is the supposed autonomy of mathematical systems, freed from realistic dependence on external reality. But as we have seen, Calvino's story exposes the ideological determinations that underwrite this autonomy. It offers a critique of the corporate capitalist model that backs this mathematical instrumentalism.

Computer becomes the *matter* that embodies this conspiratorial computational series. In our first story, Calvino's mathematical materialism registers a political critique of technological capitalism as a domain of radical contingency. However, it is the same contingency that also creates agency.

The system remains open to de-construction due to the contingency it produces on its own. In 'Numbers in the Dark,' Calvino's critique of systematicity is more evident. The humanity of error, as against the supposedly unerring mechanical structures, anchors this critique. Fantasy is an important component here. Is the old accountant fantasizing about the error? Do we believe him? Even if there is an actual error in the accounts that infects the entire statistical structure, is the accountant not deluded to think that this error will bring in any serious change?

The error that lies at the core of the entire process of counting will remain unknown and neglected. The world will go on with its business without the least irregularity. Nothing will change for that error. But in the accountant's obsessional fantasy, the erroneous number that grows out of the deep dark nadir of calculation and outgrows the dark is a primordial accumulation of surplus numbers. This mythological excess will haunt the capitalist regime of computation. This phantasm of the error brings mathematics closer to an alternative reality that supplements the capitalist imagination. Mathematics in this literary appropriation, remains committed to political materialism. We are not surprised to know about Calvino's strong association with left-wing politics in Italy.[4] This mathematical fantasy must be seen as an autonomous material structure that has the agency to topple the reality of realistic mirroring. This fantastic autonomy is the exact opposite of the ideological autonomy of technological and instrumental mathematical structures that we have spotted in the first story. This autonomy is an act of liberation. Fantasy has the courage to imagine an alternative to the degenerate capitalist reality. While the previous autonomy was technological, this one is subjective.

Here we return to the question of realism versus autonomy. Let me mobilize fantasy as a political trope that appropriates mathematical thinking in literature. The fantasy trope has a clear connection with mathematics in 'Numbers in the Dark.' It has its place in 'The Burning of the Abominable House,' if we consider Waldemar's computational composition as an extended act of fantasmatic concoction. The infinity imagined by Waldemar creates a literary fantasy. It brackets out system from form. For the mathematician Gabriele

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[4]Calvino was a member of the Italian Communist Party until August 1957. Even after his resignation from the party, he called himself a communist for life. For more see his letters [8].

Lolli who does not approach Calvino's early stories, "in Calvino's work we find examples of products of fantasy that stem from some scientific suggestion" [16, page 50]. Calvino not only treats literature as an extended fantasy based on mathematical science, as Lolli would have it, but he also locates acts of mathematical fantasy in his texts as implementations of autonomous reality. Autonomy from the reality of realism through mathematical fantasy is the political edge of this aesthetic. Waldemar and the accountant in the two stories are human agents who enact a non-realistic and generative notion of literary reality that goes against the correspondence-driven idea of realism. Mathematics becomes their structural and material support to fantasize an alternative and constructivist reality. It evokes a systematicity but only to go beyond it.

The literary fantasies of infinite computers in the first story and an infinitely growing number in the second one, make sure that form is not totalized into a system. These are formalizations that turn mathematics into a literary theme. But the literary prevents these forms from becoming totalistic and totalitarian systems. Literature involves this hesitation between form and system. Be it fantasy or infinity, or the gap between chance and contingency, there are literary forces that do not allow us to christen these deforming forms as systems. Formalization converts the law of chance into contingency. This conversion is the mathematical function of a structure that resists systematicity. Calvino's stories thus become crucial in a historical sequence of late-modernism that uses mathematics to tantalize us with the possibility of a literary systematicity. But it withdraws itself from the positivist trap of turning literature into a consistent and complete system.

The possibility of literature becoming a system is raised but finally left dangling. It is an impossibility that needs to be demonstrated as impossible. This is a double bind. Meillassoux names this tendency, an "*absolutizing* thought that would not be *absolutist*" ([17, page 34]; emphases original). This absolutization without the formation of the absolute, translates into a tension between system and structure (c.f. the Cavallaro quote at the beginning of this article). Structure here is a remnant of form that breaks systematicity. For me, this critical modulation crystallizes one particular efficacy of mathematical and logical structures for European literary Modernism. Mathematical and logical thinking constitute a battleground for the dialectical interplay of form and system, chance and contingency and finally, realism and autonomy.

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