Rhizomes, Forms, Rhythms, and Other Transportation Systems

An Attempt at Introducing Constructalism in Literary Theory

Teodora Dumitru

THE PRESENT study puts forth a novel way of approaching the literary and critical-theoretical fields by drawing on the constructal theory set forth by Romanian-American physicist Adrian Bejan in a series of articles and books written specifically for a lay readership, focusing mainly on *Design in Nature* (2012). The scientific model advanced by Bejan on the basis of what he considered to be a new law of physics offers a comprehensive explanation of the evolution of the living and non-living. The unifying perspective of constructalism is at the same time consonant as well as dissonant with several aspects of the holistic/systemic approaches, ranging from classical systems theory (Ludwig von Bertalanffy) to network theories. My strong belief is that the constructal model can be applied successfully in the field of literary studies, where it could prompt better solutions than the other scientific models that have been already employed by literary critics and theoreticians. The present study should, therefore, be understood as an attempt to test the possibility of introducing the constructalist way of seeing the world in the field of literary studies, as well as in the larger field of the philosophy of art, of culture, of political doctrines, etc.

Following a first introductory section to constructal theory and its underlying law, I suggest two case studies that discuss works which are tangential to literary studies and can benefit from the novel perspective of constructalism: *Mille Plateaux* (1980; transl. *A Thousand Plateaus*, 1987) by Gilles Deleuze and Félix Guattari and *Forms* (2015) by Caroline Levine.

I. WHILE THE laws of thermodynamics underlie the way in which the Earth appears to be in very broad terms, the concrete and ever-changing "physiognomy" of the planet is the subject of the *constructal law*. This law, as Bejan suggested, should

be regarded as a *first principle* of physics (as it cannot be derived from other laws). This particular law governs each and every design/machine/construction/structure that has the capacity to move around or to transport information, mass, matter on Earth, ranging from natural organic or inorganic structures to man-made systems.

Anything that has the capacity to "move mass" on Earth, be it animate or inanimate, should be imagined as "a flow system." This "generates form and structure over time in order to facilitate this flow within an environment that resists movement." Therefore, the constructal law can be defined as follows: "For a finite-size flow system to persist in time (to live), its configuration must evolve in such a way that provides easier access to the currents that flow through it."[1]

A "flow system" exhibits a tree-like structure: the shape of lightning bolts, river basins, the internal structure of lungs, of circulatory and nervous systems. This tree-like pattern emerges throughout nature because it represents an *efficient* design for facilitating flows.[2] And this efficient flow means that useful energy is converted efficiently, i.e., "more work for less useful energy."[3] The efficiency of this conversion is dependent on the continuous improvement of the relationship between various types of "motors" and "resistances," either natural or man-made. The idea of *evolution* itself, of organic and inorganic matter, acquires thus a new meaning: it is the continuous streamlining of the relationship between "motors" and "resistances."

Bejan argues that systems' tendency towards achieving a state of equilibrium as required by the second principle of thermodynamics effects a variety of *two stroke movements*, which, over time, engenders complex hierarchical structures which the author termed "multiscale designs." The two-stroke movement entails a slow flow on short segments and a fast flow on long segments. Hence the tree-like shape or branching-off pattern of flow systems of organic or inorganic worlds. Why then is two-stroke movement efficient? Because it is the ratio required by the action to minimize effort and to maximize performance in given conditions. Therefore, in order to cover a surface/volume with matter, both large diameter ducts as well as small pipes and capillaries are needed; capillaries or large diameter pipes alone cannot ensure the most efficient spread of matter. However, not any combination of slow-and-short and fast-and-long effects a successful flow. In every case, two-stroke movements need to generate their multiscale architectures according to well defined ratios, which engage in an equivalence relation. In other words, between the two flow regimes there needs to be a *relation of quasi-equality* (equilibrium, equivalence): "The time to move fast and long should be roughly equal to the time to move slow and short."[4] The variation of channel dimensions is then correlated with the idea of pulsation or rhythmicity. Pulsation and rhythmicity arise as the flow system gives rise to contrast (branchings, vascularizations, rhythmicity, wingbeats, etc.) in order to deal more efficiently with encountered resistances. The existence of branchings or the identification of a rhythm/pattern, therefore, cues the system to distribute matter in a more efficient way, to balance out imperfections.[5] Overcoming resistances gives rise to branchings, divergencies or, on the contrary, to convergences and the joining of channels of various dimensions.

Multiscale designs appear and evolve continuously at all levels of existence, transforming the map of the organic, inorganic, social, cultural world into an inextricable

overlapping of ever-evolving branchings. The image of superimposed multiscale tree-shaped flows gives Bejan the possibility to put forth an alternative to network theory. He does not acknowledge the existence of flow networks—with approximately equal openings—, but of structures which, despite appearing to be networks, are in fact *superimposed tree-shaped flows* containing the dimensional inequalities which obey the proportions required by the constructal law.[6] This approach could be employed to replace the egalitarian illusion associated with the concept of "network" with the more realistic image of the transportation of information and matter through *superimposed tree-shaped flows*. The advantage of such a substitution would be that it would make much more visible the physically unequal realities and relations between routes, distances and the entities they connect; furthermore, it would draw attention to the origins, convergence or transit points, or hubs in a way that the (false)egalitarian and leveling structure of the "network" does not realize or even hide.

The equivalence between the two flow systems attests not so much to the efficiency, but to streamlining, as a process: fast flow on long segments comes right *after* slow movement on short segments. It is a qualitative leap having the advantage of being able to move more mass than the former by using the same useful energy. Streamlining is, thus, an effect of complexity: *the more profound and extensive the scale effect is, the more efficient the system is*, which, Bejan argues, can always be improved, though never optimal. As such, the evolution from simple to complex has, according to the constructal law, even with reference to the evolution of the animate, a deterministic, progressive (progress meaning streamlining) and predictable character, though not a finalistic or teleological one.

As a result of evolution, of flow streamlining, multiscale designs develop an inherent *hierarchical structure*. This shows the same tendency towards equilibrium peculiar to two-stroke movements, as hierarchy too involves a proportional relation between *short-small-slow* and *long-big-fast* segments: the body contains more capillaries than larger blood vessels; the city has more narrow and short streets than large avenues; a business has more low-ranking employers than bosses/leaders, etc. Viewed this way, hierarchy is the "cornerstone characteristic of natural design"[7] and, understandably, there are no reasons for things to be any different in the case of the narrower fields of the human, social, of artefacts or of "symbolic goods." However, of greater importance for Bejan—as a philosophical frame rather than a conclusion inferred from physics—is the reinterpretation of the concept of *hierarchy* through the idea of the *interconnectedness* and the *collaboration* between the many small and few large.[8] Therefore, "hierarchy" and "interconnectedness"/"collaboration" are dependent on each other. By advancing the thesis of "collaboration" between the different and differences, "large" and "small," "many" and "few," constructalism means to criticize both the Darwinist tradition and its Malthusian, Hobbesian and Spencerian contaminations (in the competitive sense of "the struggle for existence"/"survival of the fittest"), as well as egalitarian ideologies such as Marxism.

Flows in two equivalent strokes = hierarchy = interconnectedness = multiscale design = complexity = streamlining = progress. This is what the ideas of "evolution" and "progress" look like in constructal terms. And the constructal approach on existence *is*, there ought to be too a perspective on literature/arts/culture as well as on the way these are studied.

II. Whether literature per se—fiction works, poetry, etc.—is a type of information susceptible to being dealt with through constructal lenses is still debatable. However, the works that deal with literature (literary criticism, history, theory) or are only tangential to some of the problematics thereof possess a certain potential along these lines. I have initiated the research of this possibility in a previous study, in which I revisited several of Franco Moretti's theories through the lenses of constructalism.[9]

By focusing on the two studies mentioned above I set out to extend the investigation of the possibility to introduce constructalism, as a philosophy based on the constructal law, in literary studies. My belief is that several of the views, explanations of predictions regarding literature that have been advanced in various works of literary criticism, history or theory could be reconfigured or improved if a constructalist approach were to be employed. I am primarily interested in the "constructalization" of writings on literature rather than in literature itself, because the former represents a type of discourse that is more related to scientific discourse and, therefore, can more easily be investigated with the instruments of science.

The authors I selected—Deleuze & Guattari and Levine —despite not being able to know or take note of Bejan's research, provide, in their works, a ground for testing the constructalist reform I put forth. More specifically, I argue that the mentioned authors would have benefitted more from constructalism than they did from the theories they had resorted to, in the sense that it might have helped them ameliorate the epistemological tensions contained by their work or mend the errors of their approach.

1. The case study I start with deals with *A Thousand Plateaus*, Deleuze and Guattari's famous work. I argue that the dissociation underlying the concept of "rhizome"—which is seminal in the aesthetics and theory of postmodernism—can be critically revisited through constructalism. Set by its authors in antithesis to the more traditional concept of "root," the "rhizome" possesses a series of characteristics that are meant to signal the epistemological rupture between radicular and rhizomatic structures. Thus, in contrast to the "root," the "rhizome" refuses a genealogy, namely, the orderly "flow" over time, the relationship with the past, memory, with a hierarchical/tree-shaped perspective of existence, etc., and instead thematizes indeterminacy, disorder, "deterritorialization," chaos-governed spatialization.

However, the constructal view challenges this approach. From a constructalist point of view, rhizomatic structures can only be understood as (sub)assemblies of the circulation of matter/ information in nature. The rhizome is merely a subterraneous plant stem, which, like any other stem, sends out multiple roots. These, in turn, just like any other roots, are entirely governed by a constructal design, meaning that they possess a pivot (a large channel) and the corresponding branching structures (small channels). What is more, according to constructal theory, roots and stems, regardless of their form or dimension, ought not to be imagined in opposition to each other or in succession (the tree-shaped pattern in opposition to the rhizomatic or first the tree-shaped pattern and then the rhizomatic, etc.). They are, in fact, merely sequences of a flow supersystem,

the plants being nothing more than—as vividly and ingenuously suggested by Bejan[10]—*pumps* that draw water from the ground and eject it into nature. Therefore, the chaotic, "deterritorialized" form of the rhizome looks the way it does due to the peculiarity of being a subterranean stem. The constructal theory, alongside botany, might very well offer an explanation for this "contorted" design, which it does not consider to be an antagonist of radicular or tree-like architecture (after all, the rhizome itself has roots, without which it would die). In light of this view, it becomes clear that the rhizome cannot be separated from the other components of the flow system of which itself is a constitutive part. Indeed, it is distinguishable from the roots, branches or other types of stems, though not in the radical way in which the authors of *A Thousand Plateaus* insisted to advance it on the marketplace of ideas.

The observations stated above are sufficient in order to give rise to an efficient critique of Deleuze and Guattari's project of distinguishing between a paradigm of the tree-like pattern type and a paradigm of the rhizomatic type (involving all the consequences that this distinction entails). Even if we were to ignore—though we would have no reasons to do so!—the lack of scientific accuracy in defining the rhizome as an "anti-root" for the sake of opposing it in a seemingly more pertinent way to hierarchical structures (root, tree, etc.), Deleuze and Guattari's "rhizome" would still fail the constructalism examination. For, in order to function as an efficient antagonist of the "root," of hierarchical, tree-like structures, the rhizome should have been forced to appear as being something else rather than a part of the flow system, due to the fact that, as Bejan suggested, any flow system is a fundamentally *hierarchical* mechanism. Nevertheless, this action, seeking a definition of the rhizome which would ignore its quality of being a part of a flow system—and therefore of an hierarchical system—, would have been extremely difficult—technically impossible. However, Deleuze and Guattari do not see thing this way: they do not conceive of the "rhizome" and "root" as joint subassemblies of a *flow system*; they do not notice that the "rhizome" is itself part of a larger hierarchy which governs its design to the uttermost characteristics. And, while it is reticent to do so, to even imagine this possibility, *A Thousand Plateaus* is not able to overcome the level of speculation of some differences that are more or less relevant within a *genus proximum* which cannot ignore the reality that both the rhizome as well as the root are components of a flow system. "In contrast to centered (even polycentric) systems with hierarchical modes of communication and preestablished paths, the rhizome is an acentered, non-hierarchical, nonsignifying system without a General,"[11] Deleuze and Guattari stated. Bejan would criticize such a statement: the "General"—the universal phenomenon that governs design—*exists*, both for the rhizome as well as for other structures of the world: it is the constructal law itself.

In light of all this, it seems clear that the cognitive value of the schizoid perspective on the basis of which the concept of "rhizome" has been advanced via Deleuze and Guattari is prejudiced by the confrontation with the constructal theory. However, to invalidate from a *hard* scientistic position what is nothing more than a metaphor doped in order to emit heuristic surplus value might seem to be a waste of one's resources. Nonetheless, even if it were merely a post factum correction, obtained by means of a last

generation scientific theory, which had not been accessible to the authors of *A Thousand Plateaus*, this critique might be even more useful as the "rhizome" remains a source of inspiration—as well as a source of false knowledge—for contemporary research, becoming quasi-indistinguishable from the *doxa* of post(post)modernity.

Similar theories, mainly originating out of the so-called *French Theory* camp, have already been criticized on account of their scientific inconsistency.[12] My undertaking, which centers around the constructal theory, follows along the lines of the tradition of pointing out or denouncing the lack of scientific accuracy which gave rise to concepts such as Deleuze and Guattari's "rhizome." What determines me to start such an undertaking is the fact that—although problematic from a scientific perspective—the Deleuzian "rhizome" has nevertheless managed to create for itself an enviable posterity, as it is periodically rejuvenated and co-opted in cutting-edge theories in which its presence is, in reality, unjustifiable. One example is the rallying of the "rhizome" to "Network theory," where even the internet is depicted as a rhizomatic structure. Encouraged, indeed, by some ambiguous indications from *A Thousand Plateaus*—"any point of a rhizome can be connected to anything other, and must be"[13]—the depiction of "network" as "rhizome" spread uncontrollably in varied studies across various domains.[14] In most cases, however, there are false similitudes between the two concepts, because, if we were to take in account *all* the assertions contained by *A Thousand Plateaus*, we would find within that same book the arguments that go against the identification of the "rhizomatic" structure with the "network" one (where "network" is, just like "text," a concept with its origins in the "textile" imaginary of humanity). Thus, in the section titled "The Smooth and the Striated," the authors argue that the "*felt*" structure, where the disposition of fibers does not generate a uniform pattern, but rather a chaotic superimposition, corresponds to the parameters of the "rhizome," in opposition to the "*fabric*" texture, which is much more related to the idea of "network," as its loops and segments are disposed in a relatively equal fashion, in an ordered structure. Therefore, for Deleuze and Guattari, whereas the "*felt*" texture—an "*anti-fabric*"—is the prototype of the rhizome, the "*fabric*" texture is different, it is, in fact, a "network." Then, if the "rhizome" is not a "*fabric*," it cannot be a "network" either (although all three of them are anti-hierarchical), therefore, the thesis of the affinity between the "rhizome" and the "network" is ruled out even from the premises of Deleuze and Guattari.

What else can we replace the "rhizome" and "network" with in order to maintain the conceptual motor that led to their weak relationship, namely the correct identification—and, potentially, the proper denunciation—of the essentialist idea of "hierarchy"/"power" and of its structures? We could test Bejan's solution: the multiscale constructal design, the image of the superimposed tree flows of various complexities. It is a solution far superior to the idealizing, pseudo-egalitarian image of the "rhizome" and "network," which manipulates the idea of the non-hierarchical without being able to effectively sustain it. (Moreover, the "rhizome" is a part of a natural flow system, whereas the "network," with its mathematical-ordered structure, much more related to the "*fabric*," is a structure that can hardly be found in nature, as it is mainly present in artefacts.) The constructal approach—though debatable from an ethical or social point of view due to its explicit or implicit statement on the benefits of preserving hierarchical systems—

brings to the attention in a much more realistic way the existence of power structures, which the "rhizome" or "network" models only manage to camouflage (the rhizome) or artificially conceal (the network).

Therefore, constructalism proves to be much clearer and perhaps even more convincing in some cases than any other critical approaches, indicating that the way in which Deleuze and Guattari developed the concept of "rhizome" is scientifically inconsistent. However, my critique has no intention to invalidate the merits of *A Thousand Plateaus*' star-concept or to reprimand its supporters, who can continue to explore the concept of the "rhizome" as a "heuristic device."

2. By reading the work of Marxist literary theoretician Franco Moretti through the lenses of constructalism I reached the conclusion that the author was unconsciously writing within a constructalist paradigm and I subsequently advanced the hypothesis that Bejan too was unconsciously following along the lines of Marxism or dialectic materialism, despite the fact that Marxism and its related philosophies are categorically rejected by the discoverer of the constructal law. Moreover, North-American theoretician Caroline Levine's *Forms: Whole, Rhythm, Hierarchy, Network* leads me towards a similar conclusion. It is a work which right from the title and subtitle promises to be an excellent material for testing the possibility of introducing the constructal approach in literary or cultural theory in a broader sense.

Though, owing to its theory of "forms," Levine fits in the "new formalism" trend, the author set out to put forth a new perspective, a critical one, directed at the manner in which the concept of "form" has been instrumentalized within the various philosophies that claimed to have their origins in formalism or were centered around the idea of "form."[15] Levine's formalist credo cannot be separated from her realist position. "Forms"—be they biological, political, social or cultural, literary—*exist*, persist, make up our identity, they are not operational fictions or *nominalia*.[16] After assuming the reality of "forms," Levine set out, on the one hand, to challenge with new arguments the legacy of poststructuralist relativism and, on the other, to revive the spirit of *new formalism*.

Like Bejan, Levine too aims at a theory of "forms" that extends across multiple domains, culture, society, ideology. Although her approach is systemic, it is clear that it draws especially on Marxist (or Marxist-like) determinism, with a focus on the political-sociocultural level ("no form operates in isolation . . . Literary form does not operate outside of the social"[17] etc.). Levine's novelty consists in speculating the concept of *affordance*, which the author has borrowed from design theory: "*Affordance* is a term used to describe the potential uses or actions latent in materials and designs. Glass affords transparency and brittleness. Steel affords strength, smoothness, hardness, and durability."[18] This concept serves both at overcoming the idealist-essentialist conception of "form" that finds its origin in Plato's works, as well as poststructuralist influence, which advances shapelessness, indefinability, hybridity, indeterminacy, etc. The idea of *affordance* would ensure the "form" a contour that is rigid enough in order to function as a transhistorical item, yet, at the same time, sufficiently lax to make it dependent on a context: "Form emerges from this perspective as transhistorical, portable, and abstract, on the one hand, and material, situated, and political, on the other."[19] Its similarity to

the constructal approach is obvious. Bejan too considers that constructal design can be easily recognized by its forms that pervade all levels of existence; moreover, constructal design functions within parameters that are similar to those of the concept of *affordance*, as it is always encumbered by limits and opportunities, without being able to arise in any conditions. Another feature that brings Levine and Bejan closer is the former's realist and pragmatic foundation of her discourse against deconstructivism, which, claiming to fight against the toxic "power" of some "unities" or "deep structure"—fictional elements generated by the discourses of Power (Michel Foucault)—ends up by proving its inefficiency in practice:[20] "deconstructive methods, while powerful, are not the only effective responses to these models of unified wholeness."[21] Therefore, what constitutes the solution for real social and cultural progress is not the dissolution of boundaries, of contours—of "forms"—as poststructuralists believe, but rather the identification of the various constraints and liberties which are peculiar to "forms" (*affordability*). Limits and liberties that, over time, may generate surprising opportunities for progress and for mending dysfunctions.

While Levine is a realist, she is not a foundationalist: she believes in a multitude of "forms," not only in "deep" or "dominant" ones and, furthermore, there are a multitude of relations that, depending on the context, turn the *high* into a *low*. Therefore, "forms" exist, they are not just operational fictions; but, as we cannot accept to be held under their tyranny, we can dislocate them by means of other "forms." According to the author, real deconstruction—i.e., the useful deconstruction of "forms"—could be operated by constructing other "forms" that ought to confront the previous ones and so on and so forth. At this point, the premises of constructalism and the premises of Levine's version of formalism lead in separate directions: while Bejan's watchword is *Nature*, Levine's is *Power*. While Bejan's thesis is that "nature constructs and deconstructs forms," Levine believes that "at the same time, form constructs and deconstructs *Power*." In fact, these are the most important elements of incompatibility between constructalism on the one hand, and Levine's formalism (as well as Deleuze and Guattari's "rhizomatic" philosophy), on the other: Bejan's strong attachment to the idea of "natural hierarchy" and the literary theoretician's opposing commitment to permanently represent and challenge Power *qua* hierarchy. In this sense, for Levine, the reformation of the formalist tradition is dependent on the reformation of Marxism, an action which would do a better job at refining the mechanisms of challenging Power than it has hitherto done. On the one hand, the error made by the new formalists, in her opinion, stems from the relativistic prejudice which they inherited from poststructuralism and which fed their inability to grasp the reality and persistence of "forms" in space and time. On the other hand, the error of the new formalists has its origins especially in the Marxist legacy, brought about by authors such as Pierre Macherey, Fredric Jameson, Franco Moretti, and others. According to this legacy, (literary, artistic, cultural) "forms" are just "epiphenomena" of economic and social fundaments, which they reflect or reject.[22] Thus, Levine believes that the reformation of new formalism involves a highly improved Marxism, where the issue is not discussed in terms of economico-social base and cultural superstructure, respectively in terms of form (secondary level) and foundation (primary level), but mainly in terms of relations between "forms." For, Levine insists, the political too can be per-

ceived as a "form," in the same manner in which art and literature can also be regarded as first level phenomena, rather than just epiphenomena.

Therefore, the cornerstone of Levine's revisionism aimed at Marxism and the new formalism has to do with the lack of homologous relations or isotopies between social and literary "forms." "Forms" exist, the relations between the social and the literary exist, but they do not mirror each other in the way Marxist-formalists believed. Rejecting the concepts of substance, base, "deep structural forces" as possible antagonists of "forms" and establishing in a prominent position the reality of "forms" and the interactions thereof within certain limits via the concept of "affordance"—this is Levine's innovation in Marxism and, at the same time, of new formalism. Therefore, the political does not subordinate the aesthetic and the cultural; all of them are "forms" that involve each other, on the same level of existence.

However, in light of this, what else is left that makes Levine a thinker in the Marxist tradition? It might be the idea that the political ought not to be ignored, that it ought to be taken into account as being merely a "form," as one of the multiple "forms" of existence? Or the idea of dialectics, understood exclusively as the dynamic aspect of "forms" (as *forms*, *wholes*, *rhythms* "collide" or "can disrupt one another's power"[23])? Or the impression that progress—inseparable, in Levine's view, from egalitarianism—would result precisely from this confrontation of forms? It is quite difficult to answer. However, for Levine, much more important than the pervasiveness of Marxism in her philosophy is the pragmatic commitment, the way in which we could use the dynamic of "forms" in order to generate progress. As a result, not the denunciation of the idea of "whole," but the recourse to "*more* wholes" would constitute, in this sense, a useful strategy. Not the deconstruction of oppressive totalities, as classical or modern Marxists do, but their dismantling into multiple competing micro-forms or "micro-wholes," which would work together towards the idea of a better world.

Even if we were to admit that the perspective put forth by Levine has potential, we still cannot ignore, in the model advanced, the issue of the complete *unpredictability* of the "forms" collision, a phenomenon from which the theoretician suggests that progress would result over time. For, if "forms" come into existence and evolve independent of our will—even independent of the will of dominant political actors at one point—, how can they be co-opted rationally into a revisionist project, based on a strategy, regardless of its nature? As the examples suggested in *Forms*, social change proves to be a phenomenon that is independent of any strategy and noticeable only a posteriori, as the collateral effect of some contingencies. Thus, in the case of the nuns from the Wienhausen convent discussed by Levine, the isolation established by the *clausura* doctrine turned, over time, into centrality, though not as a result of a strategy, but as the effect of circumstances that could hardly be controlled or predicted.[24] In place of the open class struggle, as in the case of classical Marxism, or of the uncompromising and assumed deconstruction of Power, as in the case of poststructuralism, Levine's solution seems to be limited to a wait-and-see strategy, hoping that nature, including society, evolves, regardless of the path taken, towards the balancing out of toxins. (Is this a sample of Levine's "quietism" for which she has already been criticized? It might be.)

Therefore, Levine seems to suggest that some "forms" are toxic, restrictive, etc. in the short term, but, fortunately, they are not the only existent "forms," and the good will, at one point, emerge from their imminent confrontation… Imminent, probably, but also unpredictable. And, due to the fact that the American theoretician established a link between realism and the pragmatic, her problem acquires a *practical* dimension. But, while Levine rejects the deterministic red thread of old Marxism and points towards "forms," hoping that these could reach a confrontation even in the absence of a certain logic that is detectable in history, it is highly questionable whether the opportunities that are generated by the "forms" that entered the confrontation could be noticed and valued in real time; whether they could be rationally trapped and oriented towards a reformist project. It would be a different story if this dynamic of "forms" could be anticipated and helped to express itself, if an evolutionary path, for example, could be identified. Constructalism has the power to offer Levine what she has lost when she was trying to mend Marxism or its 20th and 21st century avatars: a *logic* of the evolution of "forms" in nature, history, society, literature. In fact, in Levine's view, literature does function as a formal guide specialized in the identification of the dynamic of "forms," which is equivalent to a dynamic of "forces." (Following along the lines of physicist D'Arcy Thompson, Moretti too invoked in *Graphs, Maps, Trees* the idea of "form" as a "diagram of forces.") Levine suggests that the experience in interpreting literature, the skills of a meticulous formalist able to identify the mechanisms of a narration or of a poem could prove their usefulness on the sociopolitical level too. Literature could thereby be understood as a (better) strategy conductor than other types of discourses. Or, in case that "strategy" is much more of a rationalist or voluntarist concept than Levine's philosophy of "forms" can tolerate, at least as a screen that is much more transparent than others when it involves the identification of the dynamic of "forms." Far from the subordinate position of a mere epiphenomenon, a position reserved for literature within classical Marxism, the literary/ aesthetic thus manages to gain a surprisingly high position: it provides know-how to the other domains of the sociocultural life—"a method that builds on what literary critics have traditionally done best—reading for complex interrelationships and multiple, overlapping arrangements."[25] Pulsation or the flow rhythms which Bejan invoked could also be found in the rhythm of the literary space-time, which Levine regards as a very good connection between the aesthetic and the social. She scrutinizes the history of literature and the skills developed by working with literary texts and then looks towards society, where it identifies *forms*, *rhythms* and *collisions* of "forms," which could never draw attention to someone who is not acquainted with what Bejan calls "multiscale" designs and Levine—"complex interrelationships and multiple, overlapping arrangements."

However, the potential harmonization of the constructal philosophy and the new formalism as it is put into practice by Levine can become effective, having real and pragmatic efficiency, only if that evolution of literary "forms" which she considers to be useful in identifying the dynamic of sociopolitical "forms" is given a direction, preferably one that is convergent with the direction of evolution of other domains of existence. This direction might be given/provided by the constructal law: the purpose towards a more efficient flow of matter and information with regard to the variables of an era and of a society—including, there is no reason not to, the "forms" and structures of Power.

Following the analysis of the works of Moretti (contained in the study published in *Theory in the "Post" Era* and mentioned above) and Levine—both connected with Marxism—, I have to state that, although it claims the exact opposite, constructal theory could also be a good epistemological companion for the authors with clear affinities with Marxist thinking.

IN THE case of Deleuze and Guattari, constructalism provided the premises for a more powerful critique of the concept of "rhizome," enhanced by arguments that had not been previously available on the marketplace of ideas. Constructalism could offer Caroline Levine what she has lost while she was trying to improve Marxism(s) and the mechanic of the dependency of the cultural "superstructure" to its economic base: a common purpose for the evolution of literature and society, with the mention that both of them, society and literature, ought to be regarded as *nature/instances of nature*, therefore a part of a systemic, planetary evolution towards the streamlining of the transport of matter and information.

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Notes

1. Adrian Bejan and J. Peder Zane, *Design in Nature: How the Constructal Law Governs Evolution in Biology, Physics, Technology, and Social Organizations* (New York: Anchor Books, 2012), 3. Zane is a specialist in journalism and communication studies.
2. Bejan and Zane, 3.
3. Bejan and Zane, 34.
4. Bejan and Zane, 148.
5. Bejan and Zane, 56.
6. Bejan and Zane, 163–164.
7. Bejan and Zane, 130.
8. Bejan and Zane, 48.
9. I advanced a constructalist view of several of Franco Moretti's theories in Teodora Dumitru, "Constructalism: Literary Evolution As Multiscalar Design," in *Theory in the "Post" Era: A Vocabulary for the Twenty-First-Century Conceptual Commons*, eds. Alexandru Matei, Christian Moraru, and Andrei Terian (New York etc.: Bloomsbury Academic, 2022), 35–54.
10. Bejan and Zane, 111.
11. Gilles Deleuze and Félix Guattari, *A Thousand Plateaus: Capitalism and Schizophrenia*, translation and foreword by Brian Massumi (Minneapolis–London: University of Minnesota Press, 1987), 21.
12. See Alan Sokal and Jean Bricmont, *Fashionable Nonsense: Postmodern Intellectuals' Abuse of Science* (New York: Picador, 1998); Jacques Bouveresse, *Prodiges et vertiges de l'analogie: De l'abus de belles-lettres dans la pensée* (Paris: Raisons d'Agir, 1999).
13. Deleuze and Guattari, 7.
14. See the concept of "Network society," advanced by Manuel Castells—*The Rise of the Netwok Society* (Malden, MA: Blackwell Publishers, 1996)—and Jan van Dijk, *The Net-*

work Society: Social Aspects of New Media (1999), 4th edition (London etc.: SAGE Publications, 2020). For more recent approaches, see Matt Bluemink, "The Web As Rhizome in Deleuze and Guattari" (https//:bluelabyrints.com/2015/07/15/the-web-as-rhizome-in-deleuze-and-guattari), where internet is understood as a "rhizomatic" structure, i.e., anti-hierarchical, egalitarian, and Roar Høstaker, "The Rhizome, the Net and the Book," *Empedocles: European Journal for the Philosophy of Communication* 8, 2 (2017): 151–165. The type of egalitarianism that the "network"/internet gives rise to continues to be a disputable hypothesis as long as access to relevant information is, in fact, still hierarchical and influenced by many conditionalities.

15. For Levine, the formalist tradition mainly consists of Anglo-Saxon and French theories from the latter half of the 20th century. The way she ignores the contributions that stem from the outside of this fields—the Russian Formalist School, as well as several other groups from 19th and 20th century Europe interested in the theories of "forms" in art and literature—limits the scope of her approach. For a broader critical perspective, see the texts on Caroline Levine's *Forms: Whole, Rhythm, Hierarchy, Network*, PMLA 132, 5 (2017): 1181–1243.

16. Caroline Levine, *Forms: Whole, Rhythm, Hierarchy, Network* (Princeton–Oxford: Princeton University Press, 2015), 36.

17. Levine, 7.

18. Levine, 6.

19. Levine, 11.

20. It is a criticism which Levine herself had to handle when she was accused of favoring a "political quietism" that goes against the pro-change type of direct action—see Carolyn Lesjak's criticism which Levine rejects by arguing that radical change is inseparable from a correct identification of the dynamic of forms: "But in fact the primary goal of this formalism is radical social change. All politics, including revolutionary political action, will succeed only if it is canny about deploying multiple forms" (Levine, 18).

21. Levine, 27. Levine does not manage to completely suppress her attraction towards the legacy of poststructuralism either. At the beginning of the chapter titled "Network," she invokes Deleuze's "rhizome" model, which she associates in a predictable manner with the idea of "network." However, it is not "networks" or "network clusters," as Levine suggests, that should be identified in the architecture of the "forms" of existence, but rather the "superpositions of trees" or "multiscale designs" indicated by Bejan. Distinguishing between these two concepts may have important consequences for contemporary epistemology. Even Levine's interpretation could be better argued for by the image of superimposed tree flows rather than by the concept of "network."

22. Levine, 12, 14.

23. Levine, 36, 37–39, 139–140.

24. Levine, 37.

25. Levine, 23.

Abstract
Rhizomes, Forms, Rhythms, and Other Transportation Systems:
An Attempt at Introducing Constructalism in Literary Theory

The present study sets out to integrate the constructal theory set forth by physicist Adrian Bejan's in his *Design in Nature* (2012) with literary theory. To this end, I selected two works that have the potential to engage in a fruitful dialogue with constructalism: Gilles Deleuze and Félix Guattari's *Mille Plateaux* (1980) and Caroline Levine's *Forms* (2015). Though seemingly divergent, due to the fact that constructal theory focuses primarily on the physical world, while the abovementioned books deal mainly with "symbolic goods" (Pierre Bourdieu), their approaches afford real conversations and the possibility of an advantageous solution exchange.

Keywords