Nathan Brown. *The Limits of Fabrication: Materials Science, Materialist Poetics*. New York: Fordham University Press, 2017. Pp. vii + 296 (hardback).

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What are the materials of poetic writing? How are they configured? And how are we able to track in and after modernism the way avant-garde poetics stretched the limits of poetry's material form? Nathan Brown's outstanding and challenging *The Limits of Fabrication: Materials Science, Materialist Poetics* (2017) attempts to answer these questions, offering a powerful revisionist literary history of the legacy of modernism's scrutiny of the very matter of poetry. "In *The Limits of Fabrication*," Brown writes,

> I study a vector of postwar and contemporary poetry and poetics broadly situated within what has been called "the Pound tradition." This is work that affirms and carries forward the commitment of the avant-garde not only to inventing new poetic forms but to doing so through engagement with "the raw materials of poetry." (12)

This phrase, "the raw materials of poetry", appears in a number of canonical modernist poems, for example Marianne Moore's 1919 version of "Poetry" and Louis Zukofsky's *"A"*. But it also signifies the level at which Brown analyses the modernist legacy: poetry in its raw, indifferent materiality.

Yet Brown's literary history has a larger course to steer: it seeks to intervene in philosophical debates surrounding the notion of *poiēsis*. At the close of the sixteenth century, Sir Philip Sidney noted that where the Romans nominated the poet *a vates*, a "diviner, foreseer, or prophet," the Greeks nominated her instead a *poiētes*, a maker—someone engaged in the practice of *poiēsis*.[1] But a maker of what, exactly? Drawing on his classical Aristotelian education, Sidney answers that the poet brings forth something akin to a mimetic making: "that is to say," he writes, "a representing, counterfeiting, or figuring forth—to speak metaphorically,

[1] Sir Philip Sidney, "The Defense of Poesy," in *The Norton Anthology of English Literature, Volume B: The Sixteenth Century, The Early Seventeenth Century*, 8th edn, ed. George M. Logan, Stephen Greenblatt, Barbara K. Lewalski, and Katharine Eisaman Maus (New York/London: W. W. Norton & Company, 2006), 955.

a speaking picture—with this end, to teach and delight."[2] Poetry *makes* a new nature. It figures this new nature precisely by dissimulating what is given in the natural world. The question of the poet as maker was also treated by Martin Heidegger, for whom *poiēsis* denotes a kind of poetic "building." Yet as Heidegger is at pains to clarify in "Poetically Man Dwells," poetry is not a "building" that has anything to do with building houses or with material construction.[3] Instead, this is "*poiēsis* [as] bringing-forth or revealing; it is a modality of letting-appear or letting-dwell, and as such it is not understood as making, as manufacturing, or construction" (11).

If this view of *poiēsis* dominates the way it has been thought, Brown's rich book tracks the contrary position, contrary not only to the tendency to read in modernism a preoccupation with idealism but also to the binding of *poiēsis* with philosophical idealism broadly conceived. "This book returns to a familiar idea," he writes, "that poetry, *poiēsis*, is a practice of making. It takes a materialist position on this claim by treating poetry as a practice of material construction. And it seeks to make this claim new by situating it in an unfamiliar context: at the limits of fabrication" (11). To fabricate is to construct and manufacture, and this term becomes the key rubric under which Brown posits a materialist account of *poiēsis*. One of the key interventions of this book is not only to understand how poetry engages in practices of material fabrication, but also how contemporary techno- and nano-science does. With scholarly rigor, Brown's book tells the fascinating history of the development of materials science, showing how this discipline engages in the same kind of structural practice of fabrication as poetry. The two disciplines find common ground not by way of analogy, but rather through their shared structural practice.

Brown opens his literary history by reading Charles Olson: in fact, Olson becomes *the* crucial reference point for late twentieth- and twenty-first-century poetic materialism. To this end, his reading of the poet is striking: "Olson's poetry is usually classified under the label 'Projective Verse,' 'Open Field Poetry,' or 'Black Mountain Poetry,'" Brown writes, "[b]ut what if we think of his work in

[2] Sidney, "The Defense of Poesy," 958.

[3] Martin Heidegger, "Poetically Man Dwells," in *Poetry, Language, Thought*, trans. Albert Hofstadter (New York: Harper Collins, 1971), 144.

terms of the other name that he *also* gave to his poetic practice: *objectism?*" (57). Contrary to a long critical tradition that finds a residual Romanticism or humanism in Olson's poetry, Brown tracks the influence of philosopher Alfred North Whitehead on the poet to offer "a materialist account of Olson's 'objectism' as a 'stance toward reality' that situates the body and the poem in 'the larger field of objects,' rather than situating the larger field of objects within the parameters of a distinction between the human and the nonhuman" (59).

Olson was fascinated by new scientific discoveries, and Brown shows that Whitehead was Olson's "primary guide to what we know in the wake of post-classical science" (65). Whitehead's philosophy was informed by developments in post-classical science, and none seemed more important to him than the overturning of the doctrine of "simple location." Against the idea that things are situated in a determined space and time, Whitehead makes the striking claim that "every location involves an aspect of itself in every other location" (65). In other words, post-classical science forces thought to understand how any entity—or what Whitehead calls any actual occasion or actual entity—is at once "locally *specific*" and "*open* insofar as those entities are, in some sense, 'ingredient throughout nature'" (66). This finds resolution in Whitehead's philosophy through his "principle of intensive relevance": actual entities participate in a common world—they are constituted by that world—and yet their discrete unity is "a result of the graduations of relevance of the determinate relations by which they are constituted" (66).

Brown suggests that Olson takes up this idea through the category of measurement: unlike his contemporaries, the poet believes that "measure is posited [...] as a process immanent to material relationality, not as a detached quantitative standard" (69). When Olson writes of the outdatedness of the iamb or of the way in which the metrical field is tied to the larger field of objects, Brown suggests that he is in fact rejecting the idea of a fixed metrical form, as well as the idea that experience is too free or unique to be constrained by metrical writing. Instead, Olson wagers that each discrete object has its own unique measure, including the human, with no single one having ontological priority over the other. This is perhaps the greatest literary historical point Brown's book has to make. If as Marjorie Perloff has famously written, the unconscious axiom of mid-twentieth-century American poetics is "Free verse = freedom; open form = open

mind, open heart" (67), then the influence of Whitehead on Olson demonstrates he thought the opposite: measure is not the expression of a singular feeling, but rather constrained by an internal measure that inheres in physical objects.

What we find in Brown's reading, then, is an inverted image of Olson: he is not a residual Romanticist or humanist but rather a rigorous materialist, one who attempts to account for the singularity of real objects in an open field—to save, as Brown writes in a phrase that occurs throughout this book, "the object from objectification" (195). Yet the question of poetry's material form does get somewhat lost in this chapter. Brown focuses primarily on reading Olson's poetry at the level of the poetic image, and it is not until his next chapter on Ronald Johnson's *ARK* (1991) that we get a taste of just how carefully Brown treats the material dimensions of poetry. Where Olson figures his philosophical materialism at the level of the image, Johnson tentatively practices instances of such a materialism at the level of language itself.

In this chapter, Brown tracks the influence of the polymath Buckminster Fuller on two distinct but intertwined events: the discovery in 1991 of carbon nanotubes, the "most important and commonly used nanoscale materials" (98), and the completion of *ARK*, Johnson's long architectural poem. "Bucky" was something of a "self-made renaissance man" (100) in 1940s and 1950s America: he worked in the field of science, applying complex post-classical geometric principles to material constructions, and taught at the Black Mountain College at the end of the 1940s. Fuller was also something of a philosopher and published a two-volume work entitled *Explorations in the Geometry of Thinking* (1975). Reading Fuller's philosophical works, Brown extracts two key terms: "synergy," which designates the manner by which whole systems may behave independently of their parts, in ways that are incalculable from the standpoint of their individual parts, and "ephemeralisation," which denotes how those parts themselves perform. Yet this dialectic between the whole and its parts is subordinate in Fuller's philosophical system to his eternalism. Whereas Olson, *pace* Whitehead, attempts to account for things in their discrete singularity and relationality, Fuller holds that the fundamental concept of design at work in his philosophy is eternal, universal, intellectually accessible, integrated, orderly, and perfect—in other words, transcendentally operative.

This principle extends well beyond Fuller's presence at the Black Mountain School. In fact, Brown dedicates much of his chapter to showing how these very principles are at work in contemporary nanotechnology through the discovery of "fullerenes": carbon nanotubes that are so strong, they can be used as the building blocks by which material self-assembly can occur, a limit for nanotechnological fabrication. Brown tracks the influence of Fuller on contemporary ideas in materials science, and he also provides a devastating critique of the ideology motivating some areas of this science. He argues that Fuller's eternalism allows techno-capitalists to align their practices with a certain idea of the natural. If design is a transcendental principle—a condition of nature itself—then the capitalist is able to find in nature a legitimisation of their work. This is, however, a legitimation that they themselves have forged *a priori*.

Johnson's *ARK* also takes its influence from Fuller. Completed in 1991, the poem belongs to the genre of the modernist long poem. Yet Johnson renders his poem in unique terms, seeing *ARK* as literally an "architecture," an instance of self-assembly that "composed itself" (131). This is precisely where Fuller and Brown meet, in their conception of the part and the whole, the synergetic and the empheral, the microstructure and the macrostructure. However, as Brown further notes, not only was Johnson influenced by Fuller, he was also enamoured with the "folk" (130) architects Simon Rodia and Ferdinand Cheval, both of whom lend Johnson the idea of thinking about his work as a 'construction'. The poem itself is constructed via ninety nine different sections that fit into three books, each of which have thirty three parts. Indeed, this is another moment where Johnson shows affinity with Fuller: both have a "common devotion to *a priori* principles—numerological commitments—determining the articulation of a structure" (132).

Brown's reading of Johnson is formalist: he focuses on Johnson's use of lineation, for example, to point to the presence of poetic idealism in his work. He also moves away from thinking about the poetic image, arguing that *ARK* self-consciously highlights the material dimensions of language, the way in which language can be fabricated at the material level. Although Johnson goes further than Olson in manipulating the indifferent materiality of language, his poetics oscillates between a material prioritising of the letter and a linguistic idealism. In fact, Brown argues that this very tension is internal to his poetics. Through reading another section of

ARK, Brown gives the name "transcendentalism" to Johnson's poetic practice: "if the dictum of objectism is 'every sign is an object,'" he writes, then

> the dictum of transcendentalism is "every object is a sign". [...] For a materialist poetics, the value of the letter is precisely that it doesn't "stand for" anything else. For the transcendentalist, on the other hand, every physical form is a "memoranda," a "hint," and a "signature." (145)

In the next chapter, Brown pushes his materialist literary history by reading Christian Bök's *Crystallography* (1994/2003) and Caroline Bergvall's *Goan Atom* (2001), arguing that each offers a radicalised account of Olson's objectism. And just as Brown demonstrates the influence of Fuller on Johnson, he also convincingly shows how Bök and Bergvall do so in dialogue with another branch of materials science, namely crystallography. Brown's chapter is in part concerned with the manner in which crystallography shaped the evolution of molecular biology and how, in turn, Bök and Bergvall's books are "poems of this climate" (158). Crystallography is a controversial branch of experimental science that seeks to examine the atomic structure of crystalline solids. If this once again seems far from the domain of poetry and poetics, then Brown's careful historicisation demonstrates the opposite. By basing his poetry on the idea that language functions autonomously from human usage, Bök combines an inhuman understanding of language with a pre-biological understanding of crystallography, and the result is a kind of radical reformulation of Olson's objectism. This is where Brown's revisionist history is so rewarding, as he is able to track the influence of Olson's poetics through and even beyond the twentieth century:

> While Bök's is an objectist poetics insofar as he would seem to agree that composition "is a matter, finally, of OBJECTS," his objectism differs from Olson's insofar as it is not the body that provides the rhythmic measure of formal coherence in his poetics. The formal law of Bök's constraint-based objectism is not to "stay inside himself" but rather to rely precisely upon those "artificial forms outside himself" that Olson rejects as antithetical to projective verse. (177)

Brown calls this *subtractive* objectism: the lyric voice is subtracted, taken away, excised from the organic body and from the subjective experience that may be its

vehicle, displacing in turn "romantic conceptions of *organic form* associated either with the integral rhythmic coherence of traditional meter or the lyric spontaneity of free verse" (159). This avowed anti-Romanticism suggests that the poet is not an author in the traditional sense, not a driver of transmissible intentionality, but rather "an object in the larger field of objects." Brown thus focuses on the ability of language to replicate, self-modify, reorganise, and fabricate itself in his careful readings of Bök's crystalline poems.

Bergvall's *Goan Atom* offers another materialist modification of Olson's objectism. "Like Olson," Brown continues, "Bergvall evidently wants us to consider the page as a relational field on which signs are not just written but configured, where their status as differential units depends on their distribution in space" (191). Bergvall's book opens with letter grids: a series of seemingly random letters placed in a grid across the page, which in the following poems are then reorganised into words. If the letters *c, o, g*, and *s* appear in the grid, then Bergvall bundles them together to construct a poem entitled "Cogs." We are here in the same territory as Bök: "the formal structure of [Bergvall's] book, its division into titled sections and numbered pages, is inextricable from the spatial arrangement of the material units of which it is composed" (192). Yet where Bök utilises the analogy between his work and crystallography to wage a war against the lyric "I," Bergvall charts a different course. Her objectism is performative, engaging with biological and biotechnical accounts of the body:

> Bergvall's is a poetics of articulation and disarticulation, in which the anagrammatic and combinatory play of her language both mimics and parodies the disintegration of the organism and the reconfirguration of biological components by biotechnology. (158)

She achieves this by challenging contemporary technoscience, but also using its methods "through a practice of compositional *détournement*." To cite one example, *Goan Atom* contains pages made up only of small ink-blots. These blots call our attention, Brown notes, not only to the individuated letters that comprise the artificial unity of words, but also to the materials that make up those units. "Bergvall's feminist poetics merges with her materialism here, as the menstrual thematics punctuating *Goan Atom* figure these blots as an instance of textual spotting" (192). These moments demonstrate how the material configuration of

the body—and the biopolitical mechanisms organising those configurations—are challenged in Bergvall's poetry, and more radically still how the possibility of reconfiguration can be materially actualised.

Brown's moving final chapter reads the lesser known Shanxing Wang's *Mad Science in Imperial City* (2005). His reading is based around a phrase that adorns the opening of *The Limits of Fabrication*: "work nano, think cosmologic" (216). But where this may at first seem like nothing more than a slogan—satirising the bathetic injunction of capital to "start small, dream large"—Brown uses it to frame the central problem of Wang's collection: "how to take the measure of a wound" (216). The sense of the word "measure" here is extra-metrical, concerning not simply poetic metre but also the way that a measure is taken to accord for an imminent event or occasion. And the stakes are high: "Wang's book makes clear," Brown writes, "that the wound in question not only belongs to a person or a place; the wound of which his work takes the measure inheres in history" (216).

Wang moved from Beijing to Berkeley in 1991 to pursue a PhD in mechanical engineering and then took a job as a Professor in the field of nanoscale fabrication at Rutgers. After some years retraining in creative writing, he quit his job to become a poet. As Brown notes, we see this very opposition between Wang's former and current occupation at play in his book: peppered with mathematical diagrams and formulations, Brown reads *Mad Science in Imperial City* as a work that blurs the lines between working and thinking, between Wang's previous work as a nanoscale engineer and his practice of poetic fabrication, between manual and intellectual labour. It is in this regard that Wang's work takes on a political cadence. Wang was politically active throughout China in the 1980s, and Brown suggests that Wang employs his "scientific knowledge to grapple with the traumatic conclusion of his political commitment in the 1980s and his experience of parallels between totalitarian China and the political climate of the United States following September 11, 2001" (217).

Brown's reading focuses on how Wang's former occupation is incorporated into his work, how this occupation informs his own practice of poetic fabrication. One way concerns the role of abstraction. Against Pound, who famously announced that the poet should "go in fear of abstractions" (216), the final section of *Mad Science in Imperial City*, entitled T-Square, concerns the inscription of abstract

space: the T-Square is a device used to inscribe lines on paper, but it also signifies country, city, nationality in an abstract sense. "In *Mad Science*," Brown writes, "the imperial city becomes any-city-whatever, New York or Beijing, as the repression at Tiananmen comes to map the space of a global world order within which there is nowhere else to go, however far one travels" (231). And yet the two cities that the T-Square connotes—Times Square and Tiananmen—are not "any-city-whatever," but rather those cities that have been wounded. Wang thus attempts to write that trauma, that abstraction, into the body itself.

But how? If this abstract wound always escapes concrete determination, then it cannot be figured in natural language; rather, it has to be configured, fabricated, materially constructed. And this brings us back to the problem of writing, of poetics. For Wang, the idea that natural language would be able to write this wound is rejected. "Rather," Brown argues, "the problem is how to present the problem itself—how to *formalise* the irrationality of a gap that cannot be said and how to approach the longing to say it, in writing" (236). The answer to this formalisation lies in the mathematical symbols and formulations that permeate Wang's text: such symbols are written in "the common language of the nano and the cosmologic, mathematics" (237). It is precisely the ability of mathematics to formalise that which cannot be grasped, the wound of history itself, that grants Wang's poetics its singular force. "Where the image fails," Brown states, "there mathematical inscription intervenes" (240). This chapter thus completes a powerful literary history: where we started with Olson's image, we end with Wang's formalisation. Inhuman mathematics—that use of language which precisely escapes the problems of interpretation haunting natural language—is the tool by which poetic fabrication takes place.

To end, I want to offer a critical comment not in order to question the success of this excellent work, but rather to query one of its central concerns: namely, with how closely we are able to read the raw materiality of poetry. And to do this, I want briefly to think about the relationship between the material and the ideal. Brown's idea of materialism is historically developed by identifying lines of continuity that exist between poetry and science. His reading strategy matches this materialism. Brown filters his readings in part through Steve McCaffery's concept of the "protosemantic." An Olsonesque poet and theoretician, McCaffery attempts

to account for what he calls the "rumble beneath the word."[4] His aim is not to understand the scientific dimension of how language's ideal state can be theorised, but rather how language, when placed under pressure by literary writers, misbehaves and acts out in ways that cannot be captured by rule-governed accounts of language. He names this rumble the "protosemantic": the elements of literary language that are prior to meaning, underneath the signifier/signified relation, micro-poetic. Brown's materialist reading practice lies in how he, literally, puts literature under the microscope, attempting to analyse the protosemantic atomic units that operate prior to phonemes, graphemes, lexemes, etc.

This is no hard and fast rule: Brown is aware that if at times these poets seem resolutely materialist, at others they appear idealist. However, I do want to suggest that this tension sometimes goes unacknowledged—the tension but also the collusion between materialism and idealism. Take, for instance, his reading of Christian Bök, one of the few instances where the poet is seen to be engaged in an almost exclusive linguistic materialism. Brown suggests that Bök gives to language an inhuman autonomy, one in which letters themselves reveal a capacity for self-assembly. Citing the first line in *Crystallography*—"A crystal is an atomic tessellation"—Brown writes that this "will be a book in which the *particulate* materials of language will exhibit their own self-organising capacities, structural properties, and chemical dispositions" (161). This reading allows Brown to claim that Bök subtracts the lyric "I" from his verse, and indeed even the last vestiges of Romanticism. Although his position wavers throughout this excellent reading—as he comes to locate the residue of the "organic body" in *Crystallography*—I am not entirely sure that Bök is as successful as Brown suggests. As is well-known, Bök was displeased with the book's first publication run, claiming that it did not accord to the design specifications he initially envisioned. He then re-designed the book and it was re-published almost a decade later. Such careful planning—such precise specifications—do add something of an ambiguity to Bök's project: although his poetry may appear to subtract the lyric "I," we might say that this very intrusion of authorial intention into the book's design, an intrusion that Brown himself makes mention of several times, brings with it the trace of the very

[4] Steve McCaffery, *Prior to Meaning: The Protosemantic and Poetics* (Illinois: Northwestern University Press, 2001), xix.

thing supposedly subtracted. I do not wish to suggest that authorial intention offers an insurmountable hermeneutic horizon, but I do want to mention that the relationship between what the text does and what it has been designed to do raises questions about the protosemantic as a category. Could we not say, for instance, that Bök's design specifications—not to mention his critical work on the history of science, which Brown draws on at various points in the chapter—allow us to view his representation of language's capacity for self-replication as precisely that: a representation, a moment where the materialist dimensions of the text are always already mediated by the semantic horizons determined in advance by Bök? Could we not say then that his poetry is circumscribed by an organising ideality that supports its material form?

Let me briefly describe one further instance where the same problematic is at work, namely in Brown's beautifully executed "Prologue." Here he delivers one of book's signature moments: a description of the ontological possibilities afforded by nano-technology on the one hand, and a stunning reading of the protosemantic elements in Emily Dickinson's "You there — I — here —" on the other. Dickinson, however, seems an unexpected choice. Although she has been a point of fascination for the L=A=N=G=U=A=G=E poets, thanks in part to Susan Howe's *My Emily Dickinson* (1985), she nonetheless sits firmly outside the lineage Brown describes, writing in the nineteenth-century tradition of American lyric poetry.[5] The crux of Brown's reading concerns the role of the "shifter" in the poem. Focusing on the line "You there — I — here," Brown suggestively notices that in the facsimile copy of the original poem the two separate dashes surrounding the "I" can be seen to transform into the crossbar of the "t," meaning that the second half of the line, "— I — here —," results from the protosemantic material of the "there." He writes that,

> In Dickinson's line, the paragram operates on a scale below that of even the letter and the phoneme—indeed, below the level of the grapheme [...] Dickinson's "t" transforms into "I" as the crossbar of the former splits in

[5] However, as Virginia Jackson has shown in *Dickinson's Misery: A Theory of Lyric Reading* (New Jersey/Oxfordshire: Princeton University Press, 2005), there is a sense in which the category of the lyric has been anachronistically read into Dickinson's work.

> half to form dashes that both separate and conjoin the vertical stroke of "I" with the remainder of this rupture, "here." (8-10)

Here, Brown points out the rumble beneath the word, the indifferent materiality of Dickinson's writing that lies on the cusp of semantic transformation.

As interesting as this reading is, it is important for any materialist reading to acknowledge the particularity of the materials used. Dickinson is not engaged in thinking about post-classical science or the self-organising capacity of language, nor is she designing her work for the printing press. Her material is of a very different nature: it is that of the pen and the page, the place where the author's signature finds its written expression. Although again I do not wish to suggest that authorial intention must "anchor" (24) any reading of a textual object—an idea Brown discusses critically in the opening of his work—I do think that when Brown reads the facsimile copy of Dickinson's poem, he invokes a number of predetermined semantic possibilities that guide in advance what can be said of Dickinson's linguistic material; possibilities determined by the interaction, in this particular instance, of author, mind, pen, and page. Even if aspects of Dickinson's material appear indifferent, protosemantic, or prelinguistic, that appearance is only made possible by an already inscribed interpretive framework that precedes the movement of her prelinguistic atomic units. To put this in other terms: the movement Brown describes between the first and second half of the line arises not by accessing the material units of language that are prior to meaning, but rather by basing the identity and movement of those units on a fixed semantic horizon. And in this case, the personal nature of her material constitutes that horizon. The protosemantic material of "I cannot live with You—" is founded upon that very seepage of the lyric "I" Brown wishes to occlude, the place where mind meets page, signifier meets signature—the residue of Romanticism.