

Pitfalls and Opportunities of Contextual Explanation: The Case of Isaac Beeckman's Invention of the Mechanical Philosophy

John A. Schuster, *University of Sydney*

Abstract: This study deals with some pitfalls and opportunities of contextual explanation in the history of science by examining the case of Isaac Beeckman's invention of corpuscular-mechanical natural philosophy. It makes use of ideas about contextual explanation—its dangers as well as more fruitful avenues of approach—that the author has expressed elsewhere in studies of Descartes's intellectual biography, the historiography of the Scientific Revolution, and the internalism/externalism debate, as well as in articulations and criticisms of post-Kuhnian developments in the history and sociology of science.

In the 1610s Isaac Beeckman constructed a corpuscular-mechanical natural philosophy. With the exception of Thomas Harriot, Beeckman was the first to produce this new species of natural philosophy. The key to Beeckman's innovation lay not in his matter theory but, rather, in what I term the “causal register” of this natural philosophy—his epochal move of embedding a mechanics in the core of the natural philosophy to run the atomic show. Placing a mixed mathematical science like mechanics inside a natural philosophy actually meant that the mixed science was “physicalized,” not that the natural philosophy was mathematicized. Beeckman and Descartes called this kind of move “physico-mathematics.”¹ This challenged the neo-Scholastic Aristotelian “rule” that the mixed mathematical sciences were to be treated as instrumental only, oriented to problem solving and not relevant to natural philosophical questions of matter and cause. Two other characteristics of Beeckman's corpuscular-mechanism figure in the problem of explaining its genesis. First, Beeckman's corpuscular-mechanism bespoke the values of utility and active domination of nature. Second, Beeckman eschewed metaphysical or theological legitimation for his corpuscular-mechanism. It was grounded in something else—his particular appeal to, and application of, Ramism.

Obviously, we cannot explain Beeckman by emulation of (nonexistent) earlier corpuscular-mechanists or by “influence” from a revived ancient atomism, which was not “mechanistic.”

John A. Schuster is a Research Fellow in the School of History and Philosophy of Science and the Sydney Centre for the Foundations of Science, University of Sydney, and Honorary Fellow at Campion College, Sydney, the only independent liberal arts college in Australia. He has published extensively on Cartesian science and natural philosophy, the Scientific Revolution, the myth of scientific method, and historiographical issues in the history of science. He is a Fellow of the Australian Academy of the Humanities. john.schuster@sydney.edu.au.

¹ John Schuster, *Descartes-Agonistes: Physico-mathematics, Method, and Corpuscular-Mechanism, 1618–33* (Dordrecht: Springer, 2012), pp. 56–59, 108–128, 167–209.

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Thus, as most historians of science would agree, he is a good specimen through which to study the wider, contextual shaping of this natural philosophy. But we must carefully unpack the possibilities and pitfalls of contextual explanation.² Two heuristic guidelines must be honored when essaying a contextual explanation. In Beeckman's case the first guideline runs as follows: *Beeckman did not produce corpuscular-mechanism because he was "influenced" or "imprinted" or "shaped" by contextual features.* We have learned not to indulge in such vulgar, indeed impossible, historical notions. When an actor constructs something qualitatively new, he does it by active adoption and modification of resources—conceptual, material, normative—somehow available to and thinkable by him. Creators and innovators are actors, not cultural dopes.³ This rule protects against arbitrarily selecting this or that bit of context as the singular *explanans* that caused, shaped, or influenced the *explanandum*. But it also points us to something else, more subtle, which amounts to a second heuristic rule: *When attempting the contextual explanation of a significant discovery, claim, or invention, always look first for the relevant "proximate" context in which the actor was working—that is, the tradition, field, or discipline in question.* Contextual explanation must be executed "from the inside out." But this "inside" must be conceptualized, indeed modeled, by the historian—the structure and dynamics of the relevant field or discipline set out, grounded in evidence, and open to revision as historical research and historiographical debate unfold. Such proximate contexts are never merely the old internalist universe of "ideas only."

In the case of Beeckman, the relevant discipline is what I have termed the "field of natural philosophizing."⁴ By "natural philosophy" I denote not simply the new mechanical philosophy, nor the still institutionally entrenched neo-Scholastic Aristotelianism. Rather, I mean the wider institution and disciplinary field of natural philosophy in all its variety and contention—a field that included these and other variants, a field that had both a social structure (in flux in Beeckman's time) and certain rules of engagement (also being challenged, as just seen in the case of physico-mathematics). When one "natural philosophized," one was making claims regarding one or more of these dimensions: the nature of matter, the cosmological structuring of that matter, the principles of causation, and the methodology for acquiring or justifying such natural knowledge. Neo-Scholastic Aristotelianism provided a template for natural philosophizing that also applied to all its natural philosophical challengers. Beeckman's invention of corpuscular-mechanism consists of a set of radical claims inside an already existing, highly structured, and, at that moment, highly contested field.

I hold that careful construction of proximate categories like natural philosophy paves the way for fruitful and defensible modes of wider contextual explanation, rather than arbitrary ones. Drawing on the first heuristic rule, one can now say the following: Quite macro entities—social structure, economic forces, political structures and forces—can be brought into the explanatory machinery, but not in the form of causing, imprinting, or influencing actors' ideas

² *Ibid.*, pp. 104–112. See also John Schuster, "Isaac Beeckman in the Context of the Scientific Revolution," conference keynote address, "Isaac Beeckman in Context," Middelburg, Netherlands, 28 Sept. 2018. A volume of papers from this conference, to be published by Amsterdam University Press, is being edited by Klaas van Berkel and others. See also H. Floris Cohen, *How Modern Science Came into the World: Four Civilizations, One Seventeenth-Century Breakthrough* (Amsterdam: Amsterdam Univ. Press, 2010), pp. 221–226, 238–242.

³ On the problems of asserting "influence" see Schuster, *Descartes-Agonistes*, p. 13 n 25 (contributions of Quentin Skinner and post-Kuhnian sociology of scientific knowledge); and John Schuster, "Consuming and Appropriating Practical Mathematics and the Mixed Mathematical Fields, or Being 'Influenced' by Them: The Case of the Young Descartes," in *Mathematical Practitioners and the Transformation of Natural Knowledge in Early Modern Europe*, ed. Lesley Cormack, Stephen Walton, and Schuster (Dordrecht: Springer, 2017), pp. 37–65, esp. pp. 37–41.

⁴ Schuster, *Descartes-Agonistes*, pp. 35–77.

and actions. Rather, natural philosophers responded to challenges and forces outside their proximate context and decided to bring them into play in the form of revised claims, skills, material practices, and values in the field. To do that, the “things” being brought in, or responded to, had to be represented to and by them (not us!) in suitable form. Appropriately thinkable/writable representations of matters concerning entities that we historians now call contextual structures were intentionally mobilized, shaped, and deployed strategically by historical actors in natural philosophical claims.⁵ A moment’s reflection at this point reveals that everything in our explanatory strategy depends on Beeckman’s decision to inhabit and compete within the natural philosophical field. To construct his radical species of natural philosophy, he was importing resources—cognitive, normative, and material—into this proximate context. We can now move forward while avoiding explanatory pitfalls.

First of all, we can detect the error of simply invoking Beeckman’s wider Dutch economic and cultural contexts. The blurb for the recent conference on Beeckman held at Middelburg in September 2018—the catalyst for this case study—reads as follows: “[In Middelburg] he was deeply embedded in a cosmopolitan culture, a world in which sophisticated artisanal skills, riches from the overseas trading routes, humanistic culture and the study of nature were merging into a new culture of knowledge.” This is either a direct appeal to Beeckman’s local context or the flagging of one instance of even wider patterns of emerging commercial capitalism, imperial outreach, and state formation—or both. However, to invoke either, or both, of these contexts in no way licenses the claim that they directly caused, shaped, or imprinted his natural philosophical innovation.

It may readily be granted that if an individual of Beeckman’s acumen and experience had thought about it, this “lifeworld” might have prompted sentiments against Aristotle and in favor of material practice. Indeed, this undoubtedly occurred, and its plausibility tends to promote undertheorized contextual explanations. But, strictly speaking, none of this directly entails his becoming an active natural philosopher, advocating a qualitatively new species of natural philosophy. Why not, like Simon Stevin, be a maestro of the mathematical practical arts, yet avoid the game of natural philosophizing? Similarly, in the late sixteenth and early seventeenth centuries the values of practice and utility were widely embraced. But why do this inside the field of natural philosophizing? Why not just assert them in the practical arts and practical mathematics and leave it at that? Moreover, it was one thing to practice mechanics and advocate its value and status—and even call for its closer relation to natural philosophy—but it was quite another to place one’s mechanics at the causal heart of a new species of natural philosophy.

Thus it is obvious that an absolutely necessary but far from sufficient part of the explanation has to be why and how Beeckman elected to be an active player in natural philosophy. Only his placement and strategies in that field allow us further to ask how he recruited resources from even wider contexts. Any explanation of how and why Beeckman entered the field requires a biographical reconstruction beyond our scope here.⁶ Still, we can note that, as a schoolmaster and rector, Beeckman clearly accepted and coveted the high cultural status of natural philosophizing. The elevated place of natural philosophy in the geography of knowledge was a large contextual feature of his world. But he had actively to decide to enter that arena and what his agenda would be within it.

⁵ *Ibid.*, pp. 43–44, 65–70 (referencing the contribution of Marshall Sahlins to my approach). Paolo Rossi, *Philosophy, Technology, and the Arts in the Early Modern Era* (New York: Harper & Row, 1970), offered an early example of this type of argument. See Schuster, *Descartes-Agonistes*, p. 80 n 107. On the roles played by historians’ models of the relevant macro structures and processes see *ibid.*, p. 67 n 83.

⁶ On scientific biography see Schuster, *Descartes-Agonistes*, pp. 13–19.

Next, after getting Beeckman into the natural philosophy business, there would remain the question of why he did not insert his recruited values and aims into some existing species of natural philosophy. An ambitious natural philosopher could bring in values and goals from that Beeckmanian lifeworld of Dutch or European technics and commerce and become Gilbert, Bacon, or Galileo (none of them corpuscular-mechanists). Corpuscular-mechanism, once created, spoke to that lifeworld. But, again, why become the first corpuscular-mechanist?

Following Klaas van Berkel, I give a large role to Beeckman's Ramism—or, rather, to his way of dealing with and exploiting the Ramism that he had imbibed from the elder Snel and Stevin. In reviewing van Berkel's excellent book on Beeckman I wrote,

The hallmark of Beeckman's mechanism, van Berkel plausibly argues, was the application of criteria of "picturability" to the explanatory realm of particles and motions—where such picturability was explicated in terms of what would make imaginative sense to a master mechanic and craftsman, such as Beeckman, rather than, say, symbolic-metaphorical sense to a neo-Platonist. But why value such a version of picturability and then transplant it to the heart of something so high cultural as natural philosophy? Here van Berkel brings into play Beeckman's deep commitment to Ramism as a philosophy, pedagogical policy, and model of human cognition.⁷

Beeckman sharpened his version of Ramism through intercourse with machines, mechanics, and practical mathematics. Then, when doing natural philosophy he applied "Ramism-as-a-view-of-those-enterprises." Beeckman's lifeworld of commerce and technics was interpreted by him through his "specified Ramism," and that bundle was then applied within the natural philosophical field. This provided an epistemological, thence pedagogical, frame for his new kind of natural philosophy talk, corpuscular-mechanism. One can further suggest that Beeckman's leveraging of his specified Ramism within the field of natural philosophizing helps explain his radical move of making a theory of mechanics the causal register of his natural philosophy.

In sum, Beeckman's Ramism was the catalyst of, and an ingredient in, his corpuscular-mechanism. This helps to explain Beeckman, provided we view it not as an "influence" or "driver" but as a "resource" picked up, adopted, adapted, and deployed in constructing novel utterances in the field of natural philosophy. In that delicate sense, Ramism helped "cause" Beeckman's corpuscular-mechanical natural philosophy. Similar points obviously hold for Beeckman's Dutch cultural and economic context: these can be taken as "causes," but only along the nuanced trajectory of explanation outlined above. Elements in those larger contexts that Beeckman perceived as relevant to his moves in natural philosophizing were selected, adapted, and deployed. In short: examine actors in their proximate contexts first and look at their importation and deployment of resources from wider contexts second. Contexts, viewed simply, should not be taken unreflectively as causes.

⁷ John Schuster, "Review of Klaas van Berkel, *Isaac Beeckman on Matter and Motion*," *Isis*, 2014, 105:444–445, on p. 445.