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DISCUSSION NOTE

Actualism and Uniformitarianism: From Abstract Commitments to Forms of Practice

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Abstract

In "The Role of Historical Science in Methodological Actualism," Meghan Page makes a number of important points about the sciences of geohistory. Yet the force of her arguments is blunted by her decision to explicate concepts like "actualism" and "uniformitarianism" as abstract methodological commitments. In this discussion note, I illustrate the difficulties that arise from this decision, and suggest a way of avoiding them that preserves Page's main conclusions.

In her stimulating paper, "The Role of Historical Science in Methodological Actualism," Meghan Page makes a number of important points about the sciences of geohistory. While some have argued that these sciences are merely consumers, not producers, of lawlike generalizations, Page observes that historical research plays "an important and ineliminable role in advancing our knowledge of causal structure and stable regularities" (Page 2021, 462). It does this by supplying "an experimental context" to test the stability of currently observed processes and relationships. An old geological adage holds that "the present is the key to the past," meaning that presently observed processes and relationships provide the surest guide for reconstructing geohistory. But this is not always the case. Sometimes the key to the past is located *in the past itself*, as Page demonstrates in a discussion of ice core paleoclimate data. Other times the past supplies a key to *the present*, as in her example of the AMOC (now suspected to be unstable in virtue of reconstructions of its past behavior).[1] Traditional "uniformitarian" approaches overlooked these possibilities in their strict adherence to a present-to-past form of inference. But geologists today are not as uniformitarian as they used to be. Indeed, in Page's terminology, they are contributors to the project of "methodological actualism," understood to be something different than the project of traditional uniformitarianism.

[1] AMOC is shorthand for "Atlantic meridional overturning circulation." It is one of the major current systems in the world's oceans.

I regard these points as both cogent and useful. Geologists are indeed producers, not just consumers, of knowledge about natural regularities. And they are no longer bound by the idea that present observations supply the only interpretive key to the geological record. However, the force of Page's arguments is blunted by her decision to explicate concepts like "actualism" and "uniformitarianism" as highly abstract methodological commitments. This introduces an ambiguity into her analysis concerning the relationship between "methodological actualism," understood as a *project* or *methodology*, and "methodological actualism," understood as a *commitment* or *procedural assumption.* The purpose of this discussion note is to illustrate this ambiguity, and to suggest how it might be avoided. To preview my conclusion, I will suggest that we should stop analyzing "actualism" and "uniformitarianism" as abstract methodological commitments. Instead, we should regard them as forms of practice enjoining a basically comparative approach to geological problem-solving. This permits a recovery of Page's main conclusions, since the approach she terms "methodological actualism" involves a distinct form of practice geared to determining "the limits of observed regularities": a strategy that is best interpreted as a response to the limitations of the traditional comparative project (Page 2021, 477).

But first, some background. Both "uniformitarianism" and "actualism" are terms of nineteenth century vintage. The former owes its coinage to William Whewell, who used it to refer to Charles Lyell's belief that the earth has long existed in a "steady state . . . with events and processes uniformly like those of the present, both in rate and intensity" (Rudwick 2014, 323). The latter is of more uncertain coinage, but originated on the continent as a way of referring to the view that "actual causes" (*causes actuelles)* provide the most reliable guide for interpreting traces of the past.[2] Sometime during the twentieth century, "actualism" became associated with the idea that not only geological processes but also the laws that regulate them are invariant in space and time. Arthur Holmes was perhaps the first to use the term this way. In the 1965 edition of his *Principles of Physical Geology* he defined actualism as "the principle that the same processes *and natural laws* prevailed in the past as those we can now observe or infer from observations" (Holmes 1965, 44, emphasis added). Also in 1965, Stephen Jay Gould offered his classic definition of "methodological uniformitarianism" as a procedural principle asserting "the invariability of natural laws in space and time" (Gould 1965, 224). This similarity is no coincidence. "Actualism" has traditionally been understood as a methodological concept, and as one component of Lyell's "principle of uniformity," from which the term "uniformitarianism" is derived (Gould 1987). The semantic situation is complicated by the fact that "uniformitarianism" wears a variety of hats, but for present purposes what matters is that "methodological uniformitarianism" and "actualism" have usually been taken to be roughly synonymous.[3]

[2] The term "actual cause" was coined by the Swiss geologist and physicist Jean-André de Luc to refer to causes demonstrably at work in the present (Rudwick 2005). Here, "actual" has the meaning it has in several European languages: it refers to processes operative in the present as opposed to "real" or authentic processes.

[3] It is unfortunate that "uniformitarianism" was ever extended beyond its original, Whewellian meaning: a theory that events in earth history have retained a basically steady-state pattern through time. The reasons for this extension were complex, and have led to a great many ideas masquerading under a single heading (see Dresow In Press for details).

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It is worth asking why someone like Gould would identify a commitment to the stability of natural laws as the methodological core of uniformitarianism (actualism). The rationale from geological practice runs like this. Uniformitarian geology as practiced by individuals like Lyell and Holmes was a comparative approach to geological problem-solving. As Naomi Oreskes explains, "It was an injunction to go to places where one could observe geological processes in action and compare their effects with the remains of the past" (Oreskes 2013, 599). Now, the basic problem that geologists confronted in using present observations to interpret the past was one of justification. Why think that observations of contemporary lakeshores provide a reason for thinking that ripples in sandstone were produced by similar processes in the past? One reason is that past and present fluid systems are governed by the same natural laws, and it is these laws that determine the relationship between causes and their effects. If different laws had obtained in the past, no comparison between contemporary lakeshores and ancient sandstones would be warranted. So uniformitarian problem-solving involves a commitment to the stability of natural laws, for much the same reason that all inductive inference presupposes the stability of nature in certain respects.[4]

This brings us back to Page. In explicating "uniformitarianism" and "actualism," Page makes heavy use of Gould's 1965 article, "Is Uniformitarianism Necessary?" Here Gould draws a distinction between what he calls the "substantive" and "methodological" senses of uniformitarianism. Substantive uniformitarianism is uniformitarianism sensu Whewell: it is an empirical proposition asserting the constancy of rates of change or material conditions through history. Methodological uniformitarianism, by contrast, is a procedural principle asserting "the invariability of natural laws in space and time" (Gould 1965, 224). Noting a difference in focus between these senses (the former is about is about rates of change and material conditions, the latter is about the laws regulating these things), Page renames Gould's methodological uniformitarianism "methodological *actualism*," and observes that this "leave[s] room" for the categories of substantive actualism and (redefined) methodological uniformitarianism (Page 2021, 470). She defines "methodological actualism" as "[an] undemonstrable, although entirely necessary, procedural assumption asserting spatial and temporal invariance of laws describing the operation of nature's processes." "Methodological uniformitarianism," by contrast, is "[an] undemonstrable, although entirely necessary, procedural assumption asserting constancy of rates of change or material conditions through time."[5]

Considered on its own, this is so much semantic rearrangement. Whereas Gould uses the term "methodological uniformitarianism" to refer to the assumption that natural laws are spatiotemporally invariant, Page would have us speak of "methodological actualism." The problem is that Page does not just use "methodological actualism" to refer to a procedural assumption involving the stability of natural laws. She

[4] As Page is aware, the historical situation is more complicated than this. The reason is that some geologists, like Lyell, did not just assume that laws of nature are invariant. They also assumed that rates of geological change are stable over time, perhaps because they are determined by stable systems of laws. In any event, the key point I wish to emphasize is that even unwarranted assumptions about rate invariability are part of a comparative approach to geological problem-solving, variously called "uniformitarian" and "actualistic."

[5] There is no reason to worry about the substantive senses of actualism or uniformitarianism here.

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also uses it to pick out an investigative project or methodology that uses historical reconstructions "to test the stability of presently observed processes over large time periods" (Page 2021, 480–81). Methodological actualism, in this sense, "often requires using knowledge of the past to determine the stability of currently observed regularities" (462). Or perhaps this is just a hallmark of methodological actualism in geology. Given her title, it is reasonable to wonder if the project of methodological actualism extends beyond the geosciences; perhaps it refers to the more general scientific project of determining the causal structure of the world. In any event, the key point is that methodological actualism, for Page, is not only "[an] undemonstrable, although entirely necessary, procedural assumption" concerning the stability of natural laws. It is also a project or method that is specially indebted to the assumption that natural laws are stable in space and time.

But what is the relationship between methodological-actualism-the-assumption and methodological-actualism-the-project? Here is where things get hairy. Consider that "actualism" has traditionally referred to a comparative approach to geological problem-solving, which holds that the past can be deciphered in terms of present observations on the assumption that natural laws are stable. It is because laws are stable that the comparative approach stands a decent chance of success; so the assumption of stability is baked into the logic of actualistic reasoning. However, the project Page terms "methodological actualism" is an explicitly *non*-comparative one. Its tactic is not to use present observations to interpret the past by comparison, but instead to use historical reconstructions to test the stability of presently observed regularities. (Or, if methodological actualism refers to the project of determining the causal structure of the world, this quasi-experimental strategy is geology's distinctive contribution to this broader project.) The issue is that it is hard to see how this project is specially indebted to the assumption that natural laws are stable in space and time. Perhaps Page thinks that a commitment to the invariability of natural laws prompts researchers to seek more lawlike warrants, which in turn puts them in a better position to assess the stability of presently observed regularities. But this suggestion is a tenuous one, since the injunction to seek more lawlike warrants is not obviously contained in the assumption that the laws of nature are stable. Or perhaps the idea is that methodological actualists, unlike Page's "uniformitarians," do not mistake empirical generalizations for genuine laws.[6] But again, it is hard to see how actualists receive any guidance in this connection from the assumption that natural laws are stable (since uniformitarians share a commitment to the stability of natural laws). There is accordingly a disconnect between methodological-actualism-the-project and methodological-actualism-the-assumption. In order for the latter to constrain the approach of the former, the assumption and the project must be related in a relatively straightforward way. But they are not.

Now, it is possible that I have mischaracterized Page's view of methodological-actualism-the-project. Perhaps methodological actualism is broader than I have indicated, even when limiting ourselves to its geological application. If this is right, then it may be inappropriate to ask for a characterization of methodological actualism that

[6] On this count, Page observes that "methodological actualism often involves outright assuming that extrapolated calibrations are not time and space invariant, because they simply are not laws" (Page 2021, 481). Page's "uniformitarians," one gathers, are not so circumspect.

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distinguishes it from traditional, "present is the key to the past" actualism. (At least this would be inappropriate if the comparative approach of traditional actualism also contributes to the aims of methodological actualism.)[7] However, it seems to me that Page regards methodological actualism as something distinct from the comparative project of traditional actualism. Consider that, for Page, traditional actualism is bound to engage in illicit reasoning, since it has no way of verifying whether currently observed regularities are sufficiently stable to ground historical inferences.[8] By contrast, the distinguishing feature of "methodological actualism" is a wariness of illicit inferences and a corresponding interest in determining "how currently observed processes behaved under radically different conditions" (Page 2021, 472). This suggests that methodological actualism is best interpreted as a response to the shortcomings of the traditional actualistic project. Traditional actualism uses present observations to interpret traces of the past but is prone to overstretch itself. Methodological actualism uses knowledge of the past to determine the limits of present observations and thus counteracts this tendency to overstretch.

I am not quite finished, but a brief summary is in order. So far, I have suggested that Page succeeds in delineating an important feature of geological practice: its quasi-experimental strategy for probing the stability of presently observed regularities. This is a valuable contribution to our understanding of geological reasoning, not least because it shows how geologists are grappling with the shortcomings of the traditional actualistic project. But her decision to explicate terms like "actualism" as procedural assumptions adds nothing to her analysis and arguably detracts from it. This is because it fails to capture what is distinctive about the project she terms "methodological actualism": its reflexivity about the warrants adduced in geological arguments and how this imposes checks on traditional "present is the key to the past" actualism.

However, the problem is hardly Page's alone. The convention of identifying "actualism" and "uniformitarianism" with procedural assumptions has never really worked. Or at least it has never achieved much depth, precisely because it fails to highlight what is distinctive about geological reasoning. To quote Oreskes again, this time more fully:

> Methodological uniformitarianism [actualism], as understood by twentieth-century geologists, was not simply the belief in the invariant laws of nature . . . [It] was, rather, a form of practice and a guide to action. It was an idea about how to do geology. In this sense Gould [(1965)] was right that it was a methodological principle but wrong about what principle it was. The latter

[7] Taking such a broad view would arguably negate the value of "methodological actualism" as a term, since it would no longer pick out the quasi-experimental approach that Page is at pains to highlight, and would instead encompass pretty much everything that historical geologists do.

[8] This remark may suggest that my "traditional actualism" is just Page's "methodological uniformitarianism": an investigative project bound by the assumption that rates of change and material conditions are stable through time. But this is not right. While some actualists in the history of geology assumed constancies of rate and state, much of what has passed for actualistic (uniformitarian) reasoning has had nothing to do with these things and only relies on the idea that the past can be understood by comparison with processes operative in the present (Rudwick 2005). So, while there is overlap between traditional actualism and "uniformitarianism" in Page's sense, the overlap is only partial.

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> was that, by and large, the best way to do geology was not laboratory experimentation, because it was vexingly difficult to capture the scale and magnitude of geological forces in the laboratory. Nor was it to theorize broadly, because there were indeed more things in heaven and earth than dreamt of in our philosophies. It was to go outside and look. It was an injunction to go to places where one could observe geological processes in action and compare their effects with the remains of the past. (Oreskes 2013, 598–99)

For nearly the entire history of geology, researchers have sought to unravel the past by coordinating field observations with careful observational and experimental studies of the present (Rudwick 2005). It is this flexible and demanding activity that we should have in mind when we speak of "actualism" and "methodological uniformitarianism," not any claim about the stability of laws (or rates of change or whatever). To continue analyzing these terms as abstract claims is to misunderstand what they have meant to generations of practicing geologists. Indeed, it is to trivialize them. To the extent that "actualism" and "uniformitarianism" have to do with laws, it is because some commitment to the stability of laws is implicit in a comparative approach to geological problem-solving. But this is unexceptional; the assumption of invariant natural laws is implicit in a great range of scientific practices. It follows that this explication says little about how to actually *do* geology. The injunction to go and look, by contrast, is the foundation of an entire form of practice based on extensive firsthand experience and flexible and creative comparison.[9]

Still, none of what I have said imperils Page's main conclusions: (1) that geologists are not just consumers, but also producers, of knowledge about natural regularities; (2) that geologists routinely use historical reconstructions to test the stability of presently observed processes; and (3) that the present is not always the key to the past. This is because geological practice has moved beyond the traditional comparative approach associated with "actualism" and "methodological uniformitarianism." While comparative approaches are by no means extinct, contemporary geology is largely organized around newer forms of practice involving the increased use of model-based reasoning, an expansion of proxy methods, and the organization of research teams into multidisciplinary collectives. I suppose we could call these forms of practice "methodological actualism" if we need to discuss them under a general heading. Alternatively, we could reserve this term for the "experimental" strategy Page identifies as a salient feature of modern geological inquiry. In any event, the crucial point is that these forms of practice are distinct from traditional "present is the key to the past" actualism and so require philosophical characterization in their own right. Despite her adherence to a sterile convention, Page has made a promising start on this important and long overdue project.

[9] The best philosophical discussion of this form of practice is probably Frodeman (2003), especially chapter 5. Here Frodeman discusses field geology as a hermeneutical activity based on "a certain style of interrogative thinking" (and seeing) developed under the guidance of an experienced practitioner (Frodeman 2003, 111). A similar discussion is found in Rudwick (1985, 10), who argues that geological research during the nineteenth century can be profitably understood by analogy with a skilled manual craft practiced "within a living communal tradition."

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