

PROSPECTS FOR AN ONTOLOGICAL EXPLANATION OF GRAVITY

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Abstract

A neglected tradition of physical thought holds out promise of a true physical explanation of gravity which critically overcomes the inherent limitations of classical physical models. Faraday and Whitehead worked in the direction of a revision in the fundamental conception of physical reality which, once clarified and worked out, opens a broad prospect of causal intelligibility that is otherwise absent from physics.

A long time ago, speculation as to how gravity might be brought about or transmitted by unseen goings-on in otherwise empty space could be considered a legitimate approach within the diverse strategies of scientific thought. Names such as Descartes and Le Sage come to mind, and Newton in certain moods. Nowadays, it might seem that such thinking is at best marginal to science; certainly the old “ether” of special pervasive material serving as a medium of causal stresses, fluxes, and propagating vibrations is generally regarded as defunct.

However, a simple renunciation of all efforts at “natural philosophy” as antiquated, assuming the “ether” to be discarded, ignores a critical point, namely, that it is eminently questionable whether all success in identifying and understanding (in language) the background causal activity engendering “field” phenomena necessarily hinges on the classical postulate of an “ether.” That is, there have been well-regarded thinkers who have sustained the full presumption that physical phenomena should be physically and causally explainable, to paraphrase J. C. Maxwell, even while the notion of an omnipresent material ether is given up. These ideas have never been refuted logically or scientifically; indeed they have been in some measure borne out (see below). But they have in effect been quite ignored, and implicitly rejected, due to the pragmatic and technical-mathematical focus and philosophy of modern physics. My aim in this essay is to seek an initial assessment of the validity and prospects for this largely ignored and virtually unknown physical outlook which I will term “post-classical natural philosophy.” In developed form, its two main tenets are (1) that space is inherently causal activity, or as physicists might prefer to say, “energy,” that is, all material and spatial situations consist already of real and potentially effective (physical) “influence,” activity, process, or the like; (2) that

while any conception along the line of a classical substance-ether is fundamentally wrong, this reality-constitutive (and phenomena-generative) energy or activity is to be presumed thoroughly comprehensible. Notable pioneers of this view, as recounted briefly below, include Michael Faraday and Alfred North Whitehead.

About tenet (1) it can be said that it is simply right, that is, it agrees with modern physics. Though not often articulated, there is a firm recognition today that no reality—even simply a “place,” say—is devoid of energetic activity. In the words of the physicist-philosopher W. H. Watson: “Can we ever have a space free from physical processes? Of course not. ... we [physicists] believe that quantum fluctuations are occurring all the time—virtual photons being created in the electromagnetic field and virtual pairs in the electron-positron field. This is our physical view of the matter.”¹ “Vacuum fluctuations,” “zero-point energy,” “vacuum energy”—these all designate *activity* inherent to reality, space as well as matter. Even the atomic nucleus is a wavelike or quasi-oscillatory form of activity, not a “thing” in the sense of an occupying, discrete, and potentially inert object. So if Faraday and Whitehead did break constructively with classical physical thought (as I claim), this would suggest that in this respect they were strangely neglected scientific visionaries who articulated quite early on certain emerging characteristics in the physicist’s view of reality. Intriguing as this is, the more important question is whether there is anything to position (2), that the occurrences making up physical reality per se might actually be pervasively intelligible. This, I argue, depends directly on the possibility of a radical shift of ontology (i.e., the concept of reality or being) from being-as-substance to a different kind of “ether” the essence of which is activity (or energy, process, events, etc.).

Faraday had the founding intuition, which Whitehead built upon. Faraday suggested that an atom might be nothing other than a localized manifestation or aspect of “force” (or field)

which in its other polar aspect reaches throughout the physical environment from this “center.” This is indistinguishable from the modern “physical view” of the electron, say, as a field-factor pervading the environment as well as a locally effective factor. Whitehead in his early writings sought, drawing explicitly on Faraday, to understand field and matter as linked in a unitary and integral structure. This evolved into a physics based on the idea that events and “process” form the irreducible constitution of physical reality. Pervasive connectedness (i.e., causal intelligibility in principle) is established by the inherent property of “relatedness” belonging to “events.”² Whitehead insisted on a necessary ultimate stratum of reality consisting of a “uniform relatedness of events”³; arguably, this anticipated the modern recognition of a uniform and isotropic “vacuum energy” as an original or underlying physical condition. And as illustrated in the quotation from Watson, the claim that reality is intrinsically “events,” “process,” or activity is itself borne out.

Visionary or not, Whitehead had a fundamental viewpoint contrary to that so far adopted by modern physics in practice. Modern physics broadly repudiates the notion that causal processes behind phenomena should be pervasively intelligible (on a semantic-descriptive level); this is especially visible when it comes to quantum “entanglement,” but is by no means limited to this.⁴ In brief, the fate of the “ether” and classical models generally is assumed to be the fate of “natural philosophy” itself. Whitehead did make clear, in a few scattered remarks, his fundamental difference with the modern outlook on this point.

What primarily divides Whitehead’s physics from the conventional or official physics (concerning the explanation of forces, say) is thus not so much a battle between competing theories, Einstein versus Whitehead on the mathematical modeling of gravity, as it is a largely subliminal philosophical difference on the issue of whether one assumes a thorough comprehensibility of nature. If one does, then it is natural to take up as an explicit theme of

discussion the events and processes of the field, that is, the background constitutive “energies” of space and matter, with a goal of clarifying their meaning and structure. To the extent that one succeeds in identifying and describing that interconnected process or activity which appears to belong to the very being of nature, space included, one can then hope to have satisfied the demand once answered by the “ether” in its provision of a sense-making context (such as it was) for old-fashioned causal explanation of gravity and other field phenomena. But it is assumed from the beginning that the classical picture of reality in terms of given vacuous locality and material presence is to be radically supplanted.

An important caveat here, I believe, is that a full clarification only occurs if the proposal is explicitly ontological. By this I mean that “events [etc.] as fundamental” is only fully transparent to thought if it means that any and all being, indeed physical “being” as such, is constituted by transition, “process,” or “becoming.”⁵ This caveat being met, however, I submit that there is then a post-ether basis for identifying and understanding the “field” as a causal-generative condition, beyond merely useful description and modeling of observations. What is auspicious here is that “events fundamentally constitutive of reality” identifies (to the extent that it can be worked out) a causal context or “medium” of genuinely empty space (or prematerial) activity. Or to put it another way, if causality (i. e., causal “process,” transition, “events,” and so on) is fundamental, then the occurrence of matter per se entails a causally conditioning whole that radically accounts for and sustains it, hence real physical-causal structure identified independently of (since genetically prior to) material and spatial “givens.” In short, atoms and “particles” are seen as causally embedded facts, and this directly provides a natural ontological account of the “field.” in consonance with today’s physics.

Finally, the “process” physical ontology provides a conception of the field with specific characteristics to account for attraction and repulsion between separated bodies. By conceiving

both local space and matter as essentially emergent from a causal background totality (the ultimate, irreducible fact being “process” or causal transition), it establishes a structure inherently linking each particular (each event, say) with its indefinitely extended physical environment. This transition-structure has the characteristics of (a) real activity; (b) directionality (of flux or activity) toward and away from engendered locality (i.e., from and toward a causally constitutive whole); and (c) inherent continuity and connectedness (hence intelligibility of interactions) between “matter” and “field” aspects of reality. Even without working out a specific account of gravity as a distinctive force on this basis, which space does not allow, I would argue that “explanation” in an important sense (see note 4) has already been achieved once a basic sense-making context for causal explanation of forces (supplanting the classical ether) has been clarified.

In conclusion, indications are that if and only if the crucial shift is undertaken from a classical to a “process” fundamental concept of physical reality, then the prospect suddenly appears favorable for a causal understanding of the gravitational (e. g.) impetus on bodies as was hoped for in earlier times (though only envisioned in quaintly ad hoc models). This would be not so much a new theory as restoring a certain *purely explanatory* dimension to physical science.

NOTES

1. W. H. Watson, *Understanding Physics Today* (Cambridge University Press, 1967), 182-3.
2. One feature of this physics was a mathematical theory proposed as an alternative to general relativity, which is outside the concern of this paper.
3. Whitehead, *The Principle of Relativity with Applications to Physical Science* (Cambridge University Press, 1922), Preface. He saw this as inconsistent with Einstein's approach in his general theory of relativity.
4. It might be thought that entanglement phenomena refute the assumption of universal causal intelligibility. But this is true only if the classical ontology is implicitly assumed. If it is supposed that the fundamental status of locality can be constructively abandoned, then the whole aura of inscrutability surrounding nonlocal connections is removed.
5. As stated in Whitehead's "principle of process," *Process and Reality* (ed. Griffin and Sherburne, The Free Press 1978) 23. This occurs in the later metaphysical writings; whether Whitehead's *physical* thought attained to ontology is an open question.