Book Review for Phenomenological Reviews:

H. A. Wiltsche and P. Berghofer (eds.) *Phenomenological Approaches to Physics,* Springer (Synthese Library), 2020.

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Phenomenological Approaches to Physics, is a welcome attempt to bridge the gap between two areas of philosophy not often mentioned in the same career, let alone the same breath. The collection provides fertile ground for further work on phenomenological approaches to physics—and science more generally—however, as much as the collection is promising it is also disappointing in the preparatory nature of much of the material. While this is a general vice of the phenomenological tradition—consider how many of Husserl's published works are *introductions* to phenomenology—in order to appeal to one of the primary audiences of the collection, phenomenology-curious philosophers of physics, further developments with clear consequences are needed. Many of the papers stop just as they've really started. This collection is of value for many purposes: as a general introduction to phenomenology, as a guide to the consequences of phenomenology for science and physics, as a pointer to areas of application for the budding phenomenologist, but that it also provides some indications of particular lines of further development.

The editor's introduction is relatively long, but deservedly so, as it does a lot, providing expositions of ten themes from Husserl's oeuvre: anti-psychologism, intentionality, descriptions and eidetics, the epistemic significance of experience, phenomenology as first philosophy, anti-naturalism, the life-world, historiticity and genetic phenomenology, embodiment and intersubjectivity, the epochē, transcendental reduction, and transcendental idealism. The sketch of Husserl produced is that of an epistemological internalist who develops a theory of the objective from fundamental subjectivity, who denies empiricism about logic and mathematics, and who holds that phenomenology is a first philosophy which comprises analyses of the *essential* structures of subjectivity, the ground of all knowledge, therefore legitimizing all other forms of knowledge, sciences. Any reader interested in a first pass at the role of these themes in Husserl's work could probably do so no more efficiently than looking through the first half of this introduction. A highlight of the introduction: a sketch of the relevance of other phenomenologists, Heidegger and Merleau-Ponty, to the philosophy of physics. The themes brought up in the introduction and elsewhere are suggestive: Heidegger's pluralism regarding scientific standards and the difference in the concepts of time in physics and history; his preemption of the theory-ladenness of observation; his praise of Weyl; his primacy of practical understanding over theoretical knowledge; Merleau-Ponty's

participatory realism; his analysis of measurement and rejection of instrumentalism, realism, and idealism, in favor of structuralism.

Part 1: On the Origins and Systematic Value of Phenomenological Approaches to Physics

Robert Crease's "Explaining Phenomenology to Physicists" is a response to philosophy-phobic physicists, like Hawking, and aims to show how the projects of phenomenological philosophy and physics differ. This amounts to a sort of introduction to the Husserlian distinction between the natural, or naturalistic, attitude of the physicist in her workshop and the more skeptical attitude of the epochē adopted by the phenomenologist. Note that Crease makes the same point that Maudlin and other metaphysically oriented philosophers of physics often emphasize, that mathematical formulae do not comprise a theory but require an *interpretation,* an ontology (57). How this interpretation is established and justified is the common project of the phenomenologist and the analytic metaphysician. But herein lies a problem with the Crease essay, which is that it while it distinguishes analytic (narrowly focused on the logical analysts of science of the early 20th century), pragmatic, and phenomenological approaches to the sciences, Crease does not say enough to distinguish a defense of phenomenological approaches to physics from a defense of a philosophical approach to physics whatsoever. Now Crease may make the point that phenomenology preempted concerns with the metaphysics of physics or concerns regarding the applicability of mathematical idealization to nature that have more recently become central to the philosophy of physics. Further, it is not clear that this is a fair reading of the aims of the logical empiricists: What is the logical empiricist project of establishing how scientific, "theoretical" terms get their meaning if not a concern with the "framing" of scientific theories and "the reciprocal impact of that frame and what appears in it on their way of being" (55)? This is not to say there is no distinction to be drawn, but the discussion here is not fully convincing as an argument for the value of phenomenology in studies of physics *in particular.*

Mirja Hartimo's contribution, "Husserl's Phenomenology of Scientific Practice," fills out Crease's sketch of the phenomenological approach and specifies how Husserl preempts the naturalistic, practice oriented turn in contemporary philosophy of science. This "naturalism" is to be opposed with ontological or methodological naturalism, both of which Husserl rejected. Hartimo recapitulates the difference between the natural and phenomenological attitudes and its production by the epochē, in which existence is "bracketed". The case is made that the phenomenological attitude is not *inconsistent* with the natural attitude (indeed Husserl had, for the most part, the same natural understanding of the sciences as did his contemporaries in Göttingen). The Göttingen view comprises a preestablished harmony between mathematics and physics, "the axiomatic ideal of mathematics served for Husserl, as well as for his colleagues, as an ideal of scientific rationality, as a device that was taken to guide empirical physical investigations 'regulatively'." (67) This influences the focus on Galileo in *Crisis*: physics is fundamentally

mathematical in nature (68). Harmony amounts to an isomorphism of the axioms and the laws, with the axioms of physics being a formal ontology, a formal definite manifold (69). Husserl's two differences with the Göttingen consensus are: (1) scientists should also develop *material* ontologies, which provide specific normative ideals for the mathematization of nature and its connection to intuition; (2) the normativity of the exact sciences does not extend to all scientific domains, a normative pluralism. (2) is particularly important because phenomenology itself falls short of the axiomatic ideal, due to the inexactness of the relevant essences.

Pablo Palmieri's contribution, "Physics as a Form of Life," is an odd fish. It presents itself not as a presentation of Husserl's account of the lifeworld and its relevance to physics but rather as focusing on a foundational question raised by Husserl: "why is it that the axioms of mathematical physics are not self-evident despite the evidence and clarity that is gained through the deductive processes that flow from them?" (80) To answer this question Palmieri embarks on an analysis of physics as a form of "Life" in the sense some historical development. The three epochs of physics which characterize its form of life: (1) the youth of Galileo's axiomatic physics, (2) the senescence of Helmholtz's work on the anharmonic oscillator and the combination of tones, (3) the "posthumous maturity" of physics following quantum physics. These historical studies are interesting and valuable in themselves, especially the Galileo study, particularly regarding the influence of Galileo's aesthethics on his mathematization of nature (84). Unfortunately, how these studies relate to the overall aim of the essay is unclear and is shrouded by the sort of allegorical and flowery prose that turns away many from "continental" approaches more generally. Palmieri's description of the third stage of physics Life as "posthumous maturity" describes a "disarticulation" in physics that comes to a head for Palmieri in Heisenberg's use of (an)harmonic oscillator framework for quantum mechanics. The result of such a "translation" is not a direct analog to the classical treatment of spectra, due to the lack of rules for "composition of the multiplicity into the unity of an individual, by the interpretation of which we might generate the individual utterance that once performed will elicit in our consciousness a corresponding perception in any of the sensory modalities whatever" (100). The obscurity of such bridge principles to observation is again, exactly the crisis of which Husserl was concerned. The upshot seems not to be, as it was for Husserl, a call to action for phenomenological analysis, but rather the essential mystery of nature as "[i]t is nature herself that precludes herself from knowing reflexively her own totality of laws" (83). While this is supposed to have the status of an explanation it is only buttressed with metaphor:

> "This being hidden of nature as a totality, or her desire or necessity to hide herself from further scrutiny, which I would be tempted to qualify as nature's vow of virginity, explains why the axioms of mathematical physics must appear to our intuitions as obscure" (84).

This pessimistic conclusion conflicts with phenomenology's self conception as a progressive research programme, leaving Palmieri own position mysterious, and one suspects that is how he wants it.

Norman Sieroka's "Unities of Knowledge and Being—Weyl's Late "Existentialism" and Heideggerian Phenomenology" is a fascinating exposition of Weyl's latter existentialist turn and his engagement with Heidegger's work. Weyl claims that physics is dominated by "symbolic construction", of which axiomatic mathematics stands as paradigm, which are empirically evaluated holistically. Weyl's account of symbolic construction is dependent on the understanding that these symbolic systems are constructed out of particular concrete tokens. Similarly it is essential to the symbolic construction that it is intersubjective and the practitioners of a symbolic system are peers embedded in a wider public. The core of mathematics and the sciences is not logic, but rule-bound "practical management" of symbols (109). This practical level must be fundamental or else we fall into a circle of physical reduction and symbolic representation.

Weyl's 1949 paper "Science as Symbolic Construction of Man," explicitly invokes Heidegger's concept of the existential basicness of being-in-the-world as a point of agreement. Weyl does not, however, accept Heidegger's anti-scientific attitude that concludes from this, that science is "inauthentic". Weyl held that scientific practice and philosophical reflection were mutually enriching — particularly moral reflection in the shadow of the bomb. Heidegger's rejection of science is due to symbols being merely present-at-hand, they do not figure in the "care-taking encounter of daily life" (114). The weight of evidence and experience clearly sides with Weyl here, Sieroka raises examples of bridge-building and experimental physics, more simply even the manipulation of symbols in themselves is care-taking in that they are to be interpreted and not only by oneself, in a dubious "private language", but by some community. Here is a missed opportunity to engage with Heidegger's later work, though it cannot be said to have influenced Weyl. Something like "The Question Concerning Technology" shows that Heidegger did not think that modern science and technology were independent of daily life, but rather have a radical and destabilizing effect that inhibits Dasein from encountering its own essence. Though, it is not clear how much this is a rejection of the verdicts of *Being and Time,* or should correct Sieroka and Weyl's intepretations. The extension of the critique by way of Fritz Medicus, Weyl's colleague, to a critique of "thrownness" and the general receptivity or passivity of Dasein to Being seems besides the point and reliant on a misunderstanding of Heidegger. Medicus' "piglets" complaint about the thrownness of Dasein, can only rest on a misunderstanding of the role of histroicity in Dasein's being (see Division 2, Chapter 5). Intersubjectivity is fundamental to Dasein, Being-with is "equiprimordial" with Dasein's Being-in-the-World and is an existential characteristic of Dasein, even when it is alone (149-169), this Being-with defines Dasein's inherent historiticity. Dasein is thrown into a culture, into a way of life.

Sieroka's comparison of Weyl and Cassirer, that Cassirer's theory of symbolic forms provides a unity of knowledge, while Weyl's provides a unity of being, owing to his existentialist inflection, is interesting but perfunctory. It makes one wonder what such a distinction could tell us about the difference

of method between phenomenology and neo-Kantianism, how this might relate to the interpretational dispute at the center of the Davos debate, and how Weyl's conception of physics and mathematics could have played a role in such rifts.

Part 2: Phenomenological Contributions to (Philosophy of) Physics

"A Revealing Parallel Between Husserl's Philosophy of Science and Today's Scientific Metaphysics" by Matthias Egg aims to show how the crises that Husserl saw as central to the contemporary sciences and his solution are echoed in the scientific metaphysics of Ladyman and Ross (2007). The crisis is rooted in the substitution of the lifeworld for mathematical idealities, which amounts to a forgetting of the "meaning-fundament" of the sciences, undermining their own epistemological standing. Egg frames his comparison of Husserl and the scientific metaphysicians with Habermas' critique of Husserl's project of making science presuppositionless, providing a bais for absolute practical responsibility. The supposed failure is that it is left unexplained how a more perfect theoretical knowledge is to have practical upshot. The lacuna is Platonic *mimesis,* wherein the philosopher "having grasped the cosmic order through theorizing, the philosopher brings himself into accord with it, whereby theory enters the conduct of life." (129), which is in direct ontological opposition with Husserl's transcendental idealism, as Habermas sees it. (Does Habermas commit the naturalistic fallacy?) Husserl's model claims only that the *procedure* or *methodology* of theoretical knowledge that provides normative force on our practical affairs, in Egg's example, our doing of physics. Egg presents Ladyman and Ross as agreeing with Husserl's science-cum-Enlightment project, particularly, that science must be central to our worldview as it allows for a unified, intersubjectively valid approach to world even beyond theoretical practice. This too, falls short of Habermas' mimetic ideal —their project could only be preserved in the "ruins of ontology" (130). Ladyman and Ross share some skepticism about *strong* metaphysics but accept *weak metaphysics*. Unfortunately, Egg stops just before saying anything more substantive than an observation of convergent philosophical evolution. There is more to be said particularly regarding the link between this sort of communicative conception of the scientific project and *structural realism* which puts Ladyman and Ross and Husserl in the same camp. The metaphysical essays to follow cover some of what I would like to say, but let me gesture at a possible development. In *Ideas II* and the fifth *Cartesian Meditation,* Husserl develops an account of scientific objectivity such that it is *constituted* by intersubjective agreement via "appresentation". What is intersubjectively available are the appearances of objects, but what is agreed upon are the invariant structures supposed to explain the experiences of the community. Heelan's (1978) hermeneutic interpretation of Husserl provides a picture in which the infinite tasks of mathematization and measurement link together the lifeworld and the scientific image which is constituted by it. There is a structural realist position to be examined here which could provide a unified account of everyday and scientific perception.

Lee Hardy's "Physical Things, Ideal Objects, and Theoretical Entities: The Prospects of a Husserlian Phenomenology of Physics" attempts to square Husserl's phenomenology with scientific realism. Husserl's seeming positivism is especially problematic given that Husserl argues "that the objective correlates of the mathematical laws of the physical sciences simply do not exist in the physical sense. They are ideal mathematical objects, not real physical things." (137) Hardy restricts Husserl's instrumentalism to scientific laws rather than scientific theories *tout court.* Husserl's view is that knowledge of physical objects is gained by mathematical approximation, leaving room open for the positing of *actual* physical entities. Hardy's argument, a rational reconstruction of a path not (explicitly) taken by Husserl, depends on a distinction that seems both interesting and suspicious. Hardy wishes to distinguish instrumentalism about the laws from instrumentalism regarding theories, the difference between the two lies in the fact that laws specify functional interdependenicies of physical quantities which state how empirical objects behave, but theories *explain why* physical quantities behave as they do. So then, the instrumentalist holds that the semantic value of theories is limited to that of the laws, which predict observable behavior. The realist holds that scientific theories as have as semantic values the behavior of unobservables. Husserl's radical empiricism is in apparent tension with the realist's explanation, Hardy reconstructs the received view:

> (1) A obtains if and only if p is true.
> (2) p is true is and only if p is evident.
> (3) p is true if and only if A is intuitively given in an act of consciousness.
> Ergo, (4) A obtains if and only if A is intuitively given in an act of consciousness.

Theoretical entities cannot be so given, so statements about them can never be true, so we ought not be committed to them. This interpretation Hardy rejects in favor of one which changes the role of experience from semantic-metaphysical to epistemic:

> S is justified in believing p if and only if the correlative states of affairs A is given to S in an intuitive act of consciousness. (143)

Hardy specifies that the perceivability condition on existence was meant to be dependent on an *ideal* possibility, not an actual possibility (dependent on sensory apparatuses). This point goes some way towards specifying the meaning of *transcendental* idealism, though this seems to go astray in attempting to recover realism. Transcendental idealism requires that possible perception by a transcendental subjectivity *constitutes* (the preconditions for) existence. Hardy picks up the thread in the *Crisis* regarding the essential approximative nature of the sciences as their conclusions are mediated by ideal, mathematical constructions:

> Exact, objective knowledge is possible only by way of a passage through the ideal; and for that very reason will never be more than approximative knowledge of the real. (146)

In *Crisis*, Hardy claims, Husserl distinguishes the ideal, physical object and the perceived object ontologically: the objects of ordinary life are not "physical" objects. It is these limit-idealized objects that Husserl is anti-realist with respect to. The trouble with Hardy's distinction between theories and laws and between real objects and idealized objects is that the approximation relation is left unexplained. There remains an explanatory gap as to why physical objects should be subject to laws that properly only have idealities as their subjects.

Arezoo Islami and H. A. Wiltsche's "A Match Made on Earth: On the Applicability of Mathematics in Physics" shows how phenomenology can provide a response to Wigner's puzzle, "the unreasonable effectiveness of mathematics", by moving on from why-questions to how-questions. The puzzle arises from a rejection of Pythagorean mathematical monism towards which the phenomenologist is officially neutral, due to the epochē, setting aside why-questions altogether. To answer the how-questions, the phenomenologist must also provide both synchronic and diachronic accounts of how we apply mathematics. The authors explicate *constitution* and *replacement.* They show what is meant by the horizon of experience, all the non-actual aspects of some experience which frame one's interpretation of it, one's anticipations. From this constitution is explicated:

> It is this process of intending objects through specific noemata and then constantly projecting new sensory data against horizons of possible further experiences that phenomenologists call *constitution*. Of particular importance in this context are those aspects of experience that remain invariant... (169)

From these invariances of the noemata, lawlike relations are found and suitably objective properties can be ascribed of the noema. This structure generalizes to scientific constitution from the example of perceptual constitution. Aiming to intend all of reality through mathematical noemata is Galileo's great leap forward. Doing so is to *replace* the lifeworld with the scientific image. Nature is mathematical because we have made it so. While I am largely sympathetic with this approach, and hold that it contributes to a structuralist view that is worth developing, to satisfy mysterions like Wigner specific accounts of such constitution is needed.

Thomas Ryckman's essay, "The Gauge Principle, Hermann Weyl, and Symbolic Constructions from the 'Purely Infinitesimal'", provides a mini-history of Weyl's development of the gauge principle (a fuller history in Ryckman 2005), in which Weyl is motivated to investigate Lie groups and algebras by phenomenology on the one hand and *Naturwirkungphysik* on the other. *Naturwirkungphysik* is a standard for explanation, "that all finite changes are to be comprehended as arising through infinitesimal increments" (182). In practice this is to take locally defined tangent spaces to be explanatorily fundamental. For Weyl, this standard of locality is justified by appeal to not just phenomenological

epistemology, that direct givenness to the ego is the ground of all essential insight into the structure of things, and this givenness is attenuated at spatial distance, but full blown transcendental idealism:

> insofar as symbolic construction of the "objective reality" of the purportedly mind-independent objects of physics is, *per* Husserl, a constitution of the *sense* of such objects as having "the sense of 'existing in themselves". (184-5)

Just as the previous essay establishes, the objects of mathematical physics are constructions which *intend* transcendent objects. However these objects are only fixed up to an isomorphism, any further "essence" is beyond cognitive grasp and therefore unreal (188). Ryckmann provides an able and clear derivation of the gauge principle in QED and a quick rundown of how this generalizes in the Standard Model. While this is a valuable contribution to the collection, those familiar with Ryckman's past work will wish that the closing remarks regarding the standard model and the Weyl-Nozickean (2001) slogan, "objectivity is invariance", were expanded upon. I look forward to further development of the alternative view implied by Ryckman's interpretational challenge this slogan, which centers locality as the source of gauge transformations (199).

Part 3: Phenomenological Approaches to the Measurement Problem

Steven French's "From a Lost History to a New Future: Is a Phenomenological Approach to Quantum Physics Viable?" does well to show that the phenomenological background of Fritz London was deeply influential on his approach to the measurement problem (with Bauer) and that this influence has been covered over by misinterpretation. The measurement problem is essentially the apparent inconsistency of deterministic dynamics of quantum mechanics and the collapse of the wave function. London and Bauer have been taken to merely restate von Neumann's notorious solution, that the uniqueness of the interaction of the system with a *conscious* observer explains how and when the "collapse" occurs. French shows this picture presented by Wigner, which fell to the criticism of Shimony and Putnam, to be a strawman. French argues that London and Bauer's phenomenological account of quantum measurement can stand up to such criticisms and for London. Quantum mechanics presupposes a theory of knowledge, a relation between observer and object "quite different from that implicit in naive realism" (211). Measurement, considered subjectively, is distinguishable from the unitary evolution of the quantum state by introspection giving the observer the "right to create his own objectivity" (212).This is *not* some (pseudo-)causal mind-world interaction that creates a collapse but rather a precondition for the quantum system to be treated objectively and by a different mathematical function the precondition being a reflective act of consciousness in which the ego-pole and object-pole of experience are distinguished, not a substantial dualism, "thereby cutting the 'chain of statistical correlations'" (212-3). The discussion that follows, while suggestive, shows that it is not clear *how* this general phenomenological view about the nature of objectivity is supposed to remove the particular *quantum* measurement problem. Whether this is the fault of French or of London and Bauer is unclear, the most direct quotation from London and Bauer

suggests that this distinction of the ego and the object somehow licenses the transition from representing the measurement situation by the wave function, ψ, to representing the system as in a particular eigenstate. This is much too oblique, given that the nature of such fundamental acts of consciousness is, even to the phenomenological initiate, obscure, and requires some substantive claims about the determinate nature of consciousness. French too must find the explanation as given by London and Bauer incomplete as he invokes decoherence, decision theory, and the "relational" interpretation as elements of a fuller story, presenting something, protestations aside, very close to Everettianism indeed. If such a distinctive and useful interpretation can be fleshed out on phenomenological grounds, it would be the most direct and substantive proof of the progressive nature of a phenomenological programme.

Michel Bitbol's "A Phenomenological Ontology for Physics: Merleau-Ponty and QBism" is another breath of fresh air in the collection, exploring phenomenological approach other than Husserl's. Taking the primacy of lifeworld and Bohr's challenge to traditional scientific epistemology as starting points, the essay sets up correspondence between Fuch's participatory realism and Merleau-Ponty's endo-ontology. More generally Bitbol takes recent developments in the philosophy of quantum mechanics, like Peres' no-intepretation and Zeillinger's information-theoretic approach, to "all seem to be pointing in the same direction", in line with the phenomenological approach to the sciences as tools for navigation in the world. These are the pragmatists, as distinguished from the interpreters. Bitbol goes on to describe how the anti-interpretational approach is phenomenological by establishing an epochē for quantum physics. Rather than understand the states of quantum systems in a Hilbert space as properly predicative, we bracket any ontological posit and treat these states functionally as informational bridges between the preparation and outcome of experiments. Bitbol then considers a question a level up:

> what should the world be like in order to display such resistance to being represented as an object of thought? Answering this question would be tantamount to formulating a new kind of ontology, a non-object-based ontology, an ontology of what cannot be represented as an object external to the representation itself. (233)

For Merleau-Ponty (and Michel Henry), the non-obectual ontology is provided by the priority of the body and raw, original experience.

> This is an ontology of radical situatedness: an ontology in which we are not onlookers of a nature given out there, but rather intimately intermingled with nature, somewhere in the midst of it... we cannot be construed as point-like spectators of what is manifest; instead, we are a field of experiences that merges with what appears in a certain region of it. This endo-ontology is therefore an ontology of the participant in Being, rather than an ontology of the observer of beings. (236)

Here the central self-consciousness of transcendental idealism becomes self-perception of the body. In physics, this is translated into a participatory realism, wherein the observer is involved in the creation of Being. Merleau-Ponty's own statement of the relationship between his phenomenology of embodiment and physics starts from the observation that physics always attempts to take in the subjective as a part of or a special case of the objective. This is something of a category error, and in quantum mechanics it seems that there is a concrete proof of the impossibility of eliminating the subjective, or better yet shows that the objective-subjective distinction is not well formed. These are interesting points and one wishes that Bitbol (and Merleau-Ponty himself) would have spelled out this metaphysical picture in more detail. While the correspondence with QBism seems somewhat plausible, it is not shown that either view commits one to the other or that this endo-ontology provides an advance on the anti-metaphysical orientation of the QBist. The remarks regarding probability are paltry and given the significance of probabilities in quantum mechanics, a full account of is necessary if there is to be much uptake—the primary limitation here seems to be that Merleau-Ponty did not get to consider this matter much prior to his death.

In contrast, "QBism from a Phenomenomenological Point of View: Husserl and QBism" by Laura de La Tremblaye is one of the fullest contributions in the collection. This essay serves as an able introduction to non-denomenational QBism, presented as a generalization of probability theory and cataloged as a participatory realist, ψ-epistemic "interpretation" of quantum mechanics. QBism "stands out as an exception" (246) in this category because it focuses on belief, adding the Born Rule as an extra, *normative* rule in Bayesianism (the axiomatization is not explicitly shown). QBism removes the ontological significance of the collapse of the wave function, the state description and reality are decoupled, the collapse is a statement of some (ideal) agent's belief state. Accordingly, "knowledge" yielded by measurements is redefined as information about the system that is accepted via measurement (250). While the probabilities assigned are subjective, the updating rules are objective:

> It is no trivial task to draw a clear line between the subjective and the objective aspects of the Born rule... Fuchs and Schack invoke a completely new form of intersubjectivity. It is through the use of Bayesian probabilities that the multiplicity of subjectivities elaborates a reasoning that can be shared by everyone, and that, consequently, can be called "objective" in precisely this limited sense... this leads to the new conception of knowledge: knowledge is no longer understood in terms of an objectively true description of the intrinsic properties of the world; it is rather understood as the kind of knowledge that is needed to guide the future research of any agent, thus implying a weaker form of objectivity. (251)

For Fuchs, the measuring device is analogous to a sensory organ, measurement is an *experience.* This leads de La Tremblaye to consider two notions of experience, one from Husserl, the other from William James,

who influenced Chris Fuchs. de La Tremblaye argues that it is Husserl's model of experience as involving a normative, intentional horizonal structure, that better coheres with the Qbist view. This shows a positive contribution phenomenology may offer to QBism: an explanation of the source of the Born Rule's normativity. Another would be an adequate explanation of how it is that the rules of Bayesian probability can be objective via the intersubjective constitution of objectivity essential to Husserl's model of the sciences.

In sum: this collection is promising though deficient in some respects. It will provide a number of starting points for a further development of a phenomenology of physics and provides the curious or sympathetic philosopher of physics something to chew on, but it is not a full meal. Many of the contributions would do well as additions to a graduate seminar or undergraduate course on phenomenology or the philosophy of science, with the materials on quantum mechanics showing the most potential for further development.[1]

1 Thanks to Porter Williams for reading the collection with me and sharing his thoughts with me, which allowed me to sharpen my own.

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