

BOOK REVIEW

John T. Blackmore, Ryoichi Itagaki, Setsuko Tanaka. *Ernst Mach's Graz*. Enfield, NH: Sentinel Open Press, 2010. 245 pp. \$25.00 (hardcover). ISBN-13: 978-0-578-04679-2; *Ernst Mach's Influence Spreads*. Enfield, NH: Sentinel Open Press, 2009. 476 pp. \$40.00 (hardcover). ISBN-13: 978-0-578-02934-4.

The Austrian physicist Ernst Mach (1838–1916) is well known in the history of psychology for his work on the sensations of movement, the phenomenon of the Mach Bands, and neural inhibition in the retina; his numerous experiments in vision, sensations of sound, light, space, and time; and even so-called “form sensations” which influenced early Gestalt psychology. Mach was associated with the “nativist” movement in psychology, calling attention to hard-wired sensory mechanisms outside conscious control, and was a backer of Ewald Hering against Helmholtz’s doctrine of unconscious inference in perception. He was also, of course, a physicist by training, whose criticisms of classical physics were influential for a generation of scientists, including the young Einstein. His opposition to atomic theories was equally vehement, drawing the criticism of Planck and Boltzmann.

What has damaged the assessment of Mach’s work as a philosopher is his undeserved reputation as a phenomenalist and the common association of his work with the logical positivism of the Vienna Circle, representing the view that theoretical terms should be translated into an observational “protocol language,” in the process seriously hobbling scientific inquiry and misrepresenting theories and their commitments. When the inevitable reaction against logical positivism came, in the 1950s and 1960s, Mach was simply lumped in with the Circle, and even his purely scientific ideas are still often seen through this distorted lens. John Blackmore is among the authors of this postpositivist period who joined the tide. In the last 40 years, Blackmore has built up an impressive body of historical research on Mach and his contemporaries. The present volumes, *Ernst Mach's Graz* and *Ernst Mach's Influence Spreads*, are part of a recent cycle of self-published volumes with his collaborators Setsuko Tanaka and Ryoichi Itagaki. I have always found Blackmore’s historical research to be very thorough and have relied on it in my own writings. He has made available much correspondence and archival material that scholars can now find in print. The only exception are Mach’s notebooks, which for some reason he has avoided cataloging, but which contain a wealth of information on Mach’s thinking that should not be ignored.

On the philosophical front, Blackmore accuses Mach of a very extreme and unrealistic form of positivism, which he calls “presentism”: the belief only in what can be sensed consciously, denying the external world beyond perception. Blackmore’s heroes are the representative, or indirect, realists (Galileo, Newton, Locke, Planck, Boltzmann). They do not believe in the reality of perception as given in experience, but in a real mind-independent external world known only “indirectly” through representations. Hence the battle is between the “presentist” idealists and the “representative” realists and there are no other options: a Procrustean dichotomy, which I think fits the history of philosophy, and Mach in particular, quite poorly.

Mach was certainly an empiricist who emphasized observation, logically precise concepts, and continuity between the observed and the unobserved. However, and this must be very strongly emphasized, he was not a “presentist” who believed only in sense data and refused to accept an external world beyond perception. Nor was he ever a Vienna Circle style “logical empiricist” recommending a protocol language of the given, or a logical reconstruction of

theoretical terms purely in an observational language. Mach's views have nothing to do with the logico-linguistic positivism of the Circle, as Paul Feyerabend (1984), Friedrich Stadler (2001), and myself (Banks, 2003) have shown. Mach was really a kind of scientific monist, who believed in the reality of sensory experience and physics, not just one or the other. It was during his time in Graz, in fact, when Mach says he succeeded in developing his unified scientific conception of the world in terms of what he called the "elements." Mach was deeply dissatisfied with material monism and mechanist physicalism for leaving out the rich phenomenology of experience or saying it does not exist. But he was equally dissatisfied with idealist monism for reducing physical bodies and events to perceptions in a mind. During the Graz period, Mach therefore proposed a theory of neutral elements (s/e), neither physical nor mental, out of which to construct both physical bodies and minds. Mach's elements could be considered sensations (s), if present to the human mind, but they could at the same time be considered physical events (s/e) belonging to physical objects as well. Other elements belonging to the external world (e) but not present to consciousness were added in thought, in Mach's words. The existence of unsensed elements and objects could indeed be inferred, as long as a continuous link was maintained with perception, on which Mach insisted (see Banks 2003, Chapters 7 and 9). Hence his strange, obdurate opposition to atoms, which he saw as permanently isolated Kantian *Dinge an sich*, and not as little material objects continuous with observation. When experiments showed otherwise, he was willing to go along, although he may still have believed his elements were more fundamental than atoms (as Feyerabend 1984 emphasizes).

So, what were the elements of experience-reality? Tiny energy quanta, event particulars, manifestations of force or energy? Mach thought it was up to science to discover the answer and so he left the question open, also leaving the door open to misunderstandings. Mach also wrote in a pithy, aphoristic style, often leaving his readers to draw their own conclusions. I think his greatest error was his tendency to use the word "sensation" too freely, when he probably should have used the word "element" instead. In the *Analysis of Sensations* he says he only did so because we "are more familiar with elements as our sensations" (Mach 1959, p. 16).

Ernst Mach's Graz is a retelling of several episodes about which Blackmore and others have written more fully elsewhere. Mach's work during this time was strongly focused on the physiology of the senses and psychophysics, having been deeply influenced by the appearance of G. T. Fechner's *Elemente der Psychophysik* in 1860. In Graz, he discovered the Mach-Bands, an effect in which contrasts stand out more starkly in visual perception than in the actual luminance curve, which Mach attributed to neural inhibition in the retina (Ratliff, 1965). He also continued his research on hearing, spatial, and temporal sensation and other investigations. And finally, he worked out his scientific-philosophical monism. There is a brief section of Blackmore's book (pp. 131–137), which he addresses to me directly, and to which I would like to respond here. Blackmore agrees with me that the German philosopher J. F. Herbart was a significant influence on the development of Mach's view of the elements in the Graz period (Banks, 2003, Chapters 2 and 3). As I have written elsewhere, Herbart speaks about force qualities in nature, "pressing against and resisting each other," and united into nuclei of objects. Like physical forces, these natural qualities have power, or are manifestations of powers, but they also manifest concrete qualities as our sensations do. I went on to show that Mach's elements are also physical and dynamic and unite functionally into complexes and that these realistic features of the Machian elements probably came directly from Herbart. Imagine my surprise, then, to read that Herbart (who is considered a realist by most historians of philosophy) is also to be considered a "presentist" who did not believe in a real external world but only in his own sensations. Not so. Imagine my greater surprise to learn that I too am a "presentist"

(at least mostly) for my attempts to accentuate realistic features of the positions of Mach and Herbart (p. 135). I am also accused of misunderstanding basic philosophical terminology by referring to Mach and William James as “direct realists,” because, as I noted above, for them the sensory elements (s) can be considered real physical events (s/e) experienced directly. For Blackmore, all true realists are “representative realists,” not presentists. And all presentists are idealists, not realists. So, one can only be an indirect realist. But this is nonsense, since there are also realists about *experience*, like Mach or James, who are not anti-realists about the external world. There is an Alice in Wonderland quality to this conversation for me, where Blackmore seems to think that he, and only he, is allowed to stake out basic philosophical vocabulary and positions. I prefer to keep the discussion impersonal, therefore I was surprised to see my views labeled and attacked, especially without entering in any detailed way into my interpretive position, my arguments, or the substantial evidence I have adduced in my book and my other writings on Mach.

Now to a more pleasant topic: the second volume, entitled *Ernst Mach's Influence Spreads*. Here, I am happy to say, the historian Blackmore comes to the fore, bringing a wealth of information and analysis from numerous sources collected here, including some totally original material composed for this volume. The footnotes and documentation of sources are also quite precise and informative. There is some excess editorializing, but the tracing of Mach's influence across very different realms is engaging and well done. There are chapters about Mach's influence on the following: Music and Musicians (in which Mach maintained a lively interest both artistic and scientific); Mach's Jewish friends; anthropologists, such as Malinowski; Hungarian scientists and mathematicians (different authors); the Energetics movement of Ostwald, Helm, and Duhem (a nice chapter by Robert Deltete and Matthias Neuber); and finally Japan (concluding the volume is a very fine essay by Makoto Katsumori on Japanese philosopher Wataru Hiromatsu and his relation to Mach).

One question occurred to me during the chapter on the Hungarians. Why has more not been said about Mach and the quantum theory? Blackmore notes that Wolfgang Pauli was Mach's godson and surely knew Mach's works well. He also acknowledges Machian influences on Jordan and Schrödinger (1992, pp. 310–312; see the latter's delightful 1992 treatise called *Mind and Matter*). Did Werner Heisenberg also intend to invoke Mach when he developed a matrix atom and a quantum mechanics “based on observable quantities?” Heisenberg told Einstein he was aware of his empiricist philosophical influences and had presumably tried to emulate him. This could be a very interesting story with a bit more work. Would it not be ironic if Mach's views were supposedly refuted by the existence of atoms at the turn of the century, yet vindicated again a few decades later by a deeper look *inside* the atom?

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