

“Beyond the conventional boundaries of physics”: On relating Ernst Mach’s philosophy to his teaching and research in the 1870s and 80s

By: Richard Staley

Ernst Mach’s most well known critiques of mechanics concerning mass, inertia and space and time were conceptually motivated by the aim of avoiding unnecessary assumptions and basing the concepts of physics upon measured relations, and they were first published in the years around 1870 (for mass and inertia) and in his well known 1883 book *Die Mechanik in ihrer Entwicklung historisch-kritisch dargestellt*. Philosophical discussion of them has reflected these conceptual concerns, and related Mach’s critique to his emphasis on the economy of thought. Yet manuscript records of Mach’s teaching in the 1870s shows that his approach was animated also by the concerns of psychophysics and the relations between inner and outer worlds, and his publications attest to these broader interests also. In the 1870s, for example, Mach developed physiological studies of the sense of motion, and soon after his critical history of mechanics was published in 1883, his 1886 *Beiträge zur Analyse der Empfindungen* was intimately concerned with the relations between physiology and psychology. By investigating Mach’s research across subject matter that has usually been treated separately, and seeking to integrate his teaching and research also, this paper aims at offering a study of Mach’s philosophy as it is revealed in practice. Indeed, Mach offers a highly unusual example whose primary aim was to reform his own discipline of physics through the concerns of other disciplines, something he alluded to in 1886 when stating that he expected the next great enlightenments of the foundations of physics to come at the hands of biology.