Mach and the Principle of Verification

Thomas Manig
University of Nebraska-Lincoln

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THOMAS MANIG

Department of Philosophy
University of Nebraska-Lincoln 68588

Scholars of the history of the philosophy of science take it pretty much for granted that the scientist Ernst Mach had created much of the initial thrust if not many of the central principles of logical positivism. And for the most part they are quite right in thinking so. Although, as Toulmin aptly put it, 'Mach himself was never a "logical" positivist,' Mach's radically empiricistic and anti-metaphysical orientation was sufficient to justify the feelings of indebtedness most early logical positivists had for him. Indeed, the first manifesto of the so-called "Vienna Circle" of logical positivists was published by the Viennese Ernst Mach Society, a group headed by Moritz Schlick, the acknowledged founder of logical positivism. This manifesto announced that the Vienna Circle, in seeking 'to eliminate metaphysical problems and assertions as meaningless as well as to clarify the meanings of concepts and sentences of empirical science by showing their immediately observable content . . . continues the endeavors initiated by Ernst Mach.'

Some of the central principles of logical positivism, such as the doctrine of the unity of science, are easy to extract from Mach's written works. But Mach was a little more cautious about stating anything quite as bold as the principle with which we will now be primarily concerned, namely, the Principle of Verification. In its fullest generality, the Principle of Verification is the principle that a statement or proposition is meaningful if, and only if, it is either analytically true or empirically verifiable. (The analytically true ones, thought of as true come what may, are thus verified by any evidence whatsoever.) While Mach is certainly responsible for less extreme statements about the merits of empirical verification, he primarily regarded himself as a scientist trying to cleanse science of metaphysical muddles, and not as a philosopher trying to demarcate the whole realm of meaningful statements or propositions. It is one thing to say that metaphysical statements are physically meaningless, and quite another thing to say that they are meaningless *simpliciter.* As the rising philosopher Corbin Fowler has pointed out, '*Physical* propositions are meaningless from a *metaphysical* point of view.'

Throughout Mach's works, one gets the impression that Mach had intended only to keep metaphysical considerations out of science. Apparently he didn't care very much whether or not metaphysical considerations had a meaningful place outside of science. Rather, he had declared 'I do not share the Kantian point of view, in fact, occupy *no* metaphysical point of view, not even that of Berkeley.' If we respect this declaration, we must regard Mach's

hostile attitude toward metaphysics as a scientist's attitude, and not as a philosopher's doctrine about what is wrong with metaphysics *per se.* Mach never attacked metaphysics on the presumption that whatever is unempirical or unscientific must be meaningless in all contexts, but only on the presumption that metaphysical considerations are alien to the central character of empirical science. The tenet that dominates Mach's discussions of this character is that 'Economy of communication and of apprehension is of the very essence of science.' Thus, scientific laws are merely highly economical means of describing and communicating our sensory experiences. (Since sensory experiences can be sorted out in any of various ways, Mach argued that the compartmentalization of sciences into various special sciences is arbitrary. Hence his doctrine of the unity of science.)

Metaphysical considerations get ruled out of science because they are contrary to science's fundamentally economical character with respect to our sensory experiences. For metaphysical items correspond to no features of sensory experiences that we would ever need to communicate; mentioning such items would just detract from the efficient reporting of experiences. The trouble with the Newtonian conception of absolute time, for example, is that it 'can be measured by comparison with no motion; it has therefore neither a practical nor a scientific value; and no one is justified in saying that he knows aught about it. It is an idle metaphysical conception.' (Fasten on the word 'idle'.)

Mach characterized empirical science with a particular epistemology in mind, and it is noteworthy that his hostility toward metaphysics did not extend to epistemology. His epistemology is partly expressed in the following passage:

> All our principles of mechanics are, as we have shown in detail, experimental knowledge concerning the relative positions and motions of bodies. Even in the provinces in which they are now recognized as valid, they could not (be), and were not, admitted without previously being subjected to experimental tests. No one is warranted in extending these principles beyond the boundaries of experience. In fact, such an extension is meaningless, as no one possesses the requisite knowledge to make use of it.

In this passage one detects a radical restriction of mechanics to empirical principles. It was one of Mach's main tenets that laws of natural science are empirical, and he frequently went out of his way to undermine apriorism in mechanics, especially as it was manifested in the classical physical conceptions of mass, inertia, absolute space, absolute time and causality.

Again, what goes wrong with principles which invoke such *a priori* conceptions, and what made Mach say that such principles are meaningless, is that insofar as they are extended beyond the boundaries of experience they lose their usefulness. For instance, any law of inertia which purports to

describe the motion of a body which is unaffected by external forces, purports to describe a situation we could never experience and is to that extent useless. And casual laws which purport to describe anything other than functional connections between sensory experiences likewise purport to describe something we could never experience, and are likewise rendered useless in that respect.

We've been concentrating on Mach's two tenets that the laws of natural science are empirical and that metaphysical considerations are alien to the central character of science because these tenets have frequently, and appropriately, been held in conjunction with the Principle of Verification, yet they must not be regarded as sufficient to commit one to the Principle of Verification. In short, the fact that Mach held these two tenets does not by itself imply his commitment to the Principle of Verification. It is true that both of the tenets are anti-metaphysical in their source and aim, but their force is simply to rule that metaphysical considerations are not scientific considerations. The Principle of Verification, on the other hand, is the stronger claim that metaphysical propositions or statements don't make any sense at all, even in non-scientific contexts. Implicit in the desire to implement the Principle of Verification is the idea that science constitutes the paradigm case of meaningful discourse.

Of course Mach has powerful tendencies in *that* direction, too, but these tendencies couldn't really be interpreted as central tenets of Mach's. For example, in the *Science of Mechanics,* Mach did conjecture that physical science would eventually develop into a complete world view, but this was certainly much more conjecture than conviction; even if it were one of Mach's tenets, it would have been relatively minor. It is likely that Mach *would have liked to believe* that science constitutes the paradigm case of meaningful discourse, but it is equally likely that he realized that he had insufficient grounds for such a belief.

Wittgenstein and the early logical positivists incorporated various facets of Mach's thought into their own, but not without considerable revision and refinement. In his *Tractatus,* Wittgenstein incorporated Mach's empirical atomism — the idea that all empirical knowledge is founded upon elementary sensory units. Following Wittgenstein in their emphasis upon language, but going beyond Wittgenstein in their exploration of idealized formal languages, the Vienna Circle positivists sought to make Mach's positivism logical. Carnap varied a Machian theme by requiring that logical constructions be substituted for inferred entities wherever possible, for Mach had required the replacement of such inferred entities as casual connections by such abstract instruments as mathematical functions. Indeed, Mach's views concerning inferred entities may be neatly characterized as an instrumentalism which implies nothing about the entities' reality. For Mach, an inferred entity could only be

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properly introduced into a scientific theory as an instrument for economizing description and communication; and, although Mach excluded metaphysical posits from science on those grounds, he did not insist that they are also to be excluded from extrascientific contexts on those grounds.

Mach did endorse antimetaphysical views of less scope than the full-fledged principle of verification; and to this extent he was a pioneer of verificationist positivism. But the most fair assessment of his stated views is that he never arrived in the Promised Land. He never sought to create a scientific world-view which encompassed all and only empirically meaningful discourse. Again and again, he would attack the use of a metaphysical principle or concept on the grounds that it was scientifically meaningless, but never on the grounds that it was meaningless in all contexts. It is easy to confuse this viewpoint of Mach's with his other claim that the principles of science are indeed, wholly meaningless when removed from their empirical lifeblood. Thus, Mach had been saying that metaphysical principles are merely scientifically out of place, whereas scientific principles alienated from experience are unconditionally out of place. We might well conclude that Mach, dedicated scientist that he was, didn't care one way or another about metaphysics' extrascientific status. What primarily justified his heavy influence on the logical positivists was his conjecture that physical science would *eventually* develop into a comprehensive world-view.