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KANT ON THE FOUNDATIONS OF SCIENCE

The most common view of Kant’s *Metaphysical Foundations of Natural Science (MFNS)*¹ is that it represents an explicit effort by Kant to provide an *a priori* justification for the Newtonian world view. It is usually argued that Kant attempted to provide this justification by deducing the main tenets of Newtonian mechanics directly from his critical philosophy.

In fact, it is not surprising that this view of the relationship between Kant and Newton should be the dominant one. Both the quasi-geometric mode of presentation which Kant affects in *MFNS* and certain striking similarities of phrasing between Newton’s three laws of motion and Kant’s three laws of mechanics tend to promote and support this interpretation. I shall argue, however, that these formal and verbal similarities conceal rather than reveal Kant’s true intentions. In particular, they disguise the extent to which Kant rejects major aspects of the Newtonian natural philosophy. Consequently they make it difficult for the reader to see *MFNS* for what it really is: one stage in a lifelong struggle by Kant to combine in a single unified system the conceptual advantages of a force ontology with the empirical successes of mechanism.

I shall explicate and defend this claim in the early parts of this essay. Subsequently, I shall examine Peter Harman’s claims² regarding Kant’s debt to Euler and shall argue that caution is also required when attempting to determine the extent to which Kant has appropriated Euler’s insights. Here again it will be shown that even the most strikingly similar verbal formulations may mask a radical divergence in meaning.

I. PRELIMINARY CONSIDERATIONS

In the following sections of this essay we shall examine some very interesting and rather sophisticated reasons for denying the claim that Kant’s *MFNS* was an attempt to deductively establish the laws of Newtonian mechanics. The arguments there will concern the basic ontological and methodological commitments of Newton and Kant, respectively, as well as their different conceptions of lawlikeness. Before undertaking this more subtle task, however,
it would be well to dispense at the outset with some of the grosser misunderstandings of Kant's natural philosophy.

Suppose we set aside temporarily considerations of underlying methodological and ontological commitments and deal with Newton's theory at face value—simply as a collection of laws which 'describe the phenomena'. Suppose we strip our account of Newtonian matter theory to its positivistic essentials and consider only the three laws of motion and the inverse square law for universal gravitation. Can we then argue that, in this very modest sense of Newtonian theory, Kant was attempting to provide an \textit{a priori} deduction of its validity? Even a cursory reading of \textit{MFNS} reveals that the answer to this question is 'No', and that there are several good reasons for rejecting the common view of the Kantian project.

Consider first the inverse square law for universal gravitation. Kant nowhere argues that this law expresses a necessary truth, but instead is quite specific about maintaining the contrary position. Necessity characterizes only conceptual truths, and the truth of the inverse square law can be confirmed only by experience. Kant indicates this by discussing the attractive force of matter, not in the chapter called 'Mechanics' where the proper modality is that of necessity, but in the 'Dynamics' where \textit{actuality} is the appropriate modality.

Though it is clear that Kant sometimes yearns after an \textit{a priori} deduction of the inverse square law, he reluctantly admits that no such derivation is possible. The proper measure of the attractive force can be determined only empirically. Forces must be encountered in nature; they cannot be constructed \textit{a priori}.

Consider, secondly, Kant's three laws of mechanics. Though these \textit{are} meant to express necessary truths (unlike the inverse square law), it is important to note that they are not identical with Newton's three laws of motion. The three propositions discussed by Kant are as follows:\textsuperscript{3}

1. With regard to all changes of corporeal nature, the quantity of matter taken as a whole remains the same, unincreased and undiminished.
2. Every change of matter has an external cause.
3. In all communication of motion, action and reaction are always equal to one another.

Note first that nothing here corresponds to Newton's second law in either its modern \((F = ma)\) or original \((F = \Delta mv)\) form. In his discussions, Kant treats \(\Delta mv\) as the true measure of force but nowhere gives this identity the status of a law. In its place, so to speak, he substitutes the conservation of matter. It is true that Kant's second and third laws bear some resemblance