

On Mathematical Explanations of Physical Facts

by Prof. Joseph Berkovitz

Modern physics is highly mathematical, and this may suggest that mathematics is bound to play some role in explaining the physical reality. Yet, there is an ongoing controversy about the prospects of mathematical explanations of physical facts and the nature of such explanations. A popular view has it that mathematics provides a rich and indispensable language for describing the physical reality but could not play any role in explaining physical facts. Even more prevalent is the view that physical facts are to be sharply distinguished from mathematical facts. Indeed, both sides of the debate seem to hold this view. Accordingly, the idea that mathematical facts could explain physical facts seems particularly puzzling: how could facts about abstract, non-physical entities possibly explain physical facts? In this paper, I challenge these common views. I argue that in addition to its descriptive role, mathematics plays a constitutive role in modern physics: some general, fundamental features of the physical reality, as reflected by modern physics, are essentially mathematical; and that this constitutive role is the source of mathematical explanations of physical facts. On the basis of this argument, I suggest an account of mathematical explanation of physical facts. In this account, mathematical explanations of physical facts highlight the mathematical constitution of physical facts. I conclude by comparing this account to other existing accounts of mathematical explanations of physical facts.

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Faculdade de Ciências da Universidade de Lisboa

Room 6.2.46 (Building C6, 2nd Floor)

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