

Reading Guide #20 - The Explanatory Indispensability Argument

Alan Baker, "Are There Genuine Mathematical Explanations of Physical Phenomena?"

Paolo Mancosu, "Explanation In Mathematics," §1 - §3

Baker

1. How is 'indispensability for science' vague? How do indispensabilists avoid the problem?
2. Why is explanation important for the indispensability argument? What kinds of explanations are important?
3. According to Colyvan, how does mathematics help explain the pressure-temperature antipodes? How is Colyvan's explanation really a prediction?
4. How does Melia criticize Colyvan's two relativity examples?
5. How is the use of geometrical explanations to support Colyvan's indispensability thesis controversial?
6. How does Baker criticize Melia's reliance on a causal principle of explanation?
7. What is the goal of Baker's article? How does the cicada example support that goal?
8. What are two explanations of the prime-numbered year cicada life-cycle length? How do they involve mathematical facts?
9. What three criteria should a mathematical explanation of a physical phenomenon meet? Are they met in the cicada case?
10. How does Baker interpret Melia's challenge for his cicada example?
11. Why doesn't a casual account of explanation help decide whether explanation is truly mathematical?
12. What is a deductive-nomological account of explanation? Does it allow for mathematical explanations?
13. What is a pragmatic account of explanation? Does it allow for mathematical explanations?
14. How does Baker's cicada case avoid Melia's charge that some purported mathematical explanations of physical phenomena rely on arbitrary properties of mathematical objects?
15. How does Baker's case avoid the ambiguity that infected Colyvan's geometric cases?
16. Are there genuine mathematical explanations of physical phenomena? Explain.

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Mancosu

1. What is the honeycomb conjecture? How does it rely on mathematical facts?
2. How are Mancosu's four examples contrary to the claim that all explanations in the sciences must be causal?
3. What is the explanatory indispensability argument (§3.2)?
4. How does Steiner (preemptively) reject the explanatory indispensability argument?
5. How do Lyon and Colyvan press the challenge to the dispensabilist (Field)?