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*Title:* The Indeterminacy of Computation

*Abstract:* Do the dynamics of a physical system determine what function the system computes? Except in special cases the answer is no: it is often *indeterminate* what function a given physical system computes. This poses a challenge for the view that computational descriptions are genuinely explanatory of the cognitive-behavioural phenomena they target. Care must be taken when the question ‘What does a particular neural mechanism do?’ is answered by hypothesising that the mechanism computes a *particular* function. The phenomenon of the indeterminacy of computation imposes a methodological constraint on computational explanation. Yet the news is not all bad: the phenomenon also lends support to the idea that a single neural mechanism may perform multiple cognitive functions. We provide an overarching conceptual framework to further the debate.