

## **Integrating computation into the mechanistic hierarchy in the cognitive and neural sciences**

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**Abstract:** It is generally accepted that, in the cognitive sciences, there are both computational and mechanistic explanations. We ask how computational explanations can integrate into the mechanistic hierarchy. The problem stems from the fact that implementation and mechanistic relations have different forms. The implementation relation, from the states of an abstract computational system (e.g., an automaton) to the physical, implementing states is a homomorphism mapping relation. The mechanistic relation, however, is that of part/whole; the explanans in a mechanistic explanation are components of the explanandum phenomenon. Moreover, each component in one level of mechanism is constituted and explained by components of an underlying level of mechanism. Hence, it seems, computational variables cannot be mechanistically explained by the medium-dependent properties that implement them. How then, do the computational and implementational properties integrate to create the mechanistic hierarchy? After explicating the general problem we examine two possible solutions.