

Algorithmic Thinking and the Strategic Use of Abstraction

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This paper demonstrates how philosophical thought can inform science, with reference to the interplay of causal and algorithmic thinking in Cognitive Science, Evolutionary Biology and other scientific enquiries. It is argued (touching briefly on the debate between Fictionalism and Realism regarding mathematics [2,5]) that algorithmic concepts (eg. substrate neutrality) are mathematical fictions for describing processes in the same way that geometric concepts (eg. lengthless points, arealess lines) are for describing spatial relations. As such the act of parsing a causal process into “the algorithm” and its “substrate” is underdetermined by the underlying reality. It is demonstrated, using thought examples, that even the computational/algorithmic characterization of a physical digital computer is underspecified by the underlying causal/physical processes. In this way it can be seen that the Dennett–Gould [1,3,4] debate on adaptationism was not based on any real disagreement about the reality of evolution, but only the parsing of that reality into algorithm and substrate. It is shown (drawing further examples from cognitive science, phonology and physics) that the decision between differing but compatible algorithmic descriptions of natural processes is not, however, arbitrary, but rather a matter of epistemic and communicative strategy.

References

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