

Artificial Intelligence as an Experimental Science

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The journal *Artificial Intelligence* has experienced a rather steady drift, in recent years, from articles describing and evaluating specific computer programs that exhibit intelligence to formal articles that prove theorems about intelligence. This trend raises basic questions about the nature of theory in artificial intelligence and the appropriate form for a mature science of this discipline.

During the past 35 years of AI's history, the vast bulk of our understanding of machine intelligence has derived from experimenting: constructing innumerable programs that exhibit such intelligence, and examining and analyzing their performance. Theory has been induced by identifying components and processes that are common to many of the programs, and broad generalizations about them. Some of this theory is formal, but most takes the form of laws of qualitative structure. In this respect, artificial intelligence resembles other empirical sciences like molecular biology or geophysics much more than mathematics. Computers, however "artificial," are real objects the complexity of whose behavior cannot be captured fully in simple formalisms. There are no "Three Laws of Motion" of AI.

This talk examines the forms that theory has taken (and will take) in artificial intelligence, and shows why the progress of the discipline would be stifled by a premature or excessive preoccupation with formalizations derivable from logic and mathematics.