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Dear Professor Boden:

I enjoyed reading your article on artificial intelligence in the British Journal of Philosophy of Science. Reviewing three collections of articles is no easy task, but you have tied them together in a meaningful way.

Your comments on the DENDRAL programs (p. 69) are not entirely accurate, however, because you seem to be taking the articles in Machine Intelligence 5 and Machine Intelligence 6 as discussing only one program. The MI5 paper discusses our performance program in which a hand-encoded theory of mass spectrometry is used to analyze empirical data. The MI6 paper discusses both the performance program and (the beginnings of) a program that generates new statements in the theory. The "Planning Rule Generator" mentioned in MI6 deduces the particular rules necessary for the performance program to be able to analyze data from different classes of molecules. It is this program (the Planning Rule Generator) that we described as "the first small step up the ladder of programs for theory manipulation and theory formation", not the performance program itself. The claim you cite in your review certainly would not be justified by work on the performance program alone. However, the "meta-program" that extends the performance program's set of mass spectrometry rules appears to be a step toward mechanizing the process of theory formation.

More recently, we have continued work in this vein by replacing the Planning Rule Generator with a new meta-program. This program starts with a collection of data (LISP representations of many molecular structures and mass spectra) and attempts to find (1) important regularities in the data, and (2) rather low-level explanations of the regularities. The explanations are stated in terms of concepts already used in the existing theory - no new concepts are introduced. Of course, one can always quibble about the sophistication of the "theory" that such programs construct. We make no claim that our programs can begin to undertake paradigm revision in Kuhn's sense. But the programs are now able to infer new rules of mass spectrometry that are useful to both practicing chemists and the DENDRAL performance program. The enclosed paper discusses some of this work. Our next major effort will be on recodifying the rather loose-knit theory by generalizing and combining existing rules.

I would appreciate your comments on these programs. Pragmatic considerations of providing a theory formation aid to chemists often cloud the more important philosophical issues. Your insights would be helpful in guiding our future work.

Sincerely,

Bruce G. Buchanan
Research Computer Scientist