The Review of Modern Logic
Volume 10 Numbers 3 & 4 (March 2005–May 2007) [Issue 32], pp. 213–217.

Ricardo Caferra, Alexander Leitsch, and Nicholas Peltier
Automated Model Building
Applied Logic Series, Vol. 31
Dordrecht/Boston/London: Kluwer Academic Publishers, 2004
xi + 341 pp. ISBN 1402026528

REVIEW

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Automated deduction was traditionally concentrated on trying to find out whether a given statement A can be deduced from a given theory T. Some automated deduction techniques start with the theory and try to get as many conclusions as possible—in the hope that the query A will be among these statements. Other automated deduction techniques—including resolution, probably the most well known of these techniques—start with adding the negation $\neg A$ to the theory, and proceed by deducing as many conclusions as possible in the hope that one of these conclusions will be a contradiction; if T is not compatible with $\neg A$, this means that T implies A.

Sometimes, the conclusion is that the formula A cannot be deduced from the theory T. In many practical applications, it is desirable not just to show that A cannot be deduced from T, but also to produce a model explaining a situation when T holds but A does not hold. For example, one possible application of automated deduction is to prove that a robot is safe. In this case, T is a theory describing the motion of a robot under the given design, and A is a statement describing that this robot is safe (*e.g.*, that a mobile robot never leaves the safe zone where it is supposed to stay). In this example, if we prove that the robot is not safe, *i.e.*, that A cannot be deduced from T, then the robot designer would like not only to know the *fact* that the design is un-safe, but also to see an explicit detailed *example* where this design fails—*i.e.*, a model of $T \cup \{\neg A\}$. Such a specific example is, in general, much more useful in correcting the design than simply an indication that the design is wrong.

In pure mathematics, the need for models is also well known. For example, in geometry, it was an interesting theoretical achievement to