SG Colloquium

On the Limits to Scientific Knowledge

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Abstract

The story of mathematics in the latter half of this century has to a great extent been the story of ``nonexistence'' theorems. Goedel's results on the existence of undecidable propositions in number theory and Turing's proof of the undecidability of the Halting Problem in computer science are probably the best-known results of this sort. They demonstrate the existence of mathematical questions that are forever beyond the powers of the human mind to answer by carrying out a computation.

Do the same kind of nonexistence results apply to the seemingly more complex world of natural phenomena? In particular, are there important and interesting scientific questions that defy rational analysis? Given the vastly more complicated types of interactions in areas like physics, biology, and economics than what are found in the vastly simpler domain of arithmetic, it is not unreasonable to suspect that such unanswerable questions do indeed exist. If so, what are they like?

This talk will explore the thesis that the method by which questions are answered in science is to carry out a computation--either explicity by means of a computer program or implicitly by constructing a mathematical model embodying an algorithmic relationship between the components of a given system. So when it comes to unanswerable scientific questions, we can sharpen the issue considerably by asking whether there are questions that cannot be answered by performing a calculation.

Examples of candidate questions from biology, physics and economics will be presented, along with a consideration of how the three worlds of observations, mathematics and computation interrelate in addressing the question of ``limits''.

Date/Time?	**Friday, April 21, 2006, 10.00 – 12.00**
Where?	ETH Zentrum, ZUE G1 (Zürichbergstrasse 18, G-floor)