Part 4

Nature and the Computer

Computers have greatly extended man's capacity to do both sensible and silly things. They have also complicated the task of finding out which kind of effort has been done. The best that can be done with a computer may or may not be better than no effort at all. A computer model can do a lot of harm if its audience loses track of the model's limitations.

The two essays in this section present a broad critique of mathematical models of water resources, from two complementary perspectives. Robert Cleary, a water resources engineer, has the highest hopes for them; Daniel Goodman, an ecologist, is made nervous by them. Each devotes a considerable portion of his essay to a single model, LAKECO, which has played a prominent role in the Tocks Island Dam controversy. The model claims to shed light on whether the lake behind the dam will eutrophy at a given rate of inflow of various nutrients. Were it reliable, it could help disentangle one of the most perplexing issues that have stalled the Tocks project. It could, for example, assist the planners who have to design the recreation facilities around the lake, allowing them to anticipate which coves along the lake shore are likely to be filled with noxious weeds in which seasons of the year.

Both authors make it clear that LAKECO cannot do this. It is beyond repair in two critical respects: it is one-dimensional, which makes it unable to reflect any spatial variations other than with depth; and it is simplistic in its treatment of the biological reactions that govern the growth of algae. According to Goodman, spending money to make the model more elaborate is ill advised—the science of ecology is at far too primitive a stage to be reduced to mathematical expressions of the kind such models require. Leaving the biology aside, says Cleary, models in their place are an invaluable tool in allowing the decision maker to assess the consequences of a wide range of alternatives.

Goodman is persuasive that biological systems will be especially refractory to model, because evolution has put a premium on being unpredictable. However, some would argue that every scientific frontier appears chaotic to those who work there, and that generalizations of use *are* being drawn from ecology at this time. Some pollutants do more harm than others, some components of ecosystems are more vulnerable to shock than others, some minimal size habitat is needed to sustain a population above extinction. As ecologists learn the principles that clarify issues such as these, and as the truths that emerge are given public expression, rational decision making, conceivably, could be the better for it.