A sideways look at climate research

Under the title ‘A sideways look at climate research’, Weather, the magazine of the Royal Meteorological Society, published a column from my hand in February 1990.

I worry a lot these days.

I worry about the arrogance of scientists who blithely claim that they can help solve the climate problem, provided their research receives massive increases in funding. I worry about the lack of sophistication and the absence of reflection in the way climate modellers covet new supercomputers. I worry about the scientific and technological advances being promised for the next ten years. I worry about the eagerness with which we tend to prostitute ourselves in order to please politicians who might be seduced into financing our craving for expansion. I worry that our claims will rebound on us. I worry that they will hurt our chances of obtaining adequate support for the long-term commitments needed in climate monitoring and ecosystem research.

It took meteorology nearly forty years to produce consistently reliable numerical weather forecasts for a mere three days ahead. With that kind of record, we should know better than to promise rapid advances in climate modelling. The climate system is orders of magnitude more complex than the physics of the circulatory subsystem we call atmosphere; if we were to be realistic, we should promise no more than a few tentative initial results some twenty years from now.

Why are scientists so eager? I find it rather embarrassing and more than a little inconsistent to ask for rapid expansion of climate research funding at a time when it has become painfully evident that the unbridled expansion of human activities is the ultimate cause of our planet’s distress. The clamour for funding is a symptom, however indirect, of mankind’s aggressiveness. Before we fully realize, we may have aggravated the problem, notwithstanding our good intentions.

My worries multiply when I contemplate possible side effects. Expansion of research tends to support the illusion that science and technology can solve nearly every problem, given enough resources. Research supports the progress myth that pervades modern society, but that very myth seduces us into ignoring our responsibility for the state of the planet. Therefore, I want to restrain myself. I want to avoid making promises I cannot keep. I want to keep my expansive instincts in check. Above all, I try to be a scientist: I wish to think before I act.

There are several issues that require much more thought. One is the methodology to be used when developing climate models. Conventional development work, as in numerical weather prediction, proceeds by trial and error. Early prototypes unavoidably contain all kinds of defects, but these are gradually weeded out as experience accumulates through repeated experimentation. But how can we improve the forecast skill of climate models? The climate of our planet is a one-time experiment; we cannot tune climate models any faster than the evolution of climate itself.

Another issue which confronts us is the primitive state of our knowledge of the formal logic of ecosystems. Ordinary logic consists of sequential chains of rational arguments; it helps to

weed out incorrect hypotheses about the relations between causes and effects. The logic of ecosystems (eco-logic, for short) deals with the constraints imposed by the circulatory nature of all ecological relationships. In terms borrowed from control theory: eco-logic consists of many feedback loops, in which inputs and outputs become intertwined, because the outputs are inputs for the inputs. The constraints imposed by the planetary ecosystem require continuous adjustment and permanent adaptation. Predictive skills are of secondary importance.

As meteorologists, we should not find it difficult to appreciate how eco-logic works, because it is not too dissimilar from the way the atmospheric circulation operates. I would sleep a lot better if our climate research programs would show some awareness of the unavoidability of feedback loops in the logic we use to describe the planetary ecosystem and in the logic we use to design our research strategies.

A recent issue of *Scientific American* bears the pretentious title 'Managing Planet Earth'. The United States Environmental Protection Agency has launched a program to 'Stabilize the Climate System'. I am terrified by the hubris, the conceit, the arrogance implied by words like these. Who are we to claim that we can manage the planet? We cannot even manage ourselves. Who are we to claim that we can run the planetary ecosystem? In an ecosystem no one is boss, virtually by definition. Why are we, with our magnificent brains, so easily seduced by technocratic totalitarianism? Why is it that *Homo sapiens* finds it so hard to practice some humility?

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(with minor editing, March 2005)