

assailants, flee from danger, or make passionate love, yet we barely twitch in our beds.

Sigmund Freud thought the bizarreness of dreams allowed sleepers to avoid acknowledging subconscious wishes. But Hobson believes that the weird stories more likely reflect the brain's astounding ability to link a profusion of tangentially related ideas, which he terms "hyperassociation." We've all had dreams in which scenes change abruptly. In one experiment, Hobson and colleagues scissored apart 10 dream reports at the point of these dramatic scene shifts. They then spliced the fragments together, restoring half to their original form and making hybrids of the rest by combining the first part of one person's dream with the second part of another's. Even skilled psychoanalysts couldn't distinguish the real dreams from the hybrids. In trying to make sense of our dreams, Hobson believes, we search for causal ties where none exist.

Why do we dream at all? Through activation of the brain in sleep, Hobson suggests, we assimilate new information, master new skills, and prune out-of-date files. Babies get much more REM sleep than adults; intense activation may foster brain development early in life.

Freud initially aspired to unite psychology and neurology. In his *Project for a Scientific Psychology* (1895), he tried to construct a model of the human mind by describing its neurobiological workings. Since the neurological techniques of his time weren't up to the task, he concentrated on psychological theories. Today, PET scans and other sophisticated imaging tools open new windows to understanding how the brain functions. Contemporary neuroscientists can mine a trove of data that Freud could only dream of.

—LYNNE LAMBERG

**UNCERTAIN SCIENCE,
UNCERTAIN WORLD.**

By Henry N. Pollack. Cambridge Univ. Press. 252 pp. \$25

At the end of many a scientific assessment resounds the clarion call, "More research is needed." Admirably honest

though this may be as far as science itself is concerned, it can look to outsiders like equivocation. When will the next earthquake hit Los Angeles? How fast is global temperature rising? We want answers.

Uncertainty, far from being a flaw, is an essential characteristic of science, says Henry N. Pollack, a geophysicist at the University of Michigan. Dogmatism is the enemy of progress. With the help of numerous examples, not all of them scientific (stock market fluctuations and the fabled hanging chads of Florida, among other things), Pollack illuminates the way scientists pick an often zig-zag course from ignorance to knowledge. They make guesses, judge likelihoods, evaluate probabilities. Scientific models of reality may be idealized, even simplistic, but their failings light the way ahead.

As a teacher, Pollack has a pleasant style and a light touch, though his writing doesn't always make it out of the classroom. He tends to overexplain his examples, and when it looks as if he is coming to a conclusion, he gives another example. He also has the inexplicable academic habit of ending each chapter by telling you what he just told you, and letting you know what he is going to tell you next, then starting the next chapter by—well, you know.

Still, the central chapters of the book offer an informative and enlightening account of how science works in practice and how scientists learn to be at ease in an uncertain universe. Pollack's particular concern is global warming, and in his last chapter he pulls a bit of a trick. Having convinced us that uncertainty in science is the name of the game, he argues cogently that the world needs to do something about the buildup of carbon dioxide and other greenhouse gases that cause global warming. How fast the planet is warming is uncertain, he contends, but that it is warming is now beyond reasonable doubt.

Pollack is right. Advocates for the petroleum industry (such as currently inhabit the White House) like to suggest that if there are doubts in scientific models of the world's climate, then maybe there is no problem after all. This is misguided at best, irresponsible at worst. As Carl Sagan used

to point out, you can't assume that ignorance is going to work in your favor. Maybe global warming actually is proceeding at an even faster pace than the scientists' best estimates.

But what to do? Here I think Pollack is guilty of naiveté. He seems to imagine that if people understood science better, they would take global warming more seriously. But there is plenty of scientific training in the oil business. The trouble is that the policy debate is run by people who think like lawyers. Given a desire on the part of the oil

industry to maintain the profitable status quo as far as possible, the lawyer's task is to make the best case from the available evidence, not to sift out the truth. To a scientist, that's intellectually dishonest.

In the arena of public policy, the rules of science don't apply, even to scientific matters. Read this book to understand how scientists think and analyze, but don't expect help on how better to incorporate science into political decision making. On that important question, more research is needed.

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