

# OutPost on the Endless Frontier<sup>©</sup>

*EPRI e-News on Recent Key Developments in Energy Science and Technology*  
By Paul M. Grant

**No. 1, 16 June 1998**

## **Opening Act: Is It the Final Curtain Already?**

This column inaugurates a monthly series of informal reports and comments on developments in science and technology with potential to impact the future course of global energy development and use. Our intent is to share our insights on novel and interesting research reported in the current scientific literature and news media with our colleagues in EPRI member companies. Our style combines complex and controversial scientific issues with a light touch of humor. Personal opinions and views that may sometimes emerge in *OutPost* do not represent EPRI's official position.

The Second World War mobilized the scientists of the Allied Nations, and the United States in particular, on an unprecedented scale to produce the military technology vital to winning that conflict. President Franklin Delano Roosevelt, seeing "no reason why the lessons to be found in this experiment cannot be profitably employed in times of peace...for the improvement of the national health, the creation of new enterprises bringing new jobs, and the betterment of the national standard of living," on November 17, 1944, requested Vannevar Bush, the ex-vice-president of MIT whom he had chosen to lead the US wartime mobilization of civilian science, to propose a response to this vision.

By spring, 1945, the committee formed by Bush to fulfill Roosevelt's request issued the now-famous white paper entitled, *Science -- The Endless Frontier*, laid the philosophical foundation for our fantastically successful and fruitful national research and development program that we have today. Bush's essential thesis was that scientific inquiry was a self-perpetuating source of knowledge eventually yielding priceless public benefit...an "endless frontier" to explore and expand with infinite possibilities available to advance the human condition. Thus we take title to our banner, *OutPost on the Endless Frontier*, a sentinel for EPRI's constituency, alerting them to advances in science which may cross over into the present and future territory of energy technology.

This having been said, it is appropriate, and in the spirit of *OutPost*, to point out that not everyone subscribes to the view that science is indeed infinitely expandable. John Horgan, a well-known science writer, in a series of public debates and recent articles, in fact maintains the end of science is in sight (e.g. see his article in *Technology Review*, July 1996<sup>1</sup>). Much of Horgan's argument pertains to particle physics and the "theory of everything," referred to by physicists as the "grand unified theory," or "gut" models (who said scientists lack humor?). For example, Horgan points out that there is a practical limit to the size that mere mortals can construct particle colliders, those tools used to

probe what British physicist Stephen Hawking calls that “brief moment in time” following the Big Bang, the creation of the universe. To get back to  $t = 0$  would require the collision of fundamental particles accelerated to infinite kinetic energy, clearly a difficult prospect, especially given the attitude taken by Congress on construction of just the Superconducting Supercollider!

Horgan’s view has been challenged by Robert Hazen, a geophysicist and also a science writer, in a reply published in *Technology Review* entitled, *What We Don’t Know*.<sup>2</sup> Hazen stresses primarily our general ignorance of biological processes and the profundity that emerges as we begin to explore its mysteries.

What has all this rather philosophical discussion got to do with the energy business? *Outpost* believes steady progress in science and technology will be vital to its future prosperity, and what wells may be drying up, which may be coming into flood, and when, is important for you, our readers, to know.

History teaches us that new scientific disciplines seem always under development and old ones rejuvenated (about 40 years ago, classical optics was considered a completely mined-out and moribund field of physics...and then came the discovery of the laser!). An example of a new field with important implications for energy is the development of complexity theory typified by fractal geometry, deterministic chaos and nonlinear dynamics. Its application to outstanding problems in energy conversion, delivery and utilization will require vast increases in computational power. How will this be brought about? Are there fundamental limits that cannot be overcome? Will Moore’s Law, the seemingly inexorable doubling of transistor density every 18 months, continue indefinitely?

History also teaches that all too often sound scientific principles are ignored in the rush to report findings portending the energy deliverance of mankind. N-rays and Tesla’s “earth energy” were the rage in the 1920s and 30s. Cold fusion and room temperature superconductivity are some example “phenomena” of our era. In many cases, it can prove difficult to separate the wheat from the chaff. *OutPost* will attempt to do that for you.

Providing unique and timely insight into those scientific or pseudo-scientific developments with potential impact on the energy enterprise, is the mission of *OutPost*. At the end of the day, whether Horgan or Hazen is right, whether one believes science is endless or not, there will be enough coming over the horizon to be *OutPost*-ed for a long time to come.

73

<sup>1</sup><http://web.mit.edu/afs/athena/org/t/techreview/www/articles/july96/horgan.html>

<sup>2</sup><http://web.mit.edu/techreview/www/articles/july97/hazen.html>

*All Rights Reserved*