

BOSTON MEETING HIGHLIGHTS

It was a glorious fall week in Boston, with crisp temperatures and the sun shining on the last of the autumn leaves. Meeting sessions were filled with 1,831 attendees presenting 1,237 papers in 35 symposia, and lively conversations spilled over into the hallways between sessions and during coffee breaks. Twenty-five exhibitors provided information and demonstrations in the Technical Exhibition hall. Other highlights from the Meeting were a provocative plenary lecture delivered by John Horgan, and an engaging and entertaining award address given by Acheson medalist Jerry Woodall.

"The Beginning of the End of Science"

The Meeting opened with the Plenary Lecture delivered by John Horgan, a freelance science writer, who presented the premises of his national bestseller book, "The End of Science," published in 1996. Mr. Horgan warned the room packed full of conference attendees that his talk has not been greeted warmly by scientific audiences. A lively debate with Horgan did follow his address and continued well into the coffee break. The main idea he presented was that all the major, pure, scientific discoveries have been made and only incremental advances to them are to be made in the future. The list of "surprising" discoveries that have been made include the theory of relativity, Darwinian natural selection, DNA-based genetics, and quantum mechanics. Horgan stated that these past successes pose a barrier, in that science imposes limits on its own power and helps propound the scientific vision of reality as essentially true. He believes that the more we know of science, the less there is to discover. Now all that scientists are left with is to work out the details. However, some pursue what Horgan called speculative, or "ironic science." The examples he gave were superstring theory in physics (which is inaccessible to experimental verification), and wormholes in cosmology; theories Horgan thinks are signs of desperation. To support his view of the end of science, Horgan proceeded with a sophist argument defending himself from a list of typical disagreements he has faced with scientists:

"That's what they thought 100 years ago." With reference to the discovery of relativity and quantum mechanics, Horgan commented that this was bad

inductive logic and that the question is "when," not "if," the era of rapid scientific progress will end.

"Answers will raise new questions." In Horgan's view, what will be raised are details and the current picture of science will only be refined; there will always be unanswerable questions.

"Paradigm shift." Contrary to philosopher Carl Popper's belief that we can never prove, only disprove, a theory, Horgan stated that we do know that things exist, but that there will be no such paradigm shift in scientific theorizing.

"Extraterrestrial life." For Horgan it was clear that there is no evidence that life exists beyond earth.

"Chaoxplexity gambit." Chaoplexity is a word coined from a combination of the words "chaos" and "complexity." Horgan discredited explanations of scientific phenomenon by what he believes are optimistic interpretations of computer results dependent on initial conditions, in which for example, "the flutter of a butterfly wing could cause a monsoon in Bangladesh."

"Chess metaphor." For the argument that applied sciences are just at a begin-

ning, Horgan countered with examples of the unfulfilled dreams of inexhaustible fusion energy, immortality, and a cure for cancer (about the latter he noted that the U.S. has spent \$35 billion on this "war").

"What about the human mind?" The knowledge of neuroscience has not aided mental illness, Horgan contended. The drug Prozac has not proved to be better than older drugs or even talk therapy. He noted that even therapies such as lobotomy and shock therapy have come back into use.

"Lack of imagination." Horgan stated that scientists hope for a huge revelation, but he asked what if there is no big break-through over the horizon? Horgan believes that the success of science will be its undoing.

Horgan ended his talk with thoughts of what our world would be like with the "end of science." Although others have predicted extremes of a hedonistic "New Polynesia" society intent on only pleasure, to an aggressive society which invents wars for something to do, Horgan believes it will be more of a combination of the two. He ended with the comment, "It won't be heaven or hell, post-science. But remember we'll still have sex and beer."

A short but lively discussion ensued after the talk. Horgan further explained that the limits of science were not only physical, but political and economic. He

Have We Reached "The End of Science?"—(top left) Plenary Lecturer John Horgan thinks so and delivered a provocative talk on the subject to ECS Meeting attendees (see this article for a summary of his remarks).



"Award Realization for Fun and Profit"—(top right) ECS 1998-99 President Gerard Blom (right) presented the Edward G. Acheson Award medal to Jerry M. Woodall (see this article for a synopsis of Professor Woodall's address).



The 1998 Class of ECS Fellows—(seated, left to right): Katsumi Niki, Fan Ren, Zoltan Nagy, Antonio J. Ricco, Huk Y. Cheh; and (standing, left to right): Donald E. Danly, George Thompson, David A. Shores, Dennis H. Evans, Dennis C. Johnson, William H. Smyrl. Missing from the photo are Fumio Hine and Jun-ichi Nishizawa.



gave as an example the lack of public support for, and the cancellation of, the building of a superconductor supercollider, a large, costly machine to study particle physics. A question was asked about mathematics: Horgan stated that math was an invention with cognitive limits. He noted that the recent proof of Fermat's Last Theorem was inaccessible to all but a few scientists, and that math has become divorced from science. Another questioner asked about religion versus science. Horgan believes that religion never went away with scientific discovery, and may even have benefitted from those who view science as cold and bleak. And what do science writers do for a living after with the end of science? Horgan says he'll continue to write books and give presentations of his views.

Edward G. Acheson Award Address

Professor Jerry Woodall of Purdue University presented his award address entitled "Technology Realization (at a University) for Fun and Profit," following the Honors and Awards Session on Wednesday morning. During his introduction, Woodall said that as he stood there prepared to give his talk for ECS, "35 years of history flashed before me," from his career at IBM to his more recent 5 1/2 years at Purdue University. The main theme of his talk was about teaching students about "solid-state engineering," with examples from the technology of compound semiconductors, "always the material of the future." Woodall claimed that with a \$5 billion market, the future for these materials is now.

Historically, Woodall said, there has been a disconnect between research and teaching. U.S. corporations have drastically reduced or abandoned support for

"curiosity-driven" research, which is now a role of universities. Another role is to produce "work-force ready" students. This is a new paradigm for engineering education. There is an expectation in industry that students will have training in the use of sophisticated equipment. Woodall commented on the change in the "food chain" for the design and manufacturing of electronic systems. The "old way" was a linear path from the customer needs, to system design and manufacture, device research, materials research, crystal growth, and finally to the "amoeba." The new path has opportunities for feedback and is more interactive in the steps toward design and manufacture. Jerry claimed that the new approach has helped make materials science "respectable."

In his presentation, Woodall went on to discuss better device innovation and development through materials science and technology. Three examples for technology-enabling heterostructural materials were discussed, in which Woodall has cooperated with others at universities and industry: (1) an improved ohmic contact (InAs-Si) made by low temperature processing for GaAs for an industrial partner; (2) an improved, fast photodetector (40 GHz) for a start-up venture; and (3) a high-speed, high-efficiency LED. Woodall made the tongue-in-cheek comment that "cooperation" was defined as working together with friends whereas "collaboration" meant working with enemies. He described his cooperative projects at various university centers, in which partnering is done with industry, and which also provides schooling in market surveying and product development. Woodall stated that these types of projects not only teach solid-state engineering, but might help students "to get rich." ■

Board Highlights

- ▶ **Interface** will welcome a new Editor for the Spring 1999 issue: the Board unanimously approved the appointment of Krishnan Rajeshwar to the position. (Look for more on the new Editor in the next issue.)
- ▶ Among the many award nominations that were approved, two were of special note: Barry Miller, immediate past president of the Society, was awarded an ECS Honorary Membership; and Isamu Akasaki was chosen as the recipient of the 1999 Solid-State Science and Technology Award.
- ▶ The Board approved a resolution allowing the Society to purchase another property in Pennington, NJ, not far from the current ECS headquarters. The plan is to purchase the property and then move the Society offices to this new location. After the move, the Society will sell its current building. (Look for an upcoming story on this move in the next issue of **Interface**.)
- ▶ ECS Local Sections will get a name change; they'll be called "Sections", after appropriate changes are made to the ECS Constitution and By-Laws.
- ▶ The Publication Committee noted the addition to the Society's monograph series of a newly-published book: "Fundamentals of Electrochemical Deposition," by M. Paunovic and M. Schlesinger.



*"On Display"—
Meeting attendees
had a chance to see
the latest products
and services.*

*Contributions to Meeting Highlights came from Jan B. Talbot and Mary E. Yess, **Interface's** Editor and Managing Editor, respectively.*

Photos by Robert D. Davis, Boston Massachusetts.