



Joel Lebowitz at the December 2003 statistical mechanics meeting (below), which honored Freeman Dyson on his 80th birthday. At the same meeting (from left) Gene Stanley (Boston University), Jürg Fröhlich (ETH Zürich), Édouard Brézin (École Normale Supérieure, Paris), and, with his back to the camera, Michael Fisher (University of Maryland, College Park) chat over cocktails.

for which Ken Wilson got the Nobel Prize—were presented, and everything exploded,” adds David Chandler, a theoretical chemist at the University of California, Berkeley. “I remember the first time I went, in 1967. There was a guy snoring next to me. Joel said, ‘Professor Onsager, it’s your turn,’ and he gets up and gives a talk. For me it was thrilling—I was a graduate student, and here I was having [Lars] Onsager almost snoring on my shoulder.” Onsager won the Nobel Prize the following year.

Chemistry, math, condensed matter, biophysics, chaos, econophysics, and bioinformatics are among the fields that have been represented at the Yeshiva–Rutgers meetings. “When things are cooking in [statistical mechanics], Joel has the judgment to bring it to the forefront of the stage, and as a result, he has nurtured an awful lot of science,” says Chandler, who a few years ago started a smaller annual conference inspired by Lebowitz’s meetings.

Says Pierre Hohenberg, New York University’s senior vice provost for research, “Theoretical physics is omnivorous and universal and its practitioners do not hesitate to venture into far-flung areas of knowledge. That is in the spirit of these meetings.” And, he adds, the meetings have been key in fostering good communication. “Every field will have its rivalries, and this is a place where one can work things out. Joel has played a role in creating a fruitful scientific environment. It’s quite unique.”

At the conference, a few invited talks last 20–30 minutes, but most people give 5-minute talks “with no visual aids,” says Lebowitz. “I learned that if they had a slide, they’d put up 27 equations. I tell them to think of their talk as an abstract,” and then people can talk



JEFF MOZZOCHI (C.J.)

more over coffee or cocktails. “The conference is very equalizing,” says Jennifer Chayes, a mathematical physicist who heads Microsoft Research New England. “This is something special about Joel. He views everyone as equals, and that has a wonderful effect on the field. I don’t know of anywhere else where it would work for both famous professors and grad students to give these short talks.”

The meetings, originally one-day affairs, were inspired by a meeting in general relativity at his then home campus, the Stevens Institute of Technology, Lebowitz says. Now they last three days, and in recent years Lebowitz has added celebrations of significant birthdays. The meetings are intended, he says, “to foster openness and collegiality, to bring in younger people, minority people, to give younger people a chance to present their work when senior people are listening. I want to keep a fraternal, informal spirit in the community.”

Every meeting features a session on human rights. At December’s meeting Alan Beyerchen, an Ohio State University science historian and author of *Scientists Under Hitler: Politics and the Physics Community in the Third Reich* (Yale University Press, 1977), will talk.

Many meeting attendees attribute Lebowitz’s commitment to human rights to his own imprisonment in Auschwitz during World War II. “Joel gives everyone the impression that you need to be a good citizen, not just a good scientist,” Chayes says.

For the upcoming 100th meeting, Lebowitz’s friends have taken over a banquet night. Says Princeton University’s Michael Aizenman, “We want to celebrate both the jubilee of these remarkable meetings and the exceptional person who established them.”

Toni Feder

Recalibrating research at Motorola

For much of its 80 years in business, Motorola Inc has developed products from physical science research in areas such as semiconductors, RF technologies, optoelectronics, and nanotechnology. The gallium arsenide microwave transistors used in the first commercial portable cell phones sprung from applied research at Motorola; so did the radio transponder that relayed NASA astronaut Neil Armstrong’s historic message from the Moon back to Earth. In all, the company boasts almost 23 000 patents.

In recent years, however, slumping sales and marketing battles with rival cell phone makers have strained the company’s resources and forced budget cuts, including at its research labs. Perhaps the first sign of trouble came in 2000, when the company dissolved its organic LED research program and licensed the related patents. Then in 2003 its semiconductor program spun off and became Freescale Semiconductor Inc. In June of this year, three months after Motorola announced a future split of its mobile-phone business from its broadband business, several research projects were halted, some 150 jobs were slashed, and 180 positions were moved into product-development business units; those actions reduced the research staff from 630 to 300. A company spokesperson declined to provide further details about the cuts.

Reinvent and refocus

Former Motorola employees speculate that the reduction and redistribution of R&D staff—a trend also seen at Alcatel-Lucent’s Bell Labs (see the story on page 32) and other industrial labs—signals Motorola’s rebuff of innovation



The nano-emissive display glass sample shown here undergoing electronic tests by Motorola engineer Michael Johnson incorporates thermally grown carbon nanotubes as electrodes and is expected to compete with the cost and picture quality of LCD TVs.

in favor of the bottom line. "The basic driving force of technology is fundamental physical science research, and that is now declining at Motorola and throughout industry," says University of Florida professor and former Motorola researcher Franky So.

But Herbert Goronkin, former vice president of Motorola's physical research labs, notes that compared with Bell Labs, Motorola has always had a stronger focus on "proof-of-concept applied research rather than curiosity-driven basic research." Still, in this decade Motorola executives have been moving too far away from science and technology in an effort to stress sales and marketing, says Goronkin, who was at the company from 1977 to 2003. He says the semiconductor program was likely spun off because the company lost patience with the 8-10-year projections for research to yield marketable fruit.

The physical research laboratories at Motorola were closely connected to the semiconductor program, and after the spin-off "it took us about a year to reinvent ourselves and refocus," says Vida Ilderem, current vice president of the physical research labs, now known as the physical and digital realization research labs. With the recent restructuring, "we've become more focused towards research that goes out as far as five years," she adds. The physical research groups continue to collaborate with government labs and Motorola-

funded university centers on longer-term research.

A dynamic balance

"Our basic charter is to enhance user interaction with devices and to [design and program] embedded systems that take data from the physical world and connect it to the digital world," says Ilderem. For example, results from Motorola's haptics research—which studies the sense of touch—went into a 2008 cell phone model that gives its users a vibrating, tactile response when images of keys are pressed. Nanotechnology research projects, which Ilderem says often fall at the far end of their five-year projection, were spearheaded at Motorola around 1992 by physicist James Jaskie and focus on applications for quantum dots and carbon nanotubes, including technologies for new nanosensors, displays, and RF devices. Some of the carbon nanotube research is now being applied to photovoltaic energy applications, says Jaskie. "Energy is important for us, especially for our portable products."

While Ilderem says that many of Motorola's physicists are research scientists involved in optics, solid-state, and surface-science exploration, Papu Maniar, who manages the company's advanced materials and nanotechnology program, says those physicists "are most successful if they are able to stay at the interface between being research scientists and engineers."

The research climate at Motorola has

always been about "achieving a dynamic balance," says Jaskie, who in his 27 years at the company saw the focus of the physical science research shift from product engineering to more fundamental research. Now, with research projects beyond five years out the door and the more developed projects moved into business units, Jaskie says the labs are "taking the path down the middle."

Jermey N. A. Matthews

The bell tolls for Bell Labs

The glory of fundamental physics research at Bell Labs has been fading for a long time; now just a few scientists working on two-dimensional electron-gas physics remain. Bell's parent company, Lucent Technologies, merged in late 2006 with the communications giant Alcatel (see *PHYSICS TODAY*, February 2007, page 26), and among the recent research casualties were materials science and a silicon foundry, both disbanded earlier this year. According to many former Bell Labs researchers, basic physics research at Bell is dead.

"For 30 of the 41 years I was at Bell, the criterion was, 'Do good physics,'" says Dick Slusher, who is now at the Georgia Institute of Technology. "Then it was, 'Pay attention and see if you can help the company.' Then it became, 'Work on something you can get external funding for.'" Adds Oleg Mitrofanov, who last year moved from Bell Labs to University College London, "The spirit is practically gone. The culture—seminars, journal club discussions, tea time—those are gone."

Not surprisingly, Gee Rittenhouse, Bell's vice president of research, sees things differently. "A broad and fairly substantial part of our research is still fundamental research," he says, noting that some 20% of Bell's staff of 850 are active in "undirected research in areas across technologies." But while physicists still work at Bell, they don't necessarily do physics; the research there is now highly aligned to the business and is mainly in the areas of optics, networking, wireless communications, high-speed electronics, math, and computer science.

"We are coming out of an era," says Federico Capasso, who headed physical research at Bell before moving to Harvard University in 2003. "Until more or less now, research in industrial labs gave a huge edge to the US." But in today's global competition, he notes, "corporations can't afford to do medium- and long-term research in