



The Annual Meeting: Improving What Isn't Broken

Annual meetings are moneymakers for most scientific societies, and scientists continue to flock to them. But as the world changes, how long can the status quo hold?

Nearly 22,000 scientists converged on San Francisco last December for a meeting of the American Geophysical Union (AGU). Local hotels and restaurants feasted on the biggest annual gathering of physical scientists on the planet, and AGU turned a tidy profit on what was its largest meeting ever. But in a world in which the main currency of information is now bytes, have such megaconclaves become an endangered species?

There are plenty of reasons to question the future of the traditional annual scientific conference. U.S. agencies have less money to spend on travel, research budgets are tighter, scientists are busier, and Web-based technologies for accessing meetings remotely are improving. But there are few signs that extinction is around the corner.

In fact, the familiar 5-day smorgasbord of talks, poster sessions, exhibition booths, job fairs, and public outreach seems to have

lost none of its appeal for scientists. Meeting attendance has held steady or risen in recent years, according to executives at more than a dozen scientific societies who spoke with *Science*. So, too, have the number of requests to present at meetings, which officials say is a good barometer of overall interest. And compelling presenters continue to pack auditoriums (see p. 78).

At the same time, a one-two budget punch to federal agencies is taking a toll. The first blow was a May 2012 directive from the White House that ordered every agency to cut its spending on travel by 30% from 2010 levels. The cuts, triggered by over-the-top spending by one agency that prompted a public outcry, also come with a \$500,000 cap on the cost of any government-sponsored meeting and closer scrutiny of all travel. The changes have made it much harder for federal scientists to gain permission to attend their favorite conferences.

ILLUSTRATION: DAVID PLUNKERT

What's Lost When a Meeting Goes Virtual

Mihály Horányi has been a regular at NASA's annual Lunar Science Forum since its debut in 2008. But when the University of Colorado, Boulder, plasma physicist registered for this summer's conference at NASA's Ames Research Center in Mountain View, California, he didn't bother booking a plane ticket or a hotel room. That's because the meeting had gone virtual.

Horányi, who also directs the Colorado Center for Lunar Dust and Atmospheric Studies, was on the program to describe an instrument that was launched last month aboard a NASA probe to study the moon's dust and thin atmosphere (*Science*, 13 September, p. 1161). But instead of stepping onto a stage in front of hundreds of colleagues, Horányi sat down at his computer at 1:45 p.m. on the first day of the conference and began talking into a webcam perched above the screen.

"Last year it was a performance," he says about an invited talk he gave at the July 2012 forum. "This year it meant staring at myself, being annoyed that I kept leaning in and out of the picture, and thinking, 'Boy, am I getting old.'"

The switch makes the forum the largest scientific gathering to embrace the new world of cyber meetings, says Greg Schmidt, deputy director of NASA's Solar System Exploration Research Virtual Institute. (That's the new name for the Lunar Science Institute [LSI], which reflects the Obama administration's decision to substitute an asteroid for the moon as a target for human exploration.)

NASA officials decided to go virtual because of budget pressures—most participants in the forum are either NASA employees or scientists on NASA-funded projects. Schmidt doesn't know how much money was saved, although he says that the cost of the additional bandwidth and servers needed to conduct the live streaming was much less than that of hosting a physical event.

Institute officials tried to cushion the shock by preserving the forum's usual format. But instead of welcoming some 500 scientists to the Ames campus, the hosts invited participants to log on each day, from 8:30 a.m. to 3 p.m. Pacific time. In addition to the scientific talks, the forum included virtual poster sessions with an introductory video or audio from the author and a chat window to submit questions and get feedback.

Participants were also encouraged to create virtual "hubs" at home to facilitate interactions. The forum even offered a virtual version

of its traditional 1-day mini meeting for graduate students and postdocs.

By all accounts, the virtual forum escaped most of the glitches that can plague a typical webinar. "My hat is off to LSI," Horányi says. "I was expecting a hell of a lot more technical problems. But they pulled it off."

Even so, he and other participants say the virtual conference was a pale imitation of the real thing. At previous forums, Horányi says, "You see your friends, you ask about their kids, and then the discussion flows into the science." He confesses that he participated much less this year—"2 hours a day would be a generous estimate." In

addition to the physical challenge of sitting at one's computer for hours on end, participants say that their day jobs competed for their attention. Schmidt estimates that some 150 to 200 people "attended" the forum at any one time.

Even without distractions, the quality of the interaction was much lower than in person. "I received a handful of short comments [from my talk] and had maybe one e-mail exchange," Horányi recalls. One scientist who didn't present this year—and who listened to only one talk after the fact—said that he much prefers an in-person meeting because

"you get a much better sense of how the audience is reacting to what you're saying, especially any negative feedback."

Schmidt agrees that a virtual meeting has serious limitations. "It funnels people into a very narrow setup," he admits. At the same time, he says that the institute welcomed the chance to test the idea because it relies on virtual interactions among institute members.

But there's a big difference between a virtual institute and a virtual meeting, says David Morrison, a senior scientist at the lunar institute and a former director of NASA's virtual Astrobiology Institute, also based at Ames. "I do not think the virtual approach works well for science conferences," says Morrison, who believes that a virtual institute makes sense only if collaborators also have regular face-to-face meetings throughout the year.

NASA hasn't decided on the format for next year's forum, Schmidt says, and its decision will be influenced by the responses to a survey asking participants what they liked and disliked. Despite the grumbling, Schmidt says one thing is already clear: "If virtual is the only option, they say they would rather have that than nothing." —JDM

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UNIVERSITY OF COLORADO, BOULDER

The second blow is a 5% cut this year in the overall budgets of most agencies. That reduction, known as sequestration, kicked in this spring after the breakdown of a 2011 agreement between the White House and Congress to reduce the federal deficit.

Society officials say they have felt the effect of sequestration and tighter travel budgets. For example, some 14% fewer federal scientists attended last fall's AGU meeting, says the organization's CEO, Chris McEntee. In response, societies are trying to make meetings more enticing to both participants and those unable to attend in person. The revised fare includes Web-based features

such as electronic posters, live-streaming of some events, and archiving much of the content for later viewing.

But devotees say those new wrinkles are no substitute for what they consider the real thing: the chance to hear firsthand about new research, present their own findings, meet potential collaborators or mentors in person, and feel part of the tribe. Neural scientist Thomas Carew, dean of arts and sciences at New York University in New York City and a former president of the Society for Neuroscience (SfN), compares the experience of attending the society's annual meeting to a sporting event.



"You can feel the floor vibrate in the exhibit hall," he says about a meeting that last year attracted 28,574 people, good for 10th place on a ranking of the largest U.S. medical meetings. "There's a buzz that infuses the entire conference. For young scientists, it can be a transformative event in their careers."

Given all that a meeting offers, none of the society leaders anticipates switching to a virtual-only format in the foreseeable future, as NASA did this year with its annual Lunar Science Forum (see p. 75). "At least for me, there's nothing that could replace sitting and listening to a young scientist or a very prominent scientist explain his or her research to a group of people, all of whom are trained to ask hard questions and be skeptical," says Joseph McInerney, executive vice president of the American Society of Human Genetics, whose annual meeting draws about 7000 scientists.

For most societies, the annual meeting is also a moneymaker. Registration and exhibitor fees can contribute significantly to an organization's bottom line. SfN's annual meeting, for example, generated 43% of its overall revenue of \$29 million last year and netted \$3.8 million after expenses, according to the society's 2012 report.

The two major meetings put on by the Materials Research Society (MRS) each year do even better for the organization. Fueled by a record combined attendance of 13,750, the meetings produced 68% of the society's \$11 million in revenues last year, contributing \$4.6 million to its bottom line.

AGU's fall and spring meetings added \$1.5 million to the organization's coffers in 2011, a big help in a year in which overall expenses of \$39 million exceeded revenues by almost \$5 million.

Meetings That Flatter, but May Not Deliver

The e-mails come from Amber, Rainy, Dora, and Arlene. "How are you doing now?" some begin. "Hope this e-mail finds all the best on you." Flattering and solicitous and written in bewitchingly mangled English, the e-mails have the hallmarks of spam offering carnal pleasure—except they are actually far tamer. They are invitations to attend scientific meetings in China organized by a company that bills itself as the "World Leading Provider of Intelligence Exchanges in Life Sciences."

BIT Life Sciences, based in Dalian, a seaside city in Northeast China, stages conferences on a staggering array of topics, from vaccines and biodiversity to diabetes, cancer, cloud computing, HIV/AIDS, and algae. The meetings, which are often billed as an "Annual World Congress," sometimes coin names for new disciplines, such as "Endobolism" and "Drug Designology." BITeomics, the parent company, says it has 400 employees and holds at least 70 conferences a year that "tens of thousands of people" have attended since 2001.

Welcome to the bizarre world of what some call "predatory" conferences: scientific confabs, sometimes sparsely attended, that seem to come into being primarily to make money. Jeffrey Beall, a librarian at the University of Colorado, Denver, who monitors a subset of open-access journals that he calls "predatory," sees a similar phenomenon in BIT conferences. "They have the same conflict of interest as predatory publishers," he asserts. While predatory journals charge fees to publish papers, these conferences make money through registration fees that are bundled with charges for accommodation, meals, and program materials. (Typical bills run in the \$2000 range. BIT, which

stands for Bio Integration Technology, also has a subsidiary that offers to help book air flights, hotels, and tours.) "The more papers they accept, the more money they make," Beall says, as people with accepted talks are more likely to attend. While most scientific conferences have a similar financial equation, the vast majority are organized by nonprofits with members drawn from the scientific community, rigorously peer review submissions, and strictly limit the number of presentations. "Predatory" conferences, on the other hand, Beall says, "are accepting papers that

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—DEREK LOWE,
VERTEX PHARMACEUTICALS

may not be valid science: They bear the imprimatur of science even though they never go through the same quality control."

While BIT Congress claims to be "the largest-scale conference company in Asia Pacific," it has competition in what Beall says is an expanding industry. "They're just one in the landscape," he says. He has also taken aim at the OMICS Group, a company based in India that stages conferences and publishes open-access journals that Beall considers "predatory" (see p. 60). (OMICS strongly objects to being deemed "predatory" by Beall and has threatened to sue him for \$1 billion.)

In an e-mail to *Science*, Francis Wang, who works in the business development office of BIT Life Sciences, rejected the charge that the company stages predatory meetings and lowers the quality of scientific discourse. Their business, she stated, is information sharing: "We are a bridge to the professional world." Wang explained that the firm does not use spam or robots to send out e-mail invitations, and noted that only about 40% of participants use its travel subsidiary's services. She suggested that some of the criticism occurs because BIT Life Sciences reaches out to up-and-coming researchers. "We will try very hard to create more platforms to give young experts or junior scientists more visibility and encourage their motivation to engage in the competition in professional world," Wang stated.

Derek Lowe, a medicinal chemist at Vertex Pharmaceuticals in Cambridge, Massachusetts, has ridiculed BIT Life Sciences invitations on his blog, noting that he believes he's been invited to speak at meetings because he can breathe, speak, fill a slot on a schedule, and presumably pay the registration fee. "This stuff reminds me of the *Who's Who* business model," Lowe says. "You can be in this book of luminaries if you'll just pay for the book."

A typical e-mail from BIT begins by offering a slot to give an oral presentation or chair a session at a meeting that may not even intersect with your expertise. It will add that the program coordinator has invited you for your "invaluable experience and knowledge" or maybe because "you are an outstanding expert and have enjoyed great fame." The note will list other "world-class experts" and renowned speakers who have attended BIT conferences, including Nobel lau-

The allure of such profits, meanwhile, has created a growing number of “predatory” scientific meetings that appear to exist solely for making money (see p. 76).

Not all meetings are money spinners, of course. The general science meeting organized each year by the AAAS (which publishes *Science*) is not “anyone’s principal scientific meeting,” CEO Alan Leshner acknowledges. That secondary status limits how much the organization can charge registrants and exhibitors. As a result, he says, revenues are insufficient to cover many no-charge activities “that are central to our mission,”

Geophysical attraction. The American Geophysical Union’s fall meeting in San Francisco keeps growing.



creates. Program committees may well feature names you recognize from respected institutions. If you do not promptly accept, a reminder e-mail—“to ensure that you do not miss out”—is sure to follow. “Maybe there some problems with my mailbox and I haven’t received your kindly reply,” it will humbly suggest.

BIT conferences indeed have attracted Nobel laureates and other prominent speakers, some of whom vouch for the meetings they attended. “I did not learn much new, but the organization, et cetera, was OK,” says immunologist Rolf Zinkernagel, a Nobel-ist at the University of Zurich in Switzerland who gave a keynote lecture at an HIV/AIDS meeting in Tianjin in 2006. Alan Stone, a biochemist in London who previously chaired the International Working Group on Microbicides, attended the same conference and gave it a ringing endorsement. “The scientific presentations were well-chosen and the sessions I attended were effectively chaired,” he wrote the organizers in a review of the “excellent” meeting that he shared with *Science*. Malaria specialist David Warhurst, a professor emeritus at the London School of Hygiene & Tropical Medicine, gave a keynote speech at the 2nd Annual World Congress of Microbes-2012 and says it was a “valuable” meeting. “I had not been to an international meeting held under purely Chinese auspices there and enjoyed the experience,” Warhurst says. “I was able to meet some of the Chinese workers active in the fields I was interested in.”

**We are a
bridge to the
professional
world.**

—FRANCIS WANG,
BIT LIFE SCIENCES

Others, however, express serious misgivings about BIT. Some scientists—including officials such as Janet Woodcock, who directs the Center for Drug Evaluation and Research at the U.S. Food and Drug Administration, and Roger Glass, director of the Fogarty International Center at the U.S. National Institutes of Health—say they had no clue they were listed as advisory board members of a program committee until they were notified by *Science*. Immunologist Jeffrey Bluestone at the University of California, San Francisco, was billed as a “renewed” speaker for a meeting in 2011 that he did not agree to attend. “I have never and will never go to a BIT conference,” Bluestone says. “I have been trying for years to get them to stop including me on their lists.”

Attendees of some BIT conferences say they felt duped. “None of the colleagues that were supposed to be there were at the meeting,” says Mario Clerici, an immunologist from the University of Milan in Italy who chaired a session at a World AIDS Day meeting in 2011. “Ninety percent of the audience and of the speakers were Chinese, the rest a curious collection of people from exotic places. The general feeling was that of being stranded on a raft in the sea with a bunch of people who had never been sailing. In short: great opportunity to visit China, forget about science.”

Obstetrician/gynecologist Danny Schust of the University of Missouri, Columbia, says that he was honored by an invitation to chair a session

at a BIT conference and also curious to visit China. When he arrived at his session, there were only three other people there—including one from his own institution. “I don’t tell that story to many people because it’s kind of embarrassing,” Schust says. “I think lots of people are getting sucked into it. It kind of cheapens the whole research agenda.” To his surprise, BIT Life Sciences now lists him as a program committee advisory member of an upcoming meeting.

Wang told *Science* that BIT Life Sciences’ conferences list people as advisory board members only if they have agreed to serve that role. Speakers sometimes back out, she stated, which may explain why they are wrongly listed on a program. She acknowledged that on occasion, researchers receive invitations to speak at conferences outside their fields. “Some mismatched invitations can’t be avoided,” she wrote. Such issues are “the problems of a young organizer’s fast growth.” And she argued that it’s “absurd” that people would attend BIT Life Sciences meetings purely out of vanity. “Do you really believe, each year, those 10,000 professional professionals from more than 70 countries are all stupid? They are so easily hoaxed? And will they pay a good price and fly all the way to China just because they are flattered?”

At the end of some BIT Life Sciences invitations, researchers can opt out of future solicitations. “We will definitely unsubscribe requests from the bothered experts in our database,” Wang stated. The company is young, growing quickly, and trying to improve, she stressed: “In the garden of conferences, BIT is only a new flower bud with unyielding life power.”

—JON COHEN



Great Presenters

Lighting Up the Auditorium

Bonnie Bassler studies bacteria that live inside the gorgeous Hawaiian bobtail squid. The bacteria, by communicating with one another en masse, decide the proper time to light up like fireflies. The benefits are mutual: The bioluminescence helps camouflage the squid by eliminating its shadow on the ocean floor when moonlight bathes it from above, and the bacteria get nutrients from their host. It's a cool story, says Bassler, a molecular biologist

compares to individuals casting a vote and then making a group decision. She and her co-workers have shown that quorum sensing exists in all bacteria and controls myriad activities, from luminescence to toxin release.

The secret lives of bacteria makes for a compelling presentation, and Bassler does the topic justice. She says bacteria speak a lingua chemica with their own species, while also using a second Esperanto-like vocabulary that all bacteria use. If scientists figure out a way to muffle this chatter and in doing so hamper toxin release, she says, that could lead to new antibiotics. More profound still, quorum sensing informs us about human social interactions, like emotions rippling through a crowd. "How do you think we got those behaviors?" she asks, with mock incredulity that everyone doesn't know this. "It's because the bacteria invented them!"

Bassler, who looks like the late actress Gilda Radner with a splash of Lily Tomlin, loves an audience. "My job is to teach someone something they never knew, but it should not be like you're in a prisoner-of-war camp," she says. "I'm supposed to be teaching you but also entertaining you. You're giving me an hour of your time. It should be lively. We're on a hunt, it's a mystery, and it's amazing."

at Princeton University: "My bacteria glow in the dark—no human being doesn't like that."

Studying this symbiosis, Bassler's lab has deciphered quorum sensing, a system of chemical communication between bacteria that she com-



Bassler's Rules of Presentation

Stick to the big picture.

"We know this stuff in excruciating detail," she says. "You want to drive a metal stake through your head listening to our lab meetings."

On slides, use few words and make one point.

"People can read faster than I can talk," she says. "If I put the words there, I'm irrelevant."

Tell stories.

"These are detective stories with mini mysteries that all point to the same thing."

Don't strive to be the smartest person in the room.

"Sometimes people are like, 'Wow you don't sound scientific,'" she says. "The data are on the slide."

But the most important advice that Bassler has to offer has nothing at all to do with style: Prepare, prepare, prepare. "I've spent a gazillion hours to cull these nuggets from the morass," she says. **—J. C.**

such as a family science day and programs relating to international events and human rights.

Even societies with profitable meetings are doing what they can to make their meetings more accessible. The path is not always smooth, as Bob Braughler, virtual engagement manager at MRS, can attest.

The society's first major initiative was live streaming a 5-day symposium on energy and sustainability held during its November 2012 meeting in Boston. However, that decision ran afoul of scientists who balked at having their slides and words captured for posterity and made available to anyone. "We needed to go to each one of the presenters and request their permission," Braughler says, "but not everybody was willing to do that." The result was unsightly: a video with a 15-minute blank every time an author demurred.

The society's experience highlights the tension between wanting to open up a meeting to all while preserving the intellectual property rights attached to the content. Presenters were concerned about sharing information that might wind up in a journal article or become part of a patent application. "If my talk is going to be archived, then I can't transfer the copyright or file a patent," explains Husam Alshareef, a professor of materials science and engineering at King Abdullah University of Science and Technology in Jeddah, Saudi Arabia. "And MRS is petrified of being sued," says Alshareef, who is co-chair of the program committee for the society's 2014 fall meeting.

Until the society can work out those IP issues, it is proceeding with caution. For example, MRS has shifted its emphasis to what Braughler calls "video capture"—recording a session and then making the video available on demand, for free, to both attendees

Gut Instinct

When Larry Smarr pulls out a plastic model of his colon that he made with a 3D printer and simultaneously projects on a screen behind him a magnetic resonance image of his guts, it becomes abundantly clear that he believes a presentation benefits from a most personal touch.

Smarr started out as an astrophysicist and has followed an intriguing career arc from probing black holes to his own bowels. Three decades ago, he helped establish a network of supercomputer centers in the United States and was a cyber pioneer. (His grad student made the first Internet browser.) Today, the University of California, San Diego, professor runs the California Institute for Telecommunications and Information Technology (Calit2), a multidisciplinary center meshing nanotechnology with wireless communications, genomics, and computer science. Calit2, Smarr hopes, will become a force in personalized medicine—and his colon has become the centerpiece of a campaign to show the world how patients can take a more active role in their own health care by exploiting technological advances to collect genomic, biochemical, and physical data.

For several years, Smarr has intensely monitored his health, a preoccupation that in 2010 helped him diagnose, ahead of his doctors, inflammatory bowel disease. In a talk he has given everywhere from Harvard Medical School to the U.S. National Institutes of Health, Smarr shows startling graphics that chart myriad biochemical and physical perturbations in his body linked to what he believes is a condi-

tion with features resembling Crohn's disease and ulcerative colitis. He paid a company to measure blood markers that standard tests ignore, and, with the help of the J. Craig Venter Institute's genomic analysis of his fecal samples, he has documented how his body has killed off many beneficial bacterial species in his gut while allowing harmful ones to thrive. His plastic colon and the MRI scans fill out the sad picture of a gut gone haywire.

By blending systems biology and personal drama, Smarr's talks bowl audiences over. He speaks plainly; is passionate about his data (without bathing in self-pity about his disease); and makes the abstract concrete with his plastic colon, a prop that he passes around the audience. "I've given hundreds if not thousands of talks on so many different topics, and I've never had the kind of reaction I've had in the last few years," Smarr says. "When you talk about what's going on inside the human body, everyone relates."

A critical moment in his talk comes when he emphasizes that 90% of the DNA in our bodies is bacterial, and we can now sequence that foreign material to understand our health. "A lot of the reaction is, 'How did I miss the memo that 90% of



the cells in my body aren't human?' " Smarr says. "It's a moment of massive discovery essential to every single human on Earth. These moments don't come along more than a couple times in a century."

Few scientists have the luxury of drawing on data from their own bodies to captivate an audience, but one technique of Smarr's is widely applicable: Don't miss the forest for the trees. He suggests scientists imagine themselves as a baker—not a flour specialist—explaining how to make a fancy cake. "It's the integration of several ingredients over time," he says. "We aren't trained to think that way. We're trained just the opposite."
—J. C.

and those who agree to register. That platform gives the society more control over content before it is posted. "We'll probably live stream at least one event this fall," he says, while some two dozen symposia will be captured and put into the archives.

Likewise, the American Society for Microbiology drastically curtailed live streaming of last month's annual Interscience Conference on Antimicrobial Agents and Chemotherapy. The decision was based on a membership poll showing that 90% of the people who wanted online access to information from a meeting they could not attend chose the "archived with no live" option. "Live streaming is also the most costly option," says Connie Herndon, the society's director of meetings, speaking before the meeting, "so if our attendees don't really want it, then we'll probably reduce it to a minimal amount."

Logistics are another reason the venerable annual meeting is likely to persist. Organizers book meeting venues up to a decade

in advance, so any changes would necessarily take a long time to show up. "We're so big that we only fit into a few cities," says Nancy Todd, conference manager for the American Chemical Society (ACS), which holds large meetings in both the spring and the fall. Combining the two meetings, she says, would only worsen the space crunch.

But perhaps the biggest deterrent to change is the inherent conservatism of the community. "We've had two meetings [a year] since the beginning of time," Todd says. "It's what our members want." Neither federal cuts nor the Internet seem likely to change that winning formula for ACS and its sister organizations anytime soon.

—JEFFREY MERVIS

With reporting by Nisha Giridharan and Senah Yeboah-Sampong, 2013 Pitts Family Minority Science Writers interns.