odic, durations would cluster around 1500 years alone.

If the ice-core isotope signal were entirely noise, there would be no preference for any particular period. But if stochastic resonance were at work, most intervals would fall near 1500 years, far fewer near two cycles or 3000 years, and fewer still near three cycles or 4500 years, with few falling at any fraction of a cycle length. That's what the researchers found in the GRIP core as well as in the nearby Greenland Ice Sheet Project 2 core. The separate peaks of decreasing amplitude with increasing interval length are there but they're very ragged, says Jung. "The problem is we only have a small number of cycles" in the record, says Jung. "You're dealing with small numbers and large fluctuations" of climate.

No one is yet claiming that stochastic resonance is the answer—it hasn't yet solved the ice age problem either—but it's being welcomed as a promising option. "It makes intuitive sense," says paleoclimatologist James White of the University of Colorado, Boulder. Biophysicist Frank Moss of the University of Missouri, St. Louis, who has demonstrated that stochastic resonance helps paddlefish find food, considers the argument "very convincing. The authors have been careful in applying the statistics."

If stochastic resonance is indeed operating, says Alley, "I really and truly don't know" what the weak periodic signal is. Suggestions have included periodic flip-flops in deep-sea circulation, solar variations, long-term tidal variations, and orbitally driven processes in the tropical Pacific. The noise may come from the largely erratic behavior of ice sheets, which have been implicated in some of the larger glacial climate oscillations (*Science*, 6 January 1995, p. 27).

What stochastic resonance would mean for the future is even less clear. When it's involved, "a really hard kick to the system will change the climate," says Alley. "The interesting question is, can humans kick it hard enough?" Greenhouse warming, ironically enough, could in theory so suppress deep-sea circulation and the warmth that it brings to the North Atlantic that another Little Ice Age could set in, at least around the North Atlantic region—a chilling punishment for making a little noise. **–RICHARD A. KERR**

NEUROSCIENCE

Neuroscience Meeting Draws Crowds, Gripes, Loyalty

Preparing for their 30th conference, neuroscientists contemplate how the field—and the annual meeting—has grown

The Society for Neuroscience (SFN) was formed in 1969 in part because people were sick of Atlantic City. The New Jersey gambling and boardwalk town was one of the only places in the United States with enough hotel rooms to accommodate the 5000 attendees of the Federation of American Societies for Experimental Biology (FASEB) meeting, and people were starting to feel crowded. "It's one of the more mundane things," says Lawrence Kruger, chair of the society's history of neuroscience committee, but such a swarm of biologists meant that it was a pain in the neck to get a hotel room, and you had to wait 2 hours to eat dinner. It was enough to make the neurophysiologists in the meeting decide to split off and look for someplace a little more private.

Miles of aisles. Some top neuroscientists are opting to present at poster sessions.

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Today, with almost 30,000 members and an annual meeting that routinely packs in about 25,000 people, Kruger hears the same complaints. As the field of neuroscience has exploded, so has the society's meeting, and now it, too, can only be housed in a few cities. But he and other neuroscientists aren't about to fragment their annual meeting, which this year runs from 4–9 November in New Orleans. "Everybody complains about the size, and there are lots of speed bumps and glitches," concedes SFN president Dennis Choi of Washington University in St. Louis. But because of the meeting's breadth and depth, says Ron Mangun of Duke University, "it's where neuroscientists go."

Why do so many researchers come back every year, knowing they'll have to stand in long lines, lug around 25 kilograms of program and abstract books, and squint at slides from the back of a room that seats 4000? Some of the reasons neuroscientists cite apply to any scientific conference: the thrill of hearing about hot new research and the chance to catch up with friends.

But others say that the best reason to go to the SFN meeting every year is precisely because it's so huge and integrates the ever-growing number of subdisciplines in the field. It's a place to pick up inspiration or technical advice from people in related—or not-so-related—fields, get feedback from a wide range of perspectives, and forge interdisciplinary collaborations. "We're all linked by an interest in understanding the brain in a larger sense," says Choi, "whether at the genetic or the system level."

In 1970, 1 year after it had been founded, the society counted 1100 members. Many were neurophysiologists, experimental psychologists, or psychiatrists, says past SFN president and founding member Edward G. Jones of the University of California, Davis. It was an exciting time, he says, as new staining techniques were enabling neuroanatomists to track where axons went in the brain and to determine which neurons communicated with each other. It was also becoming technically feasible to record from electrodes in the brains of animals while they performed lab tasks. And in neurochemistry, researchers were starting to analyze how drugs interact with receptors on nerve cells.

As neuroscientists took up new tools and researchers in other fields turned their attention to neurons, new subdisciplines joined the society. Neuroscience "keeps drawing other fields into itself," explains Jones. Invertebrate neurobiologists started joining the society in large numbers a few years after it had been established, bringing tools for studying the development of the nervous system, particularly in such model organisms as

Tips for Neuroscience Neophytes

Writing an abstract for the Society for Neuroscience (SFN) meeting is an art. Submissions are due in late April or early May for the November meeting, says SFN program committee chair Virginia Lee, because it takes half a year to process the more than 12,000 submissions. So researchers have to write abstracts precise enough to land them in the appropriate session and attract people to their presentation, yet open-ended enough to cover fresh data come conference time.

No matter how vague the abstract, however, it won't be rejected. Every member of the society is allowed to submit one abstract per year, and every one is accepted. This practice helps to maintain quality, SFN president Dennis Choi says, as most people present their best research, notwithstanding the occasional joke poster, such as one a few years ago exploring pain mechanisms in Mr. Potato Head.

Should scientists present their research as a talk or a poster? A few years ago, the answer would have been to aim for a slide session, which was considered more prestigious. But that has changed for the SFN meeting, says Choi, as scientists from some of the best labs opt to give poster presentations instead. As Choi explains, "you give away too much to sit in a slide session for a whole half-day" when you could be out prowling the poster aisles and talking to people.

Students preparing for their first professional meeting, or those who could stand a quick review of the basics, can read a how-to guide written by Beth Fischer and Michael Zigmond of the University of Pittsburgh at www.pitt.edu/~survival/attend.html. The manual, which grew out of advice given to their own students preparing for the overwhelming SFN meeting, covers everything from what font size to format different parts of a poster to how to dress and which kinds of sessions to attend.

National Institute of Mental Health director Steven Hyman has some advice as well: New conference-goers should attend "some of the symposia not in their area to learn about the wonderful breadth of neuroscience." The opportunity to learn what's hot in many different fields, he says, "is the glory of this meeting." **–L.H.**

Heavy lifting. Abstracts and program books add up to 25 kilograms.

Drosophila and *Caenorhabditis elegans*. Studies in the early 1970s, recalls Jones, revealed the astonishing commonalities among the nervous systems of different animals at the earliest stages of development. Cellular and molecular neurobiology took off in the late 1970s and early 1980s, thanks in part to sophisticated electron microscopy that brought into view the actual synapses and other components of the nerve cell.

Some of the latest tools stem from the rapid-fire advances in molecular biology and genetics over the past 15 years, says Steven Hyman, director of the National Institute of Mental Health. These are "allowing us to ask questions that weren't even vaguely possible" when the society was founded, he says. For instance, some of the most intriguing mouse mutants, formed by traditional knockout or transgene techniques, have behavioral consequences. And that enables researchers to map genes to biochemical networks, brain circuitry, and complex behavior. Tools such as bioinformatics for making sense of that outpouring of genetic data, he adds, have only been available for about 5 years.

Brain-imaging techniques have also improved rapidly in the past 10 years, particularly with the adoption of functional magnetic resonance imagery and multielectrode arrays that enable researchers to record from many nerve cells at once. With such techniques in hand, says Hyman, researchers can ask "fundamental questions about cognition and emotion: how the brain focuses attention, how working memory works ... which circuitry is used by fear in the human brain."

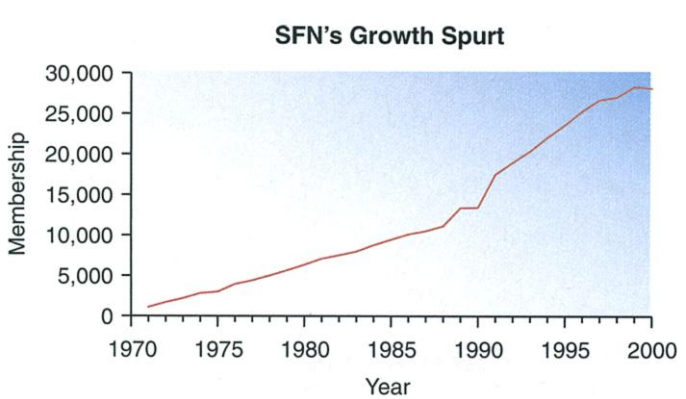
During the 1990s, the congressionally declared "decade of the brain," research on the neurobiology of disease really took off, says Choi. Prior to that time, neuroscience was "largely devoid of practical applications," he says, but now it has become clear that the field has "imminent applications for medicine, psychiatry, and neurosurgery." Jones agrees. Understanding the molecular basis of neural development, he says, might uncover treatments for spinal cord injuries. Research on the molecular basis of neuropsychiatric diseases such as schizophrenia could lead to better pharmaceuticals, and stem cell research might provide options for reversing degenerative diseases.

The ability to ask fundamental questions that once seemed impenetrable has attracted a lot of new researchers to the field, says Kruger. "There's so much to be done, and the tools are here. You put a shovel into the ground, and you dig up gold." And new researchers—who might be a bit more aware of all the dirt surrounding the gold—are flooding into the society. Indeed, of almost 29,000 members, about 20% are students, and the annual meeting is often their first chance to present their work before a broad audience.

"I enjoy watching grad students get wide-eyed," says Paul Letourneau of the University of Minnesota, Twin Cities. He says new researchers are either completely energized by the conference or totally devastated—because they realize there's so much they'll never know, or because the research question they thought was so esoteric is actually being explored by competitors from around the globe. As Kruger points out, even established researchers complain that, since the field has grown so enormously, people go to the SFN meeting and think, "No matter what I do, no matter what I present, it seems like such a trivial increment in the face of this astonishing advance."

These astonishing advances are reported in upward of 12,000 abstracts sorted into 874 sessions during the 6-day meeting. All that makes for one huge conference, says Mangun. Because of all the distractions, "it's very common to hear, 'Oh, I hate that meeting,' " he says. Yet people come, year after year, even those who, like Mangun, have helped found other, more focused conferences. Mangun compares the SFN meeting to New York City. "Some people hate the crowds and the hassle, but where else can you go to the best Russian restaurant one night and the best Thai the next?"

–LAURA HELMUTH



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