



## DIGITAL MAESTRO

Making music can often become a battle of egos. Now a group of musician-scientists at Rensselaer Polytechnic Institute (RPI) in Troy, New York, has a solution: a computer program that decides how each musician will contribute.

Saxophonist-acoustician Jonas Braasch and his colleagues

wrote the program to aid them with their unusual improvisation sessions, in which groups of five or more musicians in up to four places around the world jam via the Internet. To keep everyone in sync, they tried having one musician conduct the troupe. But unfortunately, even with video monitors showing the remote groups, conductors kept favoring performers within their own groups.

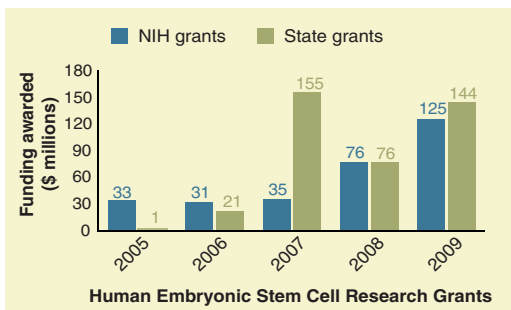
To overcome the human bias, Braasch went digital. With his RPI colleagues, including electronic composer Pauline Oliveros and research specialist Doug Van Nort, Braasch combined predictive algorithms similar to those used in speech recognition software with adaptive, genetic algorithms to create software that understands features such as musical timing and that can experiment with combinations of instruments. The program conducts the group via symbols that the musicians view on computer monitors as they play.

"The conductor makes intelligent decisions and knows which direction you want to take," says Braasch. After a performance, the musicians can log what they think of the conductor's choices. "That's the way it learns," he says. Once the program gains mastery, it could adopt the arrogance of real conductors: It's also designed to give humans feedback on their performances.

## States Pick Up the Slack on Stem Cells

As a court battle rages in the United States over the legality of using taxpayer dollars for research on human embryonic stem cells (hESCs), a recent analysis has uncovered a surprising fact: The six U.S. states that fund this area now spend more on it than the federal government does.

California, Connecticut, Illinois, Maryland, New Jersey, and New York launched stem cell



research funds after President George W. Bush limited which hESC lines could be studied with federal dollars in 2001. Aaron Levine, a profes-

## THEY SAID IT

"Space and dinosaurs are the two things that turn kids on more than anything else. If we could grow dinosaurs on the space station, we'd have this thing nailed."

—Advice on how to get more young people into science from Mark Uhran, a NASA director. Uhran spoke at a 10 December meeting about the international space station at NASA headquarters in Washington, D.C.

sor of public policy at the Georgia Institute of Technology in Atlanta, compiled a Web database ([www.stemcellstates.net](http://www.stemcellstates.net)) of the nearly 750 grants totaling \$1.25 billion that states disbursed for adult and embryonic stem cells from 2005 through 2009.

Counting only research grants, since 2007 states have spent at least as much as the U.S. National Institutes of Health (NIH) on hESCs (see graph), Levine's team reports in a letter published online 7 December in *Nature Biotechnology*. At least two-thirds of the scientists had no NIH grants for hESC work before 2007. That means if funds dry up in states like California, which leads the pack in funding (see p. 1742), it could hit some researchers hard, Levine says: "I think there's a risk of some upheaval."

Last week, a solar storm—a violent explosion from the sun's surface also known as a coronal mass ejection—struck Earth 12 hours earlier than space scientist Chris Davis and colleagues had predicted. That would have been bad news for any astronauts relying on the forecast. But Davis, who works at Rutherford Appleton Laboratory near Didcot, U.K., was pleased: The prediction was based on data analyzed entirely by volunteers, and for the virtual team's first effort, "half a day ... isn't bad," he says.

Davis and the Royal Observatory, Greenwich, launched the Solar Stormwatch project (<http://solarstormwatch.com>) on the citizen-science site Zooniverse in February. Since then, about 10,000 people have identified and tracked features in images captured by the Heliospheric Imager instruments on NASA's twin STEREO spacecraft, which study solar activity. Davis suspects the time lag occurred because volunteers track the middle of a storm instead of the harder-to-spot front. A systematic correction, he thinks, can help future predictions rival those of the National Oceanic and Atmospheric Administration, which watches storms erupt from the sun's surface, then calculates their arrival times (spot on for this storm) using a computer model.

Bringing in about 50 images daily, all requiring human analysis, the imagers used to swamp Davis's three-person team. Thanks to the Zooniverse volunteers, the researchers can now chronicle the sun's current state nearly in real time, he says: "I feel very privileged having something like 10,000 research assistants."

## Storm Chasers

