

## Discover

# Do You Understand? (And How Can We Know?)

It's one thing to hear words; understanding them requires the human brain to perform a whole range of computations.

Edmund Lalor, an associate professor of biomedical engineering and of neuroscience, and colleagues at Trinity College Dublin, where he also maintains an appointment, have identified a brain signal that indicates whether a person is indeed comprehending what others are saying. Moreover, they have shown they can track the signal using relatively inexpensive EEG (electroencephalography) readings taken on a person's scalp.

In one portion of the study, participants listened to an excerpt of an audiobook. "We could see brain signals telling us that people could understand what they were hearing," says Lalor. Play the same audio backward and "the signal disappears entirely." They also found the signals were stronger when audio and video were combined—as when participants watched, as well as listened to, a speech.

The research, reported in *Current Biology*, has important implications in a variety of areas, including determining the level of brain function in patients with head injuries, testing for the onset of dementia, and confirming that people in critical jobs have understood the instructions they have received.

—Bob Marcotte

**READING THE SIGNS:** Researchers have identified a brain signal that indicates comprehension—and have tracked the signal through EEG (electroencephalography) readings taken on the scalp.



## More Power to Clean Energy

In order to power entire communities with clean energy, such as solar and wind power, a reliable backup storage system is needed when the sun isn't shining and the wind doesn't blow.

Ellen Matson, an assistant professor of chemistry, and Lauren VanGelder, a PhD student in her lab, are helping to develop such a system by improving the function of redox flow batteries, which allow excess solar- and wind-based energy to charge solutions of chemicals that can subsequently be stored for later use.

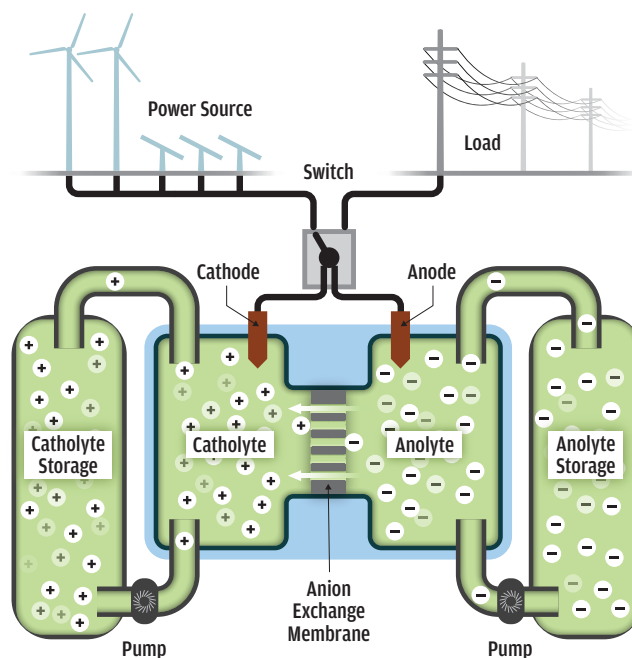
The key to the technology is finding chemicals that not only "carry" sufficient charge, but also can be stored for long periods without degrading, thereby maximizing power generation and minimizing the costs of replenishment.

Matson and VanGelder have found a compound that's easy to make and doubles the battery's storage capacity.

In a paper published in *Chemical Science*, an open-access journal of the Royal Society of Chemistry, VanGelder, who is lead author, and Matson describe modifying a metal-oxide cluster, which has promising electroactive properties, so that it is nearly twice as effective as the unmodified cluster for electrochemical energy storage in a redox flow battery.

### Storage Solution

A redox flow battery enables excess wind and solar energy to charge solutions for future power generation. Researchers found a compound that doubles the amount of energy that can be stored.



"Energy storage applications with polyoxometalates are pretty rare in the literature," says VanGelder. "There are maybe one or two examples prior to ours, and they didn't really maximize the potential of these systems."

According to Matson, "This is really an untapped area of molecular development."

Matson also notes that the new compounds are easy to produce.

"What's really cool about this work is the way we can generate the ethoxide and methoxide clusters by using methanol and ethanol," she says. "Both of these reagents are inexpensive, readily available, and safe to use. The metal and oxygen atoms that compose the remainder of the cluster are earth-abundant elements."

—Bob Marcotte

## Telemedicine and In-School Care Cut ER Visits

A Medical Center study found that children with asthma in the Rochester City School District who received a combination of telemedicine support and school-based medication therapy were less than half as likely to need an emergency room or hospital visit for their condition than a group that did not have access to the resources.

The study, published in *JAMA Pediatrics*, expands on previous research at the Medical Center which showed that children with asthma who took their preventive medication at school under the supervision of their school nurse were less likely to experience asthma flare-ups. The addition of telemedicine allows primary care providers to stay involved in a child's care while making the program more scalable.

"Clinicians and researchers across the country are designing similar programs," says Jill Halterman, chief of the Medical Center's pediatrics division and the study's lead author. She notes that their success will rely on quality in-school personnel, adding that the Rochester City School District and the school nurses were critical to the success of the program.

—Sean Dobbin

## How Multinationals Influence World Bank Lending

Political scientists studying the influence of multinational corporations on the World Bank unveiled two key findings, published in the *Journal of Politics*.

Randy Stone, a professor of political science at Rochester, and Rabia Malik '16 (PhD), a postdoctoral researcher at New York University Abu Dhabi, found that projects involving multinationals correlated with higher performance evaluations, despite no evidence that involvement of multinationals led to better outcomes.

The researchers also found that the divergence most strongly correlated with American and Japanese firms, but not with German, French, or British ones.

The United States and Japan are the largest shareholders in the World Bank, with Germany, France, and the UK rounding out the top five. In the American case, the researchers surmise that the influence takes place during interactions among a variety of parties, including bank staff, members of Congress, and Department of Treasury personnel.

"We don't have an interview with somebody in the World Bank who said, 'Well, I did this because I was contacted by the US Treasury,'" Stone notes.

But, he adds, the evidence suggests multinationals who lobby Congress generate a cascade of contacts. That can begin with representatives who contact Treasury officials to Treasury officials who contact the United States director of the World Bank, whom the US Treasury oversees.

In the end, says Stone,

"Everybody in the office knows this is a project we're supposed to disburse, so we'd better give it a pretty good evaluation, because we have to justify the disbursement rate."

Stone—a specialist in international relations and political economy, and the director of Rochester's Skalny Center for Polish and Central European Studies—is working on a series of studies about the influence of multinational corporations over multilateral institutions.

—Sandra Knispel