Worried about the Health of American Democracy? Political Scientists Offer a Second Opinion

How robust is American democracy? A recent survey shows political scientists give it a more favorable rating than the public does.

The survey was conducted by Bright Line Watch, an organization of political scientists at Rochester, Yale, and Dartmouth dedicated to monitoring risks to the US systems of government.

"Far from being complacent, the American public is in many ways more alarmed than political scientists are about the health of US democracy," write the survey's authors. "They are, for instance, less sanguine about the administration of elections and about protections for free speech and less certain that political parties can compete freely and that people's rights to protest are protected."

BLU(ER) SKIES: A study suggests American political scientists rate the health of American democracy more favorably than does the public.

Gretchen Helmke, a professor of political science at Rochester, and a specialist on democratic political institutions, the rule of law, and Latin American politics, is a codirector of the organization.

"The fact that the public is so concerned about the state of US democracy is hardly surprising, given the extraordinarily low approval ratings we are seeing for Donald Trump," she says. "That experts have a more positive view of how institutions are performing here may be due, at least in part, to their familiarity with other countries, such as Venezuela, Hungary, Poland, or Turkey, which have witnessed even greater democratic backsliding recently."

On a 100-point scale, the experts gave the US political system a health rating of 72. For the public it was 59. On 27 dimensions of democratic performance that survey respondents considered, the experts offered more positive evaluations than the public on 16 of them, including freedom of the press, the ability of citizens to make their opinions heard, the political neutrality of government agencies, and protections against political violence.

—Sandra Knispel

FILMS OF WATER, WAVES OF LIGHT: An ultrathin film of water has proven to be a "surprisingly efficient" source of terahertz radiation, says Zhang.

Physicists Make Waves

Terahertz waves—a form of electromagnetic radiation in the far infrared frequency range—have attracted attention because of their ability to nondestructively pass through solid objects to produce images of the objects' interiors. Their applications are manifold, ranging from scanning suspicious packages to detecting tooth decay.

For nearly a decade, Xi-Cheng Zhang, the M. Parker Givens Professor of Optics, has worked to produce terahertz waves from liquid water, a scientific puzzle that many in the research community believed to be impossible.

Now, as reported in a paper published in *Applied Physics Letters*, Zhang, doctoral candidate and lead author Qi Jin, and other members of Zhang's terahertz research group have made the impossible, possible.

"Figuring out how to generate terahertz waves from liquid water is a fundamental breakthrough because water is such an important element in the human body and on Earth," says Zhang.

Previous researchers have generated terahertz waves from targets of solid crystals, metals, air plasma, and water vapor. "[Liquid] water was considered the enemy of terahertz waves because of its strong absorption," Zhang says. One of the challenges was creating a film of water thin enough that terahertz photons generated by a laser beam would not be absorbed, but thick enough to withstand the laser's energy.

Along with Yiwen E, a postdoctoral associate in Zhang's research group, Jin spent months optimizing the thickness of the water film and the incident angle, intensity, and pulse duration of the laser beam.

"Almost everybody thought we wouldn't be able to get a signal from water," Jin says. "At first, I didn't believe it either."

As it turns out, Zhang says, water "is a surprisingly efficient terahertz source."

—Lindsey Valich

ADOBE STOCK

Study Pokes Holes in Fetal Alcohol Hypothesis

Exposure to alcohol in the womb can lead to fetal alcohol spectrum disorders (FASD), a condition that causes lifelong physical and cognitive impairments, and for which there is no available treatment. In order to develop treatments for the condition—now diagnosed in roughly 1 percent of babies born in the United States—researchers must pinpoint the precise biological mechanisms by which alcohol harms the developing neurological system.

A prevailing hypothesis has been that cells, or microglia, in the developing brain's immune system play a key role. Because microglia are constantly monitoring the environment in the brain and become mobilized when they detect infection, injury, or other toxic elements, scientists have speculated that alcohol may be activating the cells and causing them to either abandon their role nurturing the connections between neurons or possibly even mistakenly attacking neurons they perceive as injured.

But a study by Ania Majewska, an associate professor in the Medical Center's Department of Neuroscience, and Elissa Wong, a graduate student in Majewska's lab, undermines that hypothesis.

Majewska and her colleagues tested the hypothesis by exposing mice to alcohol early in development. Using a wide array of techniques, including genetic markers and an advanced imaging technology called two-photon microscopy, the scientists were able to observe the activity of the microglia in the brains of the mice and compare them to healthy animals. They found that there was no difference in the activity of the microglia between the two groups.

"While this work does not prove that microglia do not respond to alcohol in different brain areas or in different contexts of exposure, it does call into question a long-standing theory and shows that, in some cases at least, alcohol can elicit cognitive dysfunction without engaging microglia," says Wong. "This in turn suggests that microglia may not be the best therapeutic target for treatment of FASD."

The study appeared in the journal *Brain Behavior and Immunity*. —Mark Michaud

When Getting an Early Start May Be Bad for Mental Health

Parents, pediatricians, and educators have expressed growing concern in recent years that American teenagers have become chronically sleep-deprived. A Medical Center study gauging the effects of sleep on mental health suggests one oft-mentioned remedy to the problem—later school start times—may have benefits.

The study, supported by the National Sleep Foundation and published in *Sleep Health*, is "the first to really look at how school start times affect sleep quality, even when a teen is doing everything else right to get a good night's sleep," says Jack Peltz, a clinical assistant professor in psychiatry and the lead author.

Study participants, screened and controlled for a variety of factors, were divided into two groups: those who started school before 8:30 a.m. and those who started after 8:30 a.m. (the recommended start time for high schoolers by the American Academy of Pediatricians).

The results showed that good baseline sleep hygiene was directly associated with lower average daily depressive/anxiety symptoms across all students. However, students with good baseline sleep hygiene and earlier school start times had higher average daily depressive/anxiety symptoms than their counterparts with later start times.

BRIGHT AND EARLY? A study suggests early school start times may raise risks of teen anxiety and depression, regardless of sleep habits.

"Our findings show that earlier school start times seem to put more pressure on the sleep process and increase mental health symptoms, while later school start times appear to be a strong protective factor for teens," says Peltz. —Christine Roth

Closing a Pathway to Cancer

In human embryos, proteins of the so-called "hedgehog" signaling pathway stimulate cells to develop into different organs. In adults, the pathway falls largely silent, except in certain tissues that constantly regenerate themselves, such as skin and the linings of blood vessels and the digestive tract.

Unfortunately, several types of cancer cells are able to reawaken the dormant pathway, causing surrounding healthy cells to produce growth factors (proteins or hormones that stimulate cell growth) that help the cancer cells proliferate and metastasize.

In research published in the *Journal of the American Chemical Society*, chemistry PhD student Andrew Owens, associate professor of chemistry Rudi Fasan, and others in the Fasan lab, have identified a cyclic peptide that's able to block the activation of the pathway in live cells.

The pathway is activated when a binding molecule produced by cancer cells interacts with a receptor on the surface of healthy cells. The FDA approved a drug acting against the pathway in 2012, but it's since been shown that cancer cells become quickly resistant to it. The cyclic peptide developed in Fasan's lab uses a different mode of inhibition than the FDA-approved drug.

The next step will be to further optimize the peptide for increased potency, then proceed to animal trials.

The risk, as in any chemotherapy, is that the drug candidate Fasan's lab is developing will also inhibit the pathway in healthy skin, blood vessel, and digestive tract tissues that rely on the pathway for normal regeneration. However, the fact that a hedgehog pathway inhibitor was recently approved for use in cancer therapy holds promise that the risks are outweighed by the benefits of inhibiting cancer growth, Fasan says.

—Bob Marcotte

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