giving] the go-ahead for torture. You see these terrible pictures come across your desk in some confidential dossier, and you think, 'These guys are really in pain—they must be guilty.' But for those of us who had no say in torture and don't feel complicit, when we see those images on our TV screens, we say, 'Oh, that is terrible—those innocent men.'"

Gray says the experiment suggests that governments that initially advocate torture—or passively allow it—will see it as more justifiable, and thus are more likely to advocate for its use in the future. "You can see the feedback cycle," he explains: if torturers see their victim's pain as a sign of guilt, then the approach seems effective and it makes sense to torture more people. In reality, though, he notes, the pain that torture causes "just changes *our perception*" of the victim, not our knowledge of the facts of the case. —DAN MORRELL

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EUPHORIA FORECAST

Pleasure by Proxy

YOUR PARENTS RECOMMEND taking a Caribbean cruise and tell you about a discount deal. You've never taken a cruise and aren't so sure you'd enjoy it, so you dig up some information on the Web and even watch a couple of videos. You recollect the times you've been on ships, and your past visits to Caribbean islands—rum drinks, aqua waters. But will you really enjoy an eight-day cruise? Turns out there is a better way to answer this question: ask anyone who has just gotten off a cruise boat—a total stranger is fine. That way, you'll be 30 to 60 percent more likely to accurately predict your own experience than by basing your decision on painstaking research and inner speculations.

That's the upshot of new work by professor of psychology Daniel Gilbert, author of the bestselling 2007 psychology book *Stumbling on Happiness* and host of the recent PBS television series *This Emotional Life*. In a recent issue of *Science*, Gilbert and his coauthors—psychology graduate student Matthew Killingsworth, Rebecca Eyre, Ph.D. '05, and Timothy Wilson, Aston professor of psychology at the University of Virginia—reported findings on "surrogation": consulting the experience of another person, a surrogate, in deciding whether something will make you happy. They discovered that the direct experience of another person trumps the conjecturing of our own minds.

Visit harvardmag.com/extras to hear an excerpt from the Daniel Gilbert interview.

The surrogate's verdict is a useful guide because we are far more similar to each other than we realize. "If you look at other human beings, we seem amazingly varied," Gilbert explains. "What we for-

get is that if a Martian came and looked at us, he wouldn't be able to tell any of us apart." The same holds for our inner reactions. "One of the ways we're quite similar is in our hedonic or emotional reactions to events," he continues. "Yes, it's true that you may like strawberry ice cream more than chocolate, whereas I prefer chocolate. But that shouldn't obscure the much bigger point: *everybody* likes ice cream more than they like gall-bladder surgery. Everybody prefers a weekend in Paris to being hit over the head with a two-by-four." Economic markets exist for this very reason: to a large degree, people like the same things.

Gilbert volunteers a thought experiment: ask a random person to list all possible human experiences, ranking them from best to worst. Then ask another randomly chosen individual to do the same. Gilbert predicts, "You'd see 99 percent overlap in their arrangements." That's why surrogation works. (It isn't, however, a perfect guide, only better than the alternatives. Surrogation's a poor strategy in those rare circumstances where human emotional responses vary widely—e.g., to a question like, "What's your favorite number?")

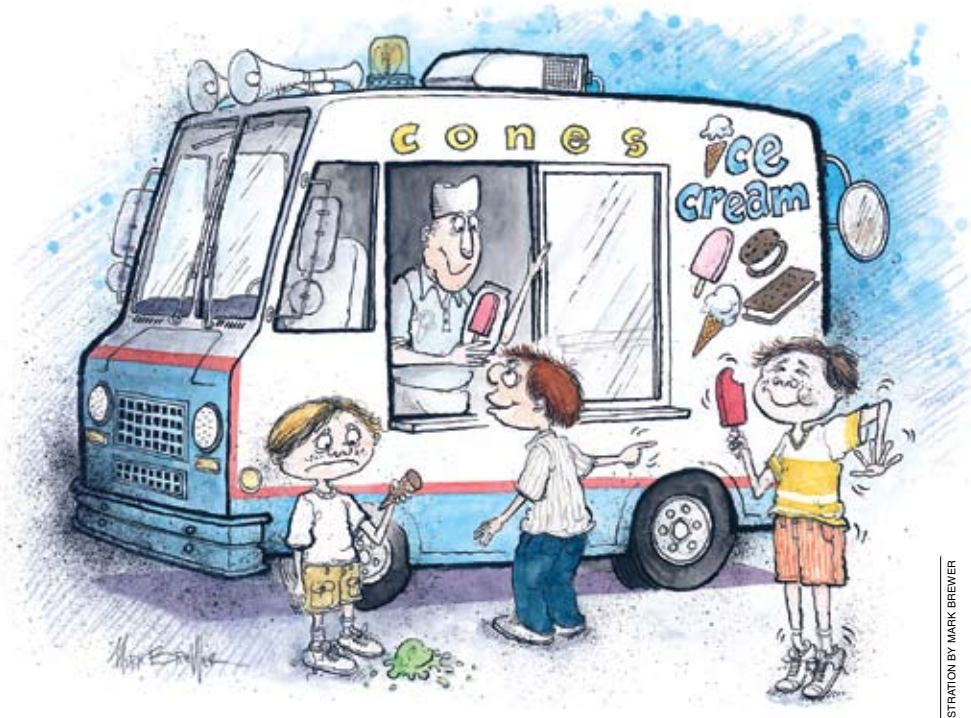

ILLUSTRATION BY MARK BREWER

In one experiment to test surrogation, the psychologists asked a sample of women to predict how much they would enjoy a "speed date" with a particular man. Some women saw his personal profile and photograph; others learned nothing about him other than how much another woman (a stranger) had enjoyed her speed date with him. The second group predicted their en-

joyment far more accurately than the first. Both groups had expected the reverse, and oddly enough, despite the outcome, both groups preferred to have the profile/photograph for their next date.

This suggests that ideas trump reality. But in predicting your *likings*, even someone else's direct experience trumps mental hypotheses—which is why surrogation works. But to be helpful, the surrogate's experience must be *recent*. "People are very poor at remembering how happy they *were*," Gilbert says. "So it's not very useful to ask, 'How much did you like something you experienced last year?' People get most questions about happiness wrong. But there is one question they get right: how happy are you right now?"

—CRAIG LAMBERT

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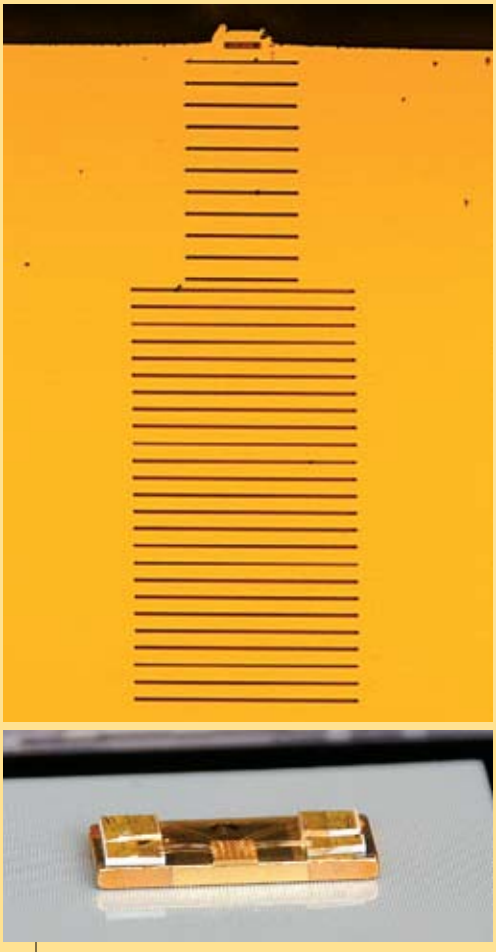
WORKING THE WAVEFRONT

Many Lasers from One

A TYPICAL LASER is supposed to emit a tight monochromatic beam of coherent light. That's the common view. But Wallace professor of applied physics Federico Capasso and postdoctoral researcher Nanfang Yu, Ph.D. '09, have created tiny semiconductor lasers that can emit many beams of laser light in multiple wavelengths from a single source. Their breakthrough work, conducted in partnership with Hamamatsu Photonics and ETH Zurich, may find application in high-throughput analysis of chemicals found in the atmosphere or on the ground, the monitoring of greenhouse gases, or even the detection of hazardous biological or chemical agents on the battlefield.

Yu and Capasso have been working on manipulating laser light wavefronts in a variety of ways. Their work takes advantage of a special property of light: it moves along the surface of certain materials, such as gold. Creating an aperture in the laser's facet (the face of the semiconductor from which the light is emitted) that is smaller than the wavelength of the light being emitted causes the light to diffract in a cone that originates at the aperture (think of a pinhole camera). A fraction of this light actually diffracts 90 degrees along the surface of the gold-coated facet in the form of electromagnetic waves—so-called surface plasmons. If they etch nanoscale grooves into the gold facet at intervals that are precise multiples of the wavelength of the laser light, the light "trips" into the grooves and is then emitted as a new beam, parallel to the original, from the surface of the facet. Such collimation—the creation of a parallel beam of light—is typically achieved with glass lenses. Yu and Capasso's approach obviates that need.



NANFANG YU

Wavelength scale grating (above) on the facet of a tiny semiconductor laser (below) creates multiple laser beams parallel to the original.

Further manipulations of beam characteristics such as intensity and direction are possible by altering the length of the grating (i.e., the number of grooves) that scatters the surface plasmons, and by changing the spacing (or "periodicity") of the grooves, respectively. By patterning two gratings side by side and controlling their respective distances to the laser aperture, one can even create two overlapping beams with 90-degrees phase difference. In this way, the two become a single circularly polarized beam. Such a rotating beam, says Yu, could be used to detect the chemical handedness (chirality) of biological molecules such as sugar, DNA, and proteins.

There are practical advantages to producing multiple beams from a single laser. Rotch professor of atmospheric and environmental science Steve Wofsy, for example, uses lasers developed by Capasso in his research because he considers them "uniquely capable" of making high-resolution sections of the atmosphere that provide new data about the locations and strengths of emissions of greenhouse gases. But to conduct such mass spectrometry in the atmosphere requires both a probe beam and a reference beam. The former interacts with an atmospheric sample and then recombines with the reference beam to reveal the sample's properties. Today, this requires two separate lasers. Having both beams originate in a single laser will halve the weight of Wofsy's measuring device.

Capasso's 1994 development of the quantum cascade laser led to commercial applications a decade later. If past is prologue, the innovative techniques he and Yu have developed for wavefront manipulation will likewise eventually appear in consumer electronics. —JONATHAN SHAW

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