

## PSYCHOLOGY

# Performance Sapped by Stereotypes

William von Hippel

As a reader of *Science*, you probably regard yourself as intellectually curious and nonviolent. But what if others didn't see you that way? What if people doubted your intellectual capacity and were visibly anxious in your presence? How would you cope with this situation and what effect might it have on you? This is the problem that Brent Staples faced as a young African-American graduate student, when he noticed that people were afraid of him as he passed them on the street at night in Chicago's Hyde Park. Staples learned to escape this stereotype by whistling Vivaldi, a strategy that put passersby at ease and inspired the title of Claude Steele's new book on how stereotypes affect us.

In *Whistling Vivaldi*, Steele (a social psychologist at Columbia University) describes the groundbreaking work that he and his colleagues conducted over the past 20 years on stereotype threat, the psychological threat of confirming or being reduced to a negative stereotype. Empirical work on this topic began when Steele and Steve Spencer found that they could dramatically improve women's math scores simply by telling them that the test they were about to take shows no gender differences in performance [research described in (1)]. Steele and Joshua Aronson

then went on to show that the performance of black students could be similarly improved if they were told that a test was not a measure of intellectual achievement (2). Indeed, Steele and Aronson also found that African Americans performed more poorly on a challenging verbal test if they were first asked to indicate their race, thereby highlighting their stereotyped identity. This result was later extended by Margaret Shih and her colleagues, who found that Asian-American women did worse on a math test after indicating their gender but better after indicating their race (3).

As Steele takes pains to note, two surprising facts about stereotype threat are that members of any group can experience it and that there need not be a prejudiced perpetrator to cause it. Rather, it can be set off by subtle environmental cues, such as seeing very few members of one's own group in a performance setting. Steele describes feeling stereotype threat himself when in a Silicon Valley workplace where everyone else was twenty-something. The environment exuded youth through the music people played and the bicycles hung over the work cubicles, and these cues were enough to make Steele feel old and out of place. If Steele were employed in this setting, research on stereotype threat suggests that

## Whistling Vivaldi And Other Clues to How Stereotypes Affect Us

by Claude M. Steele

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his concerns about being stereotyped would likely consume valuable cognitive resources, resulting in poorer job performance.

As this example from the book indicates, people need only worry that others might stereotype them, and this worry alone can disrupt performance, despite (and sometimes because of) extraordinary efforts to prove the stereotype wrong. This worry can also lead

to long-term disengagement from stereotyped domains, as people tire of the Sisyphean task of continuously trying to prove that the stereotypes don't apply to them.

Superbly written and engaging, *Whistling Vivaldi* presents research on stereotype threat in the form of an historical narrative. Readers need no scientific

expertise to follow the story, and those who are already familiar with the research are likely to be intrigued by the events, ideas, and people that influenced theory development and experimentation. Despite the book's focus on the negative consequences of feeling stereotyped, Steele remains optimistic in his emphasis on how stereotype threat can be ameliorated. For example, he describes an intervention by Geoffrey Cohen and his colleagues in which students in racially integrated seventh-grade classrooms were randomly assigned to either reflect on their important values or discuss values that another person might find important (4). This former process, known as self-affirmation and based on Steele's earlier research (5), reduces the impact of a variety of different types of psychological threats. Cohen and colleagues thought that self-affirmation might ameliorate the stereotype threat experienced by African Americans in the classroom. Consistent with their reasoning, this brief affirmation reduced the gap between black and white students by 40% over the course of the term, and the benefit of this intervention was still apparent two years later.

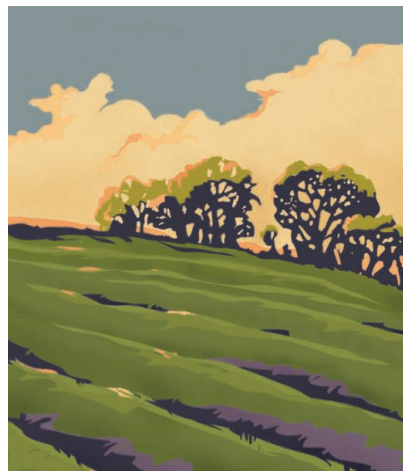
In this sense, *Whistling Vivaldi* is a social scientist's dream, as the book demonstrates how slight changes in an individual's situation or experience can lead to dramatic reductions in the magnitude of various group differences that were (and often still are) portrayed as largely genetic and biological. Indeed, a recent meta-analysis (6) reveals that stereotype threat depresses the performance of women and minorities by more than a third of a standard deviation when they take difficult tests like the SAT—that's over 40 points on each section of a test that can determine admission or rejection at some of the most selective universities in the United States. Prior to Steele's theorizing

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## BROWSINGS

**The Field Guide to Fields: Hidden Treasures of Meadows, Prairies, and Pastures.** Bill Laws. National Geographic, Washington, DC, 2010. 224 pp. Paper, \$21.95, C\$26.95. ISBN 9781426205088. **Fields.** HarperCollins, London. £15.99. ISBN 9780007358199. Collins Field Guide.

Despite the title, this is not a field guide—the identification sections cover only a small, eclectic sample of flora and fauna. Instead, Laws celebrates the natural and human histories of rural landscapes where crops and animals have been (and are) raised. Rice paddies, water meadows, paddocks, vineyards, and plains of grain are among the pastoral scenes he offers armchair travelers while weaving aspects of culture, food, and folklore into the text. The artwork includes 25 expressive, full-page, woodcut-style illustrations, such as this depiction of a traditional ridge-and-furrow field.



and experimentation, none of us would have guessed that such small differences in instruction or setting could lead to such dramatic effects on performance.

#### References

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## TECHNOLOGY

# What Would A. G. Bell Say Now?

Marc Lavine

In fictional or science-fictional literature, technologies and devices are often invented in order to solve a problem that might otherwise detract from the storytelling, such as the need to move an object or a piece of information quickly from one place to another. Examples include the transporter and tricorder from *Star Trek* to the two-way wrist radio and two-way wrist TV of Dick Tracy fame. Although the instantaneous transporting of a person may not be realized soon, small-scale sensing, analysis, and communication are now commonplace.

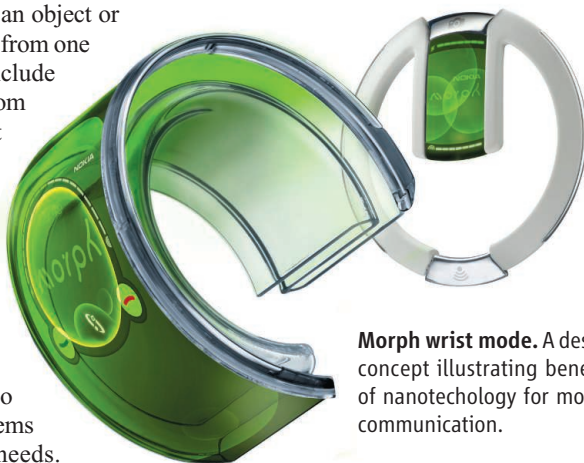
Advances in technology also come about to solve real problems or in anticipation of future needs.

The evolution of technology is not unidirectional, as new capabilities allow for the creation of new markets. Following on from workshops held with researchers from the University of Cambridge, Nokia, and Helsinki University of Technology, editors Tapani Ryhänen, Mikko Uusitalo, Olli Ikkala, and Asta Kärkkäinen offer a vision of how nanotechnology will be used to create future mobile devices. This may seem like a recipe for a dry, academic text, but *Nanotechnologies for Future Mobile Devices* more broadly explores the impact of new technologies and devices on manufacturing approaches, value

networks, innovation models, and the broader society. Our ability to connect with individuals across the planet at close to light speed has made the world both larger and smaller at the same time.

The volume starts with a vision of the growing interconnectedness of the world as seen by Ryhänen, Uusitalo, and Kärkkäinen (all of whom are at the Nokia Research Center, Helsinki). Even though the picture they paint is highly idealized, one can see how the needs of an aging population or the desires for an immersive three-dimensional virtual environment will shape the way future technologies are shaped. Beyond simple communication devices or the ability of a doctor to evaluate and treat a patient remotely, there are possibilities such as handheld devices capable of tracking seismic data or the presence of potential chemical hazards and conveying that information to the necessary authorities in real time.

Subsequent chapters survey a number of promising research areas, including nanocomposites, self-assembly, biomimicry and biological materials, and the development of



**Morph wrist mode.** A design concept illustrating benefits of nanotechnology for mobile communication.

functional surfaces. Although not exhaustive, the chapters' reference lists appear to contain the majority of key recent papers. The drive to new materials and fabrication technologies is in part due to some existing methods and materials coming up against fundamental limitations—particularly in the areas of energy and computation. Compare this with the areas of sensing, actuation, and communication and display technologies, where tremendous progress continues to be made (so that we can be bombarded with entertainment and advertising in airports, elevators,

gas stations, and taxis).

The volume's last two chapters make it stand out from other overviews and reviews. The first ("Manufacturing and open innovation"), from Tim Minshall *et al.* (a team of engineers at the University of Cambridge), looks at changes in manufacturing methods and the development of open innovation, in which

companies look beyond their own boundaries for methods to create, develop, and market new products and technologies. One might argue that such a distributed process of innovation already occurs to a large extent, either in the form of partnerships among corporations and the world of academia or through the aggressive acquisition of small startup companies. Increasingly, one finds that these startups come from university research that is promoted into its own entity, so as to better mesh with the goals of the corporate world.

The second ("Seeing beyond the hype") comes from Tom Crowley, Laura Juvonen, and Pekka Koponen at Spinverse, a company that commercializes and markets new technologies. They describe two frameworks for analyzing technology development: the S-curve (which maps the performance of a new technology over time) and the hype cycle (*I*), in which a trigger is followed successively by an initial "peak of inflated expectations," a "trough of disillusionment," a "slope of enlightenment," and lastly the "plateau of productivity." They also compare the evolution and marketing of Internet technologies with the current state of nanotechnology. Anyone looking to develop and commercialize promising emergent scientific and engineering advances—even researchers working outside the core areas covered in the volume—will certainly find this chapter worth reading.

To some extent, the technologies employed in the future are limited by our ability to design and manufacture the necessary devices. But as the fictional literature shows, the starting point is seeing and understanding a fundamental need and then working toward its solution. *Nanotechnologies for Future Mobile Devices*, the product of an unusual and productive collaboration, offers an interesting vision of our growing interconnectedness and the technologies that are likely to change this in the future.

#### References

1. J. Fenn, "When to leap on the hype cycle" (Gartner Group, Stamford, CT, 1995).

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