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Hacking the Soul

New technologies that look inside the mind will make it possible to change what we think, feel, and remember.

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K900 V8 with VIP package shown.

From the Editor

LUDWIG WITTGENSTEIN WAS NOT TECHnologically illiterate: he had studied aeronautical engineering at the University of Manchester before World War I, researching the behavior of kites and designing a propeller with little rockets at its tips. But the philosopher was violently opposed to *scientism*, which Trenton Jerde, in his review of James Klagge's *Wittgenstein in Exile,* describes as "a preoccupation with the scientific method, the appeal to the sciences to solve problems that are beyond their reach, and a misuse of scientific terminology." The philosopher insisted on an unbridgeable divide between philosophy and science, which Klagge calls "Wittgenstein's insulation thesis," one of whose consequences was that science cannot resolve philosophical problems.

Wittgenstein would have been especially derisive of the claims of neuroscientists to meaningfully explain mental phenomena. In his *Zettel* (or posthumously collected remarks), he writes about the psychology of his own time: "No supposition seems to me more natural than that there is no process in the brain correlated … with thinking; so that it would be impossible to read off thought processes from brain processes."

Wittgenstein's interdiction is now a commonplace among philosophers. Many argue that understanding the causes of events in our brains cannot tell us much about the mind, because inferring anything about the latter from the former is a kind of "category mistake." But the attitude is becoming a rearguard defense against the encroachments of an advancing explanatory method. Questions such as "What is consciousness?" or "Do we have free will?" or "How do we ethically reason?" are of abiding interest, and because philosophers have made little progress in answering them, neuroscientists have felt at liberty to try. Thinking, feeling, and deciding are the most intimately human of all things, and yet we understand them hardly at all.

That neuroscientists can make the attempt is the result of recent technological advances, including (but not limited to) new kinds of brain imaging and the emerging field of optogenetics. This issue of *MIT Technology Review* describes those emerging technologies (see "Neuroscience's New Toolbox," by Stephen S. Hall, page 20, and "Cracking the Brain's Codes," by Christof Koch and Gary Marcus, page 42) and explains some of the surprising early insights they have suggested (see "Searching for the 'Free Will' Neuron," by David Talbot," page 64, and interviews with the neuroscientists Joseph LeDoux on memory, page 30; Antonio Damasio on emotions, page 48; and Rebecca Saxe on empathy, page 60). Finally, we report on the interventions the new technologies may make possible, including treatments for intractable mental illnesses such as schizophrenia (see "Shining Light on Madness," by David Rotman, page 34) and the use of brain-machine interfaces to help paralyzed patients ("The Thought Experiment," by Antonio Regalado, page 52).

Are the philosophers convinced by any of this? Not really. Responding to Gabriel Kreiman's research into decision-making, Hilary Bok, a philosopher at Johns Hopkins, is reserved: "I love these experiments and think they are really interesting, but I'm less convinced whether they have shown anything crucial about free will." But they are intrigued. Patricia Churchland, a philosopher at the University of California, San Diego, says of the same experiments, "Self-control is an entirely real brain phenomenon. Insofar as self-control is a key component of free choice, we do in fact have free choice."

But perhaps it doesn't matter much what professional philosophers think. They've had 2,000 years to answer these questions in their own way. The power of an explanation is its capacity to satisfyingly illuminate something hitherto obscure and to allow us to do things we could not before (here, effectively treat mental illnesses and build brain prosthetics). Insofar as traditional philosophy has an important role in understanding the mind, it may be to pose questions and parse answers, and the questions we ask will become more interesting because of the conceptual breakthroughs of neuroscience.

But write to me at jason.pontin@technologyreview.com and tell me what you think.

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Contents

Front

July/August 2014

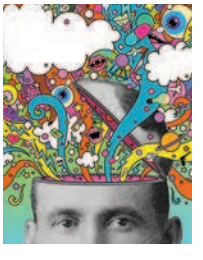
Back

BUSINESS REPORT

REVIEWS

53 YEARS AGO

ON THE COVER



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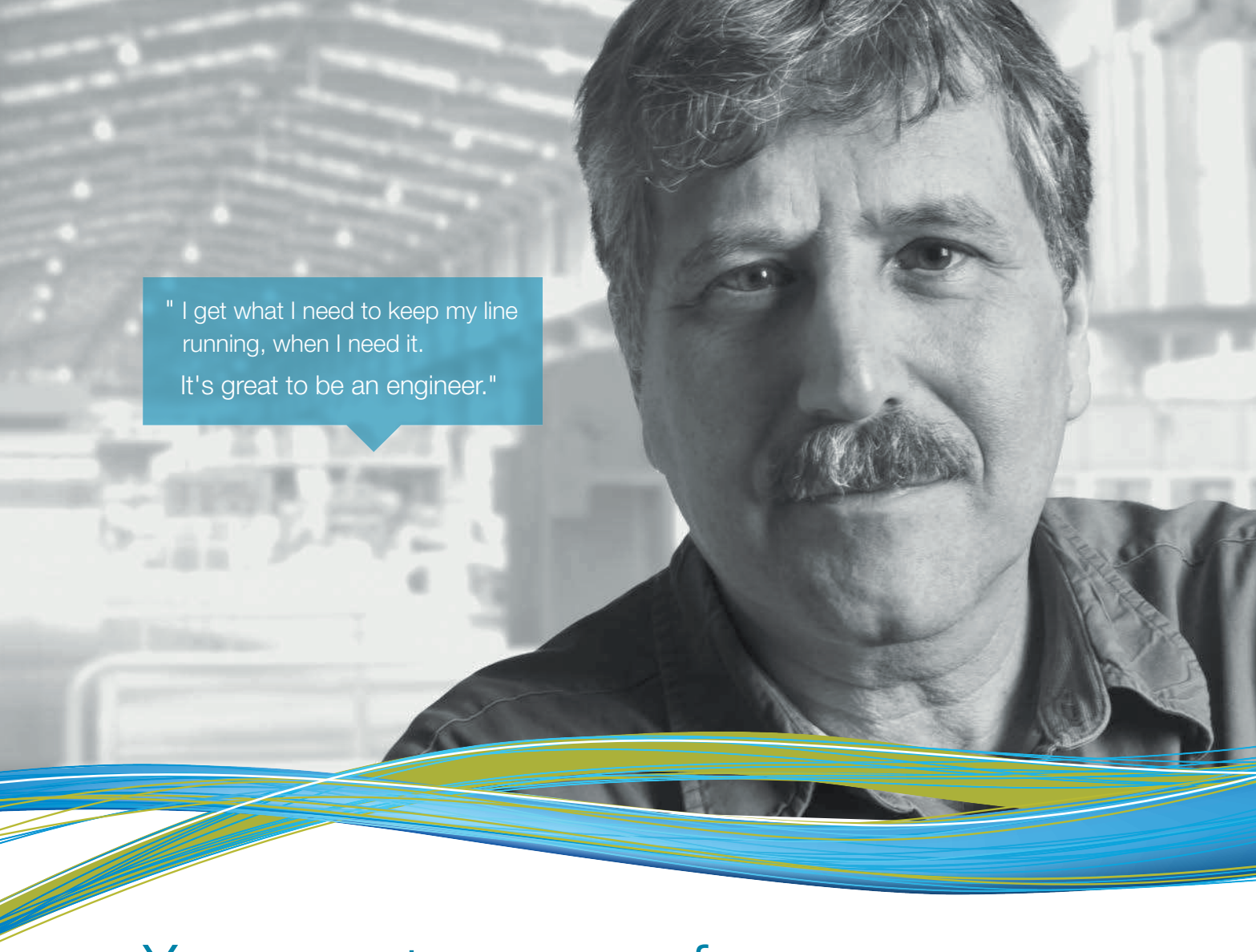

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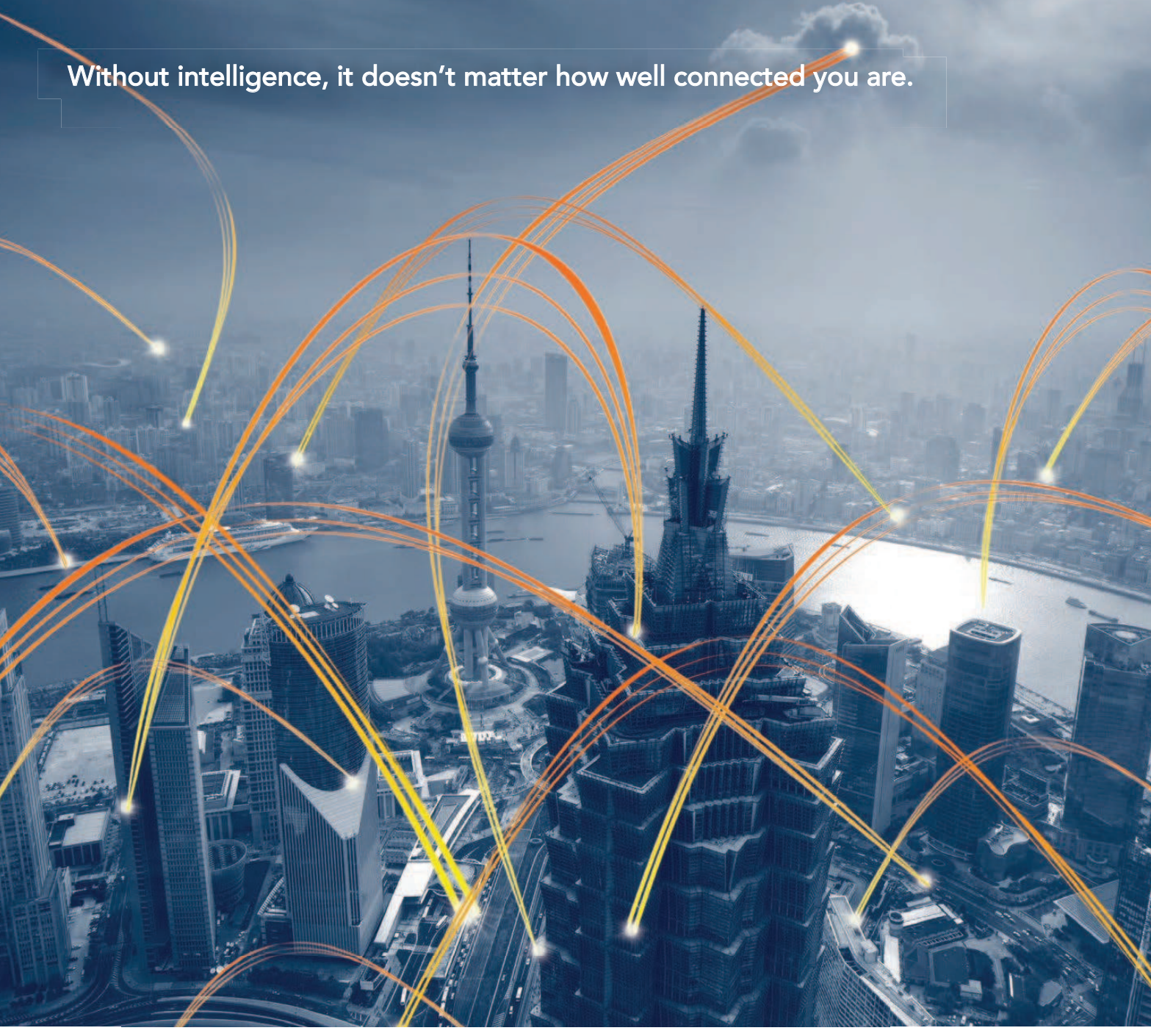

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Five Most Popular Stories

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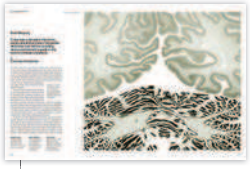
Volume 117, Number 3



1

Smart Wind and Solar

If the grid can't manage the tiny fraction of power now produced by wind and solar, just imagine how bad the problem would be if they were increased five times or more.

—big.league.slider

@big.league.slider: It's actually easy to imagine, just like in Colorado or Texas when inclement weather throws thermal and nuclear plants offline and poor old intermittent power has helped utilities to ride it through. That's what this article implies: stronger modeling allows utilities to understand better what they are facing. It's a learning curve. **—jeffhre**

2

Ultraprivate Smartphones

What if Silent Circle and Blackphone are actually operating by order of the NSA, set up to catch exactly those who really value privacy and therefore are prime targets? Do we have any guarantees?

—bluppfisk

Sometimes I wonder about this fanatical need for secrecy. I take my wife to an Indian restaurant and the waiters begin preparing her favorite samosas when we drive into the parking lot. It is part of life and a nice part of it at that. I don't want to walk around being suspicious of everyone and everything in my vicinity. **—tag**

3

Oculus Rift

Anybody who has had the opportunity to try side by side the Google Glass and the Oculus Rift (as I could at a recent conference in Brussels) would quickly understand Zuckerberg's acquisition decision. Between the "cool" factor and the "wow!" effect, the fact that Glass is less obstructive (allegedly allowing you to keep in contact with the real world) may eventually play against Glass commercially. Young people might be more reluctant to look like a "dandy geek" (as they would with Glass) than to stake their claim as a "dedicated nerd" (as they would with Oculus Rift).

—borisazais

4

Brain Mapping

We will never mimic the human brain in silicon or carbon. The physiology of neurons is not nearly as intriguing as the behavior that allows them to self-assemble into pattern-matching engines that can be recalled and reapplied.

—marcvky

It would have been nice if you'd addressed what we expect to gain by seeing the brain cells. Can we decipher thoughts, ideas, fears, by just seeing? Can we understand conditions like autism? Can we enhance the brain functions of healthy individuals? What is the problem we are trying to solve, and how far are we from that?

—ankur

5

Q&A: Sarah Lewis

Art is exploration and curiosity, so in that sense it shouldn't be considered much different from science. The scientific process—hypothesis, designed experiment, results analysis, and all over again—can be applied everywhere. **—vnedovic**

My art skills are minimal, but I've been interested in the relationship between art and science since college. Having worked in video-game design since the 1970s, I've seen brilliant engineers enjoy juggling, chemists coding intricate game logic, a whale-study scientist creating a game, and software engineers writing science fiction. **—ricklev**