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A LETTER FROM **DEAN GARTH SALONER**

Risks Create **Opportunities** for Every Organization

I've been spending a lot of time thinking about "risks" as I begin my second five-year term as dean of this wonderful business school. Facing them. Mitigating them. Taking them. Risk is one of the factors I always consider as I reflect upon the things that are most important to us. It's a process that allows me to identify the external forces that may impact our institution and the internal factors that could affect our programs and people.

At the GSB, we continue to attract the finest prospective students every year, and we have an exceptional alumni network, a leading faculty, a dedicated staff, and a sterling reputation. We are part of an extraordinary university and are located in one of the most innovative places in the world. I feel very fortunate.

We work hard to ensure that we continue to be the destination of choice for young men and women seeking professional management education and that, in everything we do, we uphold the reputation

of the GSB. However, the case studies of successful organizations are replete with examples of companies that have focused on what they have historically been good at. The result has been that they have not adapted to changing conditions and have ultimately failed. Paradoxically, perhaps, to avoid that risk one must sometimes take new ones. That is, one must innovate knowing full well that innovation is inherently a risky business.

We encourage innovation within the GSB even as we strive to mitigate the risks that accompany it. While we celebrate our successes we try to be mindful to recognize those who were bold enough to try something new, even if it didn't work out as planned. There is always something to learn from the things we try that don't work. We also try to be honest with ourselves about what is working and what isn't. One way to mitigate the risks of innovation is to close down an unsuccessful new venture sooner rather than later, and to celebrate that at least we tried.

We have taken some large risks in the last five or 10 years — including the decisions to build the new Knight Management Center, to overhaul our curriculum, to take Stanford Ignite around the world using synchronous distance education, and to launch SEED, the Stanford Institute for Innovation in Developing Economies.

However, some of the risks I am most proud of are the smaller ones our faculty take every day. Let me report on just two that were made salient to me during our recent AACSB reaccreditation process, which takes place every five years. As part of that process, a three-person team of



leaders of our peer schools visited with us for a couple of days. Through the materials we prepared for them and their reaction to what they saw, it became apparent that some of the things we have come to take for granted are in fact incredibly special.

The first is the enormous amount of continuous innovation in our elective curriculum. Some 28% of the elective classes that we teach in any given academic year, including this year, are brand new. Almost half of our electives this year didn't exist five years ago. I admire the courage and drive of our faculty to constantly reinvent their elective teaching and of our MBA Program administration to drive elective innovation.

The second is what is for us the fairly standard practice of combining tenure-line faculty and practitioners in the classroom. Safra Catz, the newly appointed co-CEO of Oracle, teaches an elective on M&A with accounting professor Ron Kasznik. Steve Ballmer, having recently stepped down from the helm at Microsoft, just finished co-teaching a course titled *Leading* Organizations with economics professor Susan Athey. Organizational behavior and strategy professor Bill Barnett has had a very successful multi-year collaboration with renowned Silicon Valley venture capitalist Andy Rachleff teaching an elective on "market fit."

We now have a very long list of electives like this in which our students essentially are taught a course "in stereo," learning contemporaneously from masters of frameworks and of practice at the same time. Again, I admire the willingness of our faculty to bridge theory and practice in this way. Doing so involves taking risks on both sides.

Many of the practitioners who join us in this endeavor, like Andy and Steve, are our own alumni. This is just one of the many ways in which our alumni support our innovation and risk-taking. You provide the advice, the risk capital, the support, and the encouragement that gives us the courage to take the calculated risks that are necessary to safeguard the value that the GSB represents to all of us. Thank you.

Garth Saloner is the Philip H. Knight Professor and Dean of Stanford Graduate School of Business. Follow him on Twitter @Saloner

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Stanford Business

INSIGHTS AND IDEAS FROM STANFORD GRADUATE SCHOOL OF BUSINESS

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Cover illustration by Brett Ryder

Flipbook illustration by Nicholas Blechman

INTRODUCTION



This issue examines risk from a variety of perspectives, including why we are so bad at understanding the probability of harm, the likelihood of a space catastrophe, and (much) closer to home, how to identify a boss you just shouldn't trust. > But rather than simply dwelling on danger, our stories take a solutions-oriented approach. For example, we explore how data can be used to reduce the number of hospital readmissions and potential policy responses to addressing the effects of some of the world's most terrifying scenarios, such as a terrorist attack or the outbreak of a fatal disease. > Taking calculated risks is also part of our DNA. You'll see this in evidence in our magazine as well as on Insights by Stanford Business, our new digital home for research, stories, and ideas, where we have developed innovative ways to create a more engaging reader experience. This includes an emphasis on social sharing and increased use of video, audio, interactive features, and infographics. Alongside each story we offer related articles, research papers, case studies, books,



TEMPESTUOUS The Lower Yosemite Fall, by Carleton Watkins, on display earlier this year at Stanford's Cantor Arts Center (left), and a 1993 homage to it, by Mark Tansey, at the new Anderson Collection

and educational programs for those whose curiosity inspires them to dig deeper. You can find it at *gsb.stanford.edu/ insights.* ► We also recently launched a new multimedia project based on the book *Roadside MBA*, by Stanford GSB economist Paul Oyer and two colleagues. Our team joined them on a trip through the American West to create a package of videos and written pieces on what you can learn from and about small business in America. (You can find that one at *roadside-mba.stanford.edu*) Let us know what you think about these and our other projects at *StanfordBusiness@Stanford.edu*.

- MICHAEL FREEDMAN, EDITORIAL DIRECTOR



IN THE MAGAZINE



Before moving to the Bay Area two years ago, **lan Chipman** was a senior editor at *Booklist* magazine, the review journal of the American Library Association. He has since served as deputy director of content at the digital publishing startup Byliner, where he curated a deep archive of long-form journalism and now works as a writer, photographer, and content strategist.



Elizabeth MacBride is a freelance writer and editor who frequently writes about finance, technology, and corporate culture. She has contributed to CNBC, BBC Capital, *Crain's New York*, and many others. She is working on a book that was recently excerpted in the *Atlantic*. Follow her on Twitter *@editoremacb* or check out her blog on Forbes.com.



Shana Lynch is the senior editor at Stanford Business. A veteran journalist and digital content producer, she was most recently managing editor of the Silicon Valley Business Journal and was previously a copy editor and researcher at the Sacramento Business Journal, a guest commentator for Capital Public Radio, and a writer for a web startup through the University of Missouri, Columbia. Follow her on Twitter @SVShanaLynch.



Edmund L. Andrews was a business and economics correspondent at the *New York Times* for two decades and is now a writer and consultant in Lake Tahoe, Nevada.

ON THE WEB



- You Tube Three economists hit the road to learn about small business in America. Here's what they discovered. See the videos at YouTube.com/StanfordBusiness
 - "A manager who takes time to feed his or her own creative side knows how to elicit the creativity of others." Follow us @StanfordBiz

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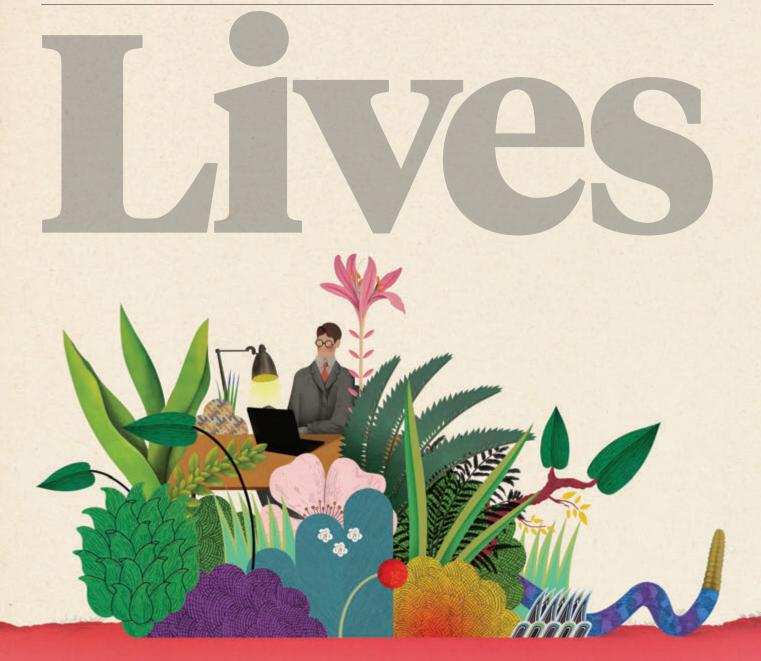
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"If you are an entrepreneur, you want to continue to gain experience

as an entrepreneur. Learning from that experience

can shape your future." **Kathryn Shaw** PAGE 22

UZMA KHAN Exploring our perceptions of danger

JUDGMENT

A study shows just how poor we are at instinctively understanding probabilities.

BY IAN CHIPMAN

It's a typical afternoon, which means that you're on Facebook instead of doing whatever it is you're supposed to be doing. You notice an ad from a brand you follow — say, Chevrolet — offering you a chance to win a car if you sign up for a newsletter. Meanwhile, in a parallel universe — where, ves, you're also on Facebook — the same promotion from Chevrolet pops up offering a chance to win not only a car but also a handful of smaller prizes, including iPads, gift certificates, T-shirts, and hats. Since all else is equal, it makes sense that the second promotion would be the more enticing one: There are more prizes to win, so objectively it should be a more valuable prospect for you.

Yet according to new research by Stanford GSB associate professor of marketing Uzma Khan and graduate student Daniella Kupor, it turns out that precisely the opposite is true. The promotion offering only the car will seem more valuable, and as such is the one you're more likely to enter. So, what's going on?

Across a series of experiments, Khan and Kupor found that the addition of smaller prospects (winning those iPads and T-shirts) actually makes the larger prospect (winning the car) seem less likely. And since it seems less likely that you'll win that car, the whole promotion appears less valuable to you. In short, the common marketing practice of throwing the kitchen sink into a promotion in order to make it seem more valuable is counterproductive.

Uzma Khan is an associate professor of marketing at Stanford GSB, where Daniella Kupor is a PhD student. Khan's research interests fall in the area of behavioral judgment and decision making.



THE "VALUE ATROPHY" PHENOMENON

This effect, which Khan calls "value atrophy," is rooted in the complex interplay between our perceptions of size and likeliness. Previous research has shown that we are good at contrasting the size of outcomes in a given context — in our promotion example, knowing that the car is a larger win than an iPad — but rather poor at instinctively understanding probabilities. Khan's research systematically documents a link between the two, in which we believe that larger outcomes such as winning a car are less likely than smaller outcomes, such as winning a T-shirt. Which makes sense and is perhaps even accurate in most cases.

"It certainly seems true that smaller things are more likely," Khan says. "Think about a lottery: There are a hundred hats and a hundred mugs, but only one Ferrari. I don't know any jackpot winners, but I know plenty of people who win the smaller things." Yet her findings illustrate that this belief that larger outcomes are less likely becomes a cognitive shortcut that we overapply when we assess the value of riskreward outcomes.

There are two key elements in understanding value atrophy. The first is that the effect arises only when smaller prospects are added to a larger one. The second is that the phenomenon occurs only in probabilistic contexts where the outcome is uncertain. Essentially, the contrast generated by placing the smaller outcomes next to a larger outcome not only makes the larger outcome seem even larger than it would have by itself, but it also makes the larger outcome seem even more unlikely. As a result, our overall impression of the value of the whole proposition gets skewed.

WIDE-RANGING IMPLICATIONS

What's even more interesting, and suggests that this finding has potentially wideranging implications, is that value atrophy occurs in both positive and negative scenarios. That is, it makes objectively more dangerous outcomes appear less dangerous, just as it makes more beneficial outcomes appear less beneficial.

In one study, people were asked to imagine that they were headed on a trip to Guatemala and were thinking about buying travel insurance. They then had to decide how much they would pay for two different types of insurance: one that covered the cost of treating serious injury while abroad and one that offered the same level of coverage as well as the costs of minor cold and flu. The results found that people were willing to pay more for the insurance that covered only serious injury. In other words, the mere addition of the smaller prospects to the larger one actually reduced people's willingness to pay for what is objectively a better product.

In another experiment, participants were told about a new drug that could help treat hypertension, albeit with some side effects. Half of the participants were told that the drug may increase the likelihood of cancer, whereas the other half were told that the drug may increase the likelihood of cancer, dizziness, cold hands and feet, asthma, tremor, and/or insomnia. Rationally, the

This effect, which Khan calls "value atrophy," is rooted in the complex interplay between our <u>perceptions of</u> size and likeliness. drug with many possible side effects is more dangerous than the drug with the single possible side effect, yet participants found the drug with multiple side effects to be less threatening, even though such a belief is not really in their best interest.

The health-care realm, Khan believes, might be the one area in which her findings have the most impact, yet it's easy to spot the double-edged sword here. Laws that are designed to help consumers by informing them of every possible side effect of a potentially harmful drug can actually play into the hands of pharmaceutical companies, ultimately distorting the overall picture of the risks involved. Or consider the insurance industry, which is built on the very sophisticated pricing of risk, where people could be unwittingly exposing themselves to substantial danger. Imagine a homeowner who is less likely to purchase home insurance if providers describe the minor incidents that can happen in addition to the serious damages that might occur.

Still, Khan sees a world of good that can come from this finding. Think of public-health awareness campaigns, for instance. A targeted antismoking message of "Smoking causes lung cancer" would be much more effective than one that provides a detailed rundown of all the negative consequences that await you from lighting up.

It is at the policy level that Khan hopes her findings will be best understood and implemented. "If you're a health agency and you want people to make informed decisions by giving them all this information about all the risks involved," Khan says, "you're actually reducing how risky people think that drug is going to be. If policy makers [understood] this, they would mandate disclosure of information in a way that helps consumers rather than hurts them." Δ



JOHN BROWNE Making the business case for diversity

DISCLOSURE

"I Was Not Going to Hide Any Longer. A former oil executive explains why he his gay identity a secret for decades. BY JOHN BROWNE

A former oil executive explains why he kept

At 5 p.m., on May 1, 2007, just a few hours after resigning as chief executive of BP, I stepped into the elevator on the 5th floor of the London headquarters and began my descent. When the doors opened I had two options. I could make my way to an underground parking garage without being noticed. Alternatively, I could simply walk through the lobby and out of the main entrance overlooking leafy St. James's Square, where about 30 press photographers had spent the day waiting like vultures for their prey.

My overwhelming desire to conceal my sexual orientation over four decades in the oil industry had culminated in this terrible juncture. My long-kept secret was about to be exposed, and I was not going to hide any longer. I decided I would leave through the front door.

PROTECTING A SECRET TO SAVE A CAREER

In 1969 I accepted a job with BP. I wanted to go to the United States, and BP decided to send me to Alaska. It was not what I had in mind. But I accepted the offer and started my career in the frozen tundra, above the Arctic Circle, 650 miles north of Anchorage. I learned my trade as a petroleum engineer as part of a team that drilled exploration wells. I was the lowest of the low. Over time my responsibilities grew as I was promoted through various jobs in New York, San Francisco, London, and Calgary.

As my career progressed and my hours became longer, I channeled any personal frustration about my identity into my work. I saw absolutely no purpose being served by coming out. My career was going in the right direction and the line between my private and public lives was clear.

By 1981 I had been with BP for 12 years. I was 33 years old when I moved to Aberdeen, the Scottish city known for its granite buildings and extraordinarily rare beautiful summer days. I had been appointed manager of Forties Field, the largest oil field in the North Sea and one of BP's most important production assets. Twice a month

John Browne, knighted in 1998, was a Sloan Fellow at Stanford GSB in 1981. Currently, he is a managing partner and managing director at **Riverstone Holdings LLC.**

I spent my weekends on our massive offshore platforms. Staff jokingly referred to the dozen platform managers as the "college of cardinals" and to me as the "pope."

One weekend evening when I was onshore I went into the only gay club in town. I had been to gay venues elsewhere, but this was my first time in Aberdeen. I was absolutely terrified, but I had calculated that the risk of seeing anyone from BP was slim to none. I met someone, and we went home together. We did not reveal much personal information about ourselves, but he was clearly an educated professional of some kind.

Two days later I was in the office and I saw him walking toward me in a corridor. In a split second I could feel my temperature rise and scanned the area to make sure no one else could see whatever reaction I was about to have. I had hundreds of people working for me at that point. How many of them would now joke that the pope had sinned?

It was a fleeting moment of monumental internal crisis, but it passed without incident. As it turned out, the man I had met worked for another division of the company. It was obvious that he was in the same situation as I was. Later, on the rare occasions we spotted each other, we acted as complete strangers. It was naive of me to think that I was the only one trying to keep a secret. Pursuing a long-term relationship never crossed my mind. The practical barriers were simply too high. The corporate ladder is slippery enough on its own. Why complicate your ascent by throwing oil on the rungs? By 1981, the AIDS epidemic was fueling homophobia across the world, bringing with it another reason to suppress any thoughts of a homosexual relationship.

My paranoia went up in 1995 after I became chief executive. When I was traveling abroad, I was often a government guest and there were security people around. After BP acquired Amoco in 1998, my profile grew in the United States, so I also had personal security there around the clock. Security personnel would stay in rooms adjacent to mine, and the moment the door opened they would be awakened. The closet door was now nailed shut.

My fear of being discovered arose from my belief that I could not do business as an openly gay person in a country that criminalized homosexuality. This was true in places as far apart as the Middle East, Angola, and Nigeria. I viewed being in the closet as a practical business decision. From 1995 to 2005, I served as a trustee of the British Museum. The keeper of Greek and Roman antiquities unveiled a piece of silverwork depicting two male lovers. I wanted to sink into the ground. It was thought to have been made about 2,000 years ago, and was said to have been unearthed near Jerusalem. It was a truly enticing masterpiece with an extraordinary history. Yet I could not bring myself to speak in favor of the museum purchasing the object because of its homosexual imagery. I thought that praising the work would be tantamount to coming out of the closet.

In 2013, I was having lunch with the Russian ambassador to the United Kingdom in his residence. My long-standing business acquaintance, Russia's former energy minister Yuri Shafranik, was the guest of honor. The ambassador recounted in vivid detail how, in 1989, I had met Shafranik when I was leading BP's exploration and production division. "We treated you very well at the time because our intelligence showed that you were going to be the next CEO of BP," he said. "Our agents picked that up." I wondered what else was in their files.

OTHERS HAD TO TREAD CAREFULLY

For decades I believed that it would be socially unacceptable to come out. I worried that the negative stereotype of a gay person would overshadow the reality of who I am. I am sure that staying in the closet did prevent some people from forming unflattering opinions about me. However, I am no longer convinced that they matter.

By avoiding one stereotype I conformed to another: that of a gay man in the closet. I had a dominant mother and a highpowered job. I associated almost exclusively with straight people, and I worked more than I lived. Every moment of my day was scheduled, often months in advance. Observant people, and there are many at BP, would have seen me for what I was: a gay man too fearful to come out, a man who poured himself into work to escape personal frustration and loneliness. In retrospect, I know that the people who do matter to me did not care whether I was gay. But they felt for me for carrying such a heavy burden, even if they did not always know precisely what it was.

During a recent business trip to San Francisco, I spoke with Gini Savage, a long-standing friend who sensed my inner turmoil decades ago. "You were an incredibly reserved person," she remembers. "No one

"I worried that the negative stereotype of a gay person <u>would</u> <u>overshadow</u> <u>the reality of</u> who I am."

knew where they could put a foot down with you because you were very private." She and others had to tread carefully. We danced around the subject of my sexual orientation without ever confronting it. It was tiring, and not just for me.

As chief executive of BP there was so much to do. But you can only divert the tension and anxiety for so long. Toward the end of my tenure I felt those negative feelings turning back on me. Had I stayed in the closet I think I would have remained an incomplete and unfulfilled person. Since coming out, my friendships, both old and new, have flourished. And so has the relationship with my partner whom I respect and admire.

Coming out does not mean your life will be peace and serenity. You will still encounter people who make you uncomfortable. You will still have to make difficult decisions. However, as I have learned since coming out, you will be better able to cope with all of them.

ARE WORKPLACES BECOMING MORE LGBT FRIENDLY?

More than 90% of Fortune 500 companies have policies that are designed to prevent discrimination, including on the grounds of sexual orientation. In spite of the progress, it is estimated that 41% of LGBT employees in the United States remain in the closet at work, as do 34% of their counterparts in the United Kingdom.

These closeted employees certainly lack role models: At the end of 2013, there was no openly gay CEO in the Fortune 500. (A notable exception came this October, when Apple CEO Tim Cook published an essay saying that he is "proud to be gay.") I do not think that is due to a dearth of talent among gay executives. Rather, the lack of representation in the upper echelons of business seems to stem from the issue of selfselection and inclusion. Anxiety still grips LGBT employees from the factory floor all the way to the chief executive's office.

The paranoia is present even among employees who work at firms known for embracing LGBT inclusion.

At one of them, every year, employees must submit a list of people who are able to assess their performance. At the same time, managers seek unsolicited comments from employees who are not named on the list, which is common practice at large banks. The results of these reviews determine how much employees are paid, whether they will be promoted, and essentially their long-term viability in the firm. "While you think there is a 99% chance coming out will be fine, the consequences of that 1% are terrifying," says George, an investment banker for the firm.

Among headhunters, there is debate about whether the situation is actually improving. Anna Mann, a headhunter of choice for board appointments to many FTSE 100 companies, says that sexual orientation is not a consideration during the selection process. "I have never come across any form of prejudice against gay people at board level," she says. However, another distinguished headhunter, who wishes to remain anonymous, sees plenty of scope for prejudice. "The point of recruiting people to boards is people want kindred



The estimated share of LGBT employees in the United States who hide their sexual identity from workplace colleagues. spirits," she says. "That may well exclude people who are not identical to people who are recruiting them."

This is not proof of discrimination; the reality is much more complex. Corporate boards are the product of established social and professional networks and are tasked with the stewardship of a company. It is therefore unsurprising that they tend to be conservative and risk averse, and that they have behaved in ways that reinforce the division between insiders and outsiders.

For example, I have seen male directors attempt to close deals or argue a point while standing at a urinal, thereby excluding female members of the board. I believe that for executives making high-level decisions, homosexuality might raise a conscious and unconscious red flag, since someone who does not fit the board's mold brings with them risk and uncertainty. This may explain why, at the end of 2013, there were no openly gay executives among FTSE 100 corporations. (Since then, one board has appointed an openly gay chief executive. Christopher Bailey took up the position at Burberry in May 2014.) If we were to assume that 5% of the population is gay, there should be five gay chief executives among FTSE 100 companies, and some 25 in the Fortune 500.

THE BUSINESS ARGUMENT FOR DIVERSITY

In 2008, the Campbell Soup Company hoped to target the LGBT population by placing an advertisement in The Advocate, the highest circulation gay magazine in the United States. First printed in December of that year, the advertisement featured a lesbian couple and their son preparing dinner with Swanson Chicken Broth, one of Campbell's products. The rightwing American Family Association, an organization that promotes fundamentalist Christian values, objected strongly. The group contacted its list of more than three million email subscribers to ask them to write to Campbell's CEO to express their outrage. "Campbell Soup Company has openly begun helping homosexual activists push their agenda," the message read.

Douglas Conant, the company's CEO at the time, sought the view of Rosalyn Taylor O'Neale, his chief diversity officer. She recalls giving him two pieces of advice. "The first," she remembers, was "'know that this too shall pass. It's a two- to four-week issue, and at the end of that they will go on to annoy someone else. Ride it out." Her second point emphasized the business case for placing the advertisement in the first place. "We advertise in *The Advocate* because we sell soup to gay people, and we want LGBT people to buy soup and crackers and all of our other products. Explain to them that we advertise in Hispanic and Latino publications, in African American publications, and in women's publications. It's about advertising in publications where our consumers are." The company stood by its action, thousands of consumers wrote in to thank them, and the protest eventually stopped.

A marketing strategy aimed at a diverse population is essential for any business: In order to grow it needs to reach as many new consumers as it can. The LGBT population, traditionally under-served by marketers, presents a meaningful and often sizeable opportunity. Discretionary spending by gay men and lesbians is growing. The overall buying power of the LGBT market in the United States is estimated to have reached roughly \$830 billion in 2013, up from \$743 billion in 2010. In the United Kingdom, it is estimated that the gay market is worth at least \$90.4 billion (£70 billion). Allan Gilmour, the former chief financial officer at Ford Motor Company, has famously described his company's marketing push to gay people in these terms: "I know a lot of lesbians and gay men buy automobiles. I just want my unfair share."

Buying a billboard and plastering it with images of apparently gay men will not make a lasting impact. The gay consumer is increasingly wary of gimmicks and instead seeks a sustained, sincere commitment to LGBT issues. That is one reason why the Human Rights Campaign launched its popular "Buying for Workplace Equality Guide" in 2006, which scores companies on, among other issues, its policies toward LGBT employees. "We get letters all the time from people letting us know how they use the Buyer's Guide to make their own purchasing decisions," says Deena Fidas, the director of the Human Rights Campaign's Workplace Equality Program.

However, positive stories and encouraging examples are not enough. All those concerned with change must emphasize the *business* case for diversity. Relating LGBT diversity and inclusion to economic gain is ultimately the biggest driver of change. \blacktriangle

Excerpted from The Glass Closet by John Browne, published by HarperBusiness, an imprint of HarperCollins Publishers.

= NATIVE LIFE

ATCHANCEROWORG

GRUELING Sami Inkinen and Meredith Loring, as the sun rises over the Hawaiian island of Oahu, on their 45th and final day rowing across the Pacific.

LIVES

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ADVENTURE

Pushing the Limits

An entrepreneur explains how a seemingly hazardous journey was good for mind, body, and business. BY LOREN MOONEY



Last summer, Sami Inkinen, cofounder of the Trulia real estate website, and his wife, Meredith Loring, set out to row an ocean boat from Monterey, California, to Honolulu. They were to cover the distance, a straight-shot 2,400 miles, with only physical effort, sometimes rowing together and otherwise taking turns for round-the-clock propulsion.

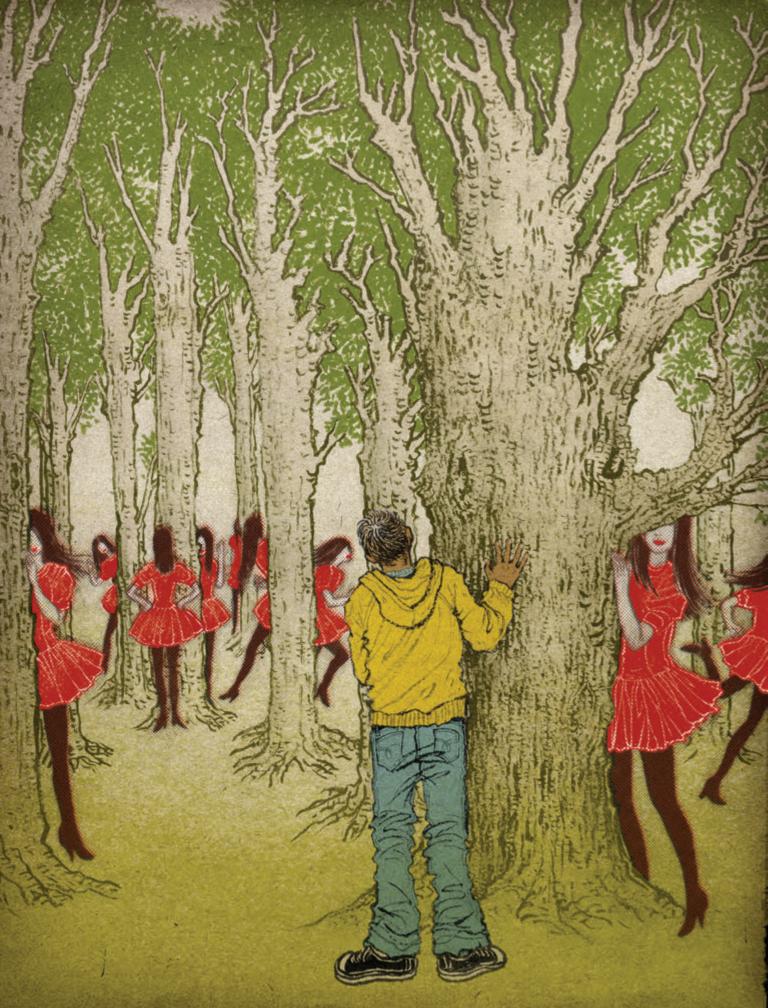
Why? "I was inspired by Laura Hillenbrand's *Unbroken*, and the descriptions of the vast, wild ocean," says Inkinen. Also, he says, the trip was an effort to raise awareness about the harmful effects of sugar in our diets. Some might call the quest crazy, but Inkinen points out that with rigorous training and careful analysis, the trip wasn't really risky from a life-and-death perspective. It was grueling (Inkinen lost 26 pounds), but he says the raw natural experience and exploring of personal limits was actually restorative.

"Typically we use our bodies to carry our brains from meeting to meeting," he says. "So to suffer physically in a way is good for you." Mentally, Inkinen says, he honed skills exceedingly valuable in everyday life: how to overcome setbacks; staying focused on the moment; how to plan for and manage factors you can control; and training your brain not to cling to external factors you can't control. "This lesson was particularly important for me when changing winds and currents slowed our progress from 60 nautical miles per day to 45," he says.

Coincidentally, as the couple rowed, Trulia was being sold to Zillow for \$3.5 billion in stock at the time of the announcement; Inkinen says this wasn't a distraction.

After 45 days and 2,765 miles of rowing, the couple reached Honolulu, beating their goal of 60 days and setting a pairs world record for rowing across the Pacific. \blacktriangle

Sami Inkinen earned his MBA from Stanford GSB in 2005, the same year he cofounded Trulia. He is currently living in the present.



Does Playing Hard to Get Work?

A Hong Kong speed-dating experiment suggests the strategy may pay off in some ways — but there's a cost. BY MARINA KRAKOVSKY The best-selling dating advice book *The Rules* counsels single women that to capture Mr. Right, they should appear busy, rarely return phone calls, and generally keep a man playing cat and mouse. Versions of the hard to get strategy have been recommended around the world since at least the days of Socrates, but how well does the ploy actually work?

That's the question a trio of researchers, including recent Stanford GSB PhD graduate Jayson Jia, set out to answer the scientific way, through a series of experiments. Their main finding: When the strategy works at all, it leads to seemingly paradoxical results, increasing *wanting* even as it decreases *liking*.

In one experiment, the researchers, who included Xianchi Dai of the Chinese University of Hong Kong and Ping Dong of the University of Toronto, signed up unsuspecting male undergraduates at a Hong Kong university for what the students thought would be a speed-dating event. The scientists then had a confederate, an attractive female undergraduate, play either easy or hard to get with these participants.

Jayson Jia received his PhD from Stanford GSB in 2013. His advisor was Baba Shiv, the Sanwa Bank, Limited, Professor of Marketing and director of the Strategic Marketing Management Executive Program. Jia is currently an assistant professor of marketing at the University of Hong Kong.

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"Even though the men liked the person less if she was playing hard to get, <u>they were</u> <u>more motivated to</u> <u>pursue her</u>."

The easy to get approach was straightforward: With men in that group, the young woman showed warmth and interest in her date by smiling and actively engaging the young man in conversation. But the hard to get approach couldn't simply be the polar opposite of that because, as Jia explains, "If someone is too rude to you, you won't bother talking to her anymore." Instead, he says, playing hard to get involves a mix of "uncertainty and a mild negative signal" — the kind of uncertainty that past research had shown to increase interest. (For example, in another recent paper, Jia and his colleagues had demonstrated that people express a preference for potential over known achievement.) So instead of showing hostility, the actress playing coy merely responded to the men's questions and wore a poker face.

In Hong Kong, where the research was conducted, people's general attitudes toward playing hard to get are similar to those in the United States, Jia believes. Chinese culture tends to be "quite strategic socially," he says, so people don't automatically frown on game-playing in dating, and Hong Kong is more westernized than, say, mainland China. The results of these experiments, therefore, would probably hold true in the U.S. and Europe.

To see the effect of their female ally's behavior, the researchers surveyed the men after their dates about how much they liked the woman, how much they enjoyed the experience, and, if they wanted to talk with the woman again, how motivated they felt to do that. In other words, the scientists were trying to get at two separate issues: liking versus wanting.

Liking and wanting may seem to go hand in hand: It stands to reason that if you like something, you want it, and if you want it, that must be because you like it. But in recent years, psychologists and neuroscientists have discovered otherwise. Animal research, for example, shows that lab rats can be made to crave sugar without deriving pleasure from it, and nicotine addicts want to take a drag even if they don't actually enjoy cigarettes any more than non-addicts do. This disjunction between liking and wanting isn't merely an addict's anomaly. In research conducted at Stanford GSB, Baba Shiv, Uzma Khan, and the late Ab Litt found that being thwarted in pursuit of a prize makes students less fond of the prize even as the frustration increases the price they're willing to pay to win it. All this odd behavior occurs because the brain, as University of Michigan neuroscientist Kent Berridge has found, uses separate reward pathways for pleasure (or liking) and for desire (or wanting). As a result, it's perfectly possible to want an experience you don't particularly like.

That's pretty much what happened in the dating study. "Even though the men liked the person less if she was playing hard to get, they were more motivated to pursue her, like getting her phone number or getting a second date," Jia explains. But he adds a big caveat: This occurred only if the man had expressed interest in the woman to begin with. In a clever twist, the researchers had duped some of the participants into thinking they were choosing the woman they'd go out with on their date from a set of photographs. (The choice was illusory because the researchers had rigged the options by including three less attractive photos that they knew the men wouldn't pick; that way, everybody would be interacting with the same woman.) As the researchers had suspected, the hard to get strategy worked only on men who had first "chosen" the woman. Otherwise, the hard to get strategy backfired, with less liking and wanting than in the easy to get condition. And that makes intuitive sense, Jia says. If you're interested in someone and she jilts you, you'd expect to like her less and want her more. "But if, for example, you're in a bar and someone plays hard to get and you're not interested, you wouldn't expect any effect."

Pulling off the hard to get strategy, in short, is tricky. For one thing, you must be careful with your sequencing: Whether in dating or hiring or in making any kind of sale, Jia says, "uncertainty can increase motivation, but there needs to be interest to start off with." What's more, even when playing hard to get works to heighten interest, there's a cost to pay in decreased liking. As Jia puts it, "You risk winning the battle and losing the war." ▲

INNOVATION

Three **Entrepreneurs Discuss Professional** and Personal Risks

BY ERIKA BROWN EKIEL

"Focus on Value, Not Price"

In 1968, Kenneth "Hap" Klopp acquired The North Face - then two small stores, one in San Francisco and one in the Old Barn one in San Francisco and one in the Old Bar at Stanford — and turned it into a global apparel business that he ran for 20 years. He also became the executive chairman of Cocona, a nanoparticle company that makes fibers, fabrics, and laminates for active apparel companies, and Obscura Digital, a digital communications business Today, the 1966 MBA graduate of Stanford GSB continues his board roles while also mentoring aspiring entrepreneurs. He talks with us about the importance of infusing your values into your brand, the virtues of Digital, a digital communications business. mentoring aspiring entrepreneurs. He talks

influencer marketing, and the benefits of interdisciplinary design teams.

In 10 words or fewer, what is the big idea behind your business? To apply

technology to a commoditized business and create a new industry. For example: At The North Face, we took materials that the U.S. military used in the Vietnam War and applied them to camping. We lightened the load and created a new backpacking industry.

What is the best advice you've ever

received? Dick Salomon, the first chairman at The North Face, told me, "Products have an ever-shortening life cycle but brands last. They carry an enduring message and belief." Your brand is about you, your culture, and

what you stand for. You need to put all of that forward so people can see and feel it. Most companies have goals that are quantitative, but brand is qualitative. It is about how you carry out your business and what you stand for. It is what makes you stand apart in a crowd. A great brand is cohesive. It doesn't waste time. When you are consistent with your philosophies, it becomes easier to articulate in the marketplace. An established brand gives you a stronger multiple. Brand durability is an annuity.

What was the most difficult lesson you have learned on the job? The 90/10 rule. I assumed in business that things would be 50/50: I do mine and you do yours. What I learned is that 90% of the responsibility is mine and 10% is theirs. If you think it's 50/50, you will be let down more often than not. Another is that people don't come to work for you or anyone else. They work for themselves. I was naive. I thought people worked for me because I was the boss. I learned they only work for you if you have earned their respect or you have given them a meaningful incentive — not because you gave them instructions.

What advice would you give other entrepreneurs on how to build a great

business? One: Focus on value, not price. At The North Face we wanted to make the best and we assumed there was a market for it. If you've ever spent the night in a sleeping bag at 20 below zero and you couldn't sleep because it was too cold, you would pay \$200 more for one that works. We knew that the people who really needed a sleeping bag to work at 20 below would buy ours, and they would influence other people. Markets are wide at the bottom and narrow at the top. You need to know who the influencers are in your business. In outdoor gear, it was the mountaineers. Two: Focus on consumer needs. People buy what they need, not what you sell.



Kenneth "Hap" Klopp

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Three: You should have a higher calling, a triple bottom line. Build your team around things that transcend making money.

What inspires you? How do you come up with your best ideas? The people around me provide new ideas and challenges. You reach a higher point when you work together. The best ideas come about because of friction and interaction between people. If you put engineers together with salespeople, they come up with great solutions. Do you want to sell what you make, or make what you sell? You can't do one without the other!

I worked with Buckminster Fuller to make tents. He was amazing. He applied a new math to structures, and we made a geodesic tent. Stress is equally distributed, and as it gets larger it gets stronger. As Bucky pointed out to me, most things — physical, political, economic — get weaker as they get bigger. But they don't need to.

"Do Something Every Day That Scares You"

Gina Bianchini is the founder and CEO of Mightybell, where you can create your own social network with your purpose, your people, and your content. Before Mightybell, Bianchini and Marc Andreessen cofounded Ning, the largest social platform for communities of interests online. Bianchini received her MBA from Stanford GSB in 2000. She talks to us about fear, intuition, and *War and Peace*.

What is the best advice you've ever received? Do something every day that scares you. I think I saw it on a Lululemon



bag. I love that idea. Entrepreneurship is the opposite of conformity. You create your own structure every single day. You have to do things that scare you and push you, and you have to do them proactively because it is the only way to push your business forward. If I'm not ruthlessly prioritizing things that are harder and scarier than what I'm comfortable with, I'm probably not working on the right things.

What was the most difficult lesson you have learned on the job? The importance of trusting my gut about people I want to work with. In every recruiting interview I have ever done, I've known within the first few minutes what their strengths and issues are going to be. When I am excited about someone and feel we have a good chemistry and a shared way of looking at the world, those end up being the best hires.

What advice would you give other entrepreneurs on how to build a

business? Entrepreneurship and success in general can't be summarized in sound bites. You need a certain level of fearlessness and you need to recover quickly from failure. Success lies in how many experiments you can run. You need to learn faster than your competition — and ship product!

Why are you an entrepreneur?

Right now I don't see anyone else working on this problem in the right way. If I did, I would not be an entrepreneur. I am not an entrepreneur for entrepreneur's sake. I have some natural comfort with chaos and uncertainty. And I have worked very hard to have a disciplined relationship to failure.

What is the best business book you

have read? The most profound business education moment I had was as a senior at Stanford in *Organizational Leadership*. We read *Don Quixote* and *War and Peace*. I was so grateful for that class. The professor tied business and leadership to life. What I remember about *War and Peace* 20 years later is that characters who seem important can disappear at a drop of a hat. Likewise, someone who seems unimportant sticks around for 700 pages. Life is that way.

What businessperson do you most

admire? I have been fortunate to have up-close and personal relationships with some larger-than-life figures. Nobody is perfect. Everyone has superpowers. We are all wonderful and flawed at the same time. Deification is not very constructive.

"Listen — to Your Customers, Your Team, and Your Employees"

Christine Su is cofounder and CEO of Summer Technologies, a startup that aims to help ranchers adopt and maintain more sustainable practices. Summer's upcoming PastureMap mobile app will provide information to ranchers such as how much grass they should be able to grow based on current conditions, how to manage rotational grazing, and how much livestock they can raise without overgrazing the land. Originally from California, she has lived and worked in Hong Kong, Shanghai, Singapore, and Malaysia. She is expecting to receive in 2015 her MBA from Stanford GSB and MS in land use and agriculture from Stanford School of Earth Sciences. She talks to us about how moving every year can be good for you, the virtue of being wrong in public, and why the Uber for cows never quite took off.

In 10 words or fewer, what is the big idea behind your business? Empowering sustainable ranchers to transform their industries through technology.

What is the best advice you've ever received? "Always be moving toward your own personal version of happiness." Before starting at Stanford GSB, I worked at KKR in Hong Kong. It was a very prestigious firm, and I had the job I thought everyone wanted. My dad came to visit me. Over a couple of scotches at a swanky whiskey bar, he asked me to draw my personal vision of happiness. My vision had to do with sunshine, green fields, feeding my family and loved ones good food, and having the flexibility to spend time with those people. He said, "Honey, that's great but I don't see you moving toward any part of that vision here." My dad inspired me to quit my job and apply to Stanford, which has enabled me to do things like run around in the fields in New Zealand with farmers talking about the future of food. I feel really grateful to my dad and lucky to have the resources to chase my vision of happiness.

What was the most difficult lesson you have learned on the job? Learning how to be wrong. I am the kind of person who likes to decide quickly and plow ahead



Christine Su

recklessly without regard to consequences. My cofounder, Jennifer Tsau, is an introvert who likes to hang back and examine things. I am often wrong with my first snap decision, and if my cofounder wasn't there to rein me in, I would fail. I'm learning to admit when I'm wrong and to do it gracefully in front of employees, mentors, and founders.

What advice would you give other entrepreneurs on how to build a

business? Listen — to your customers, your team, and your employees. They often have information that you don't. Who knew that pasture management, grass forage, and stocking were on farmers' minds? In Steve Blank's class, he suggested we talk

"As an entrepreneur, I am doing something every day that <u>I have</u> <u>never done before</u>, and I have to go figure it out." to 100 farmers before we begin. I talked to more than 200 farmers before developing PastureMap. Before doing that, I had all these dumb ideas. One idea was for something I wanted to call "Moober" — like Uber for cows. Farmers who only had a few cows to slaughter at a time could rent and share trailers with other farmers to save costs. It turns out cows get stressed in the backs of trucks with stranger cows and that affects the quality of the meat.

If there was one thing that has enabled you to be successful as an entrepreneur, what would it be? Adaptability and an affinity for learning. As an entrepreneur, I am doing something every day that I have never done before, and I have to go figure it out. I am grateful for how I was raised. My dad was an entrepreneur, and we moved every year when I was growing up. I went to 14 different schools in California, Shanghai, Hong Kong, and Taiwan. It forced me to immerse myself in new environments where I didn't know the social cues and had to adapt and learn. It set me up well for all those times as an entrepreneur when you don't know where you are or how to do what you need to do.

How do you come up with your best

ideas? I do a lot of driving to visit ranchers who are hours away from everything. I love

thinking in a car with the landscape rolling by and the radio off. It's very peaceful.

What impact would you like to have on the world? In 30 years or so I would like the agriculture industry to be much more sustainable. I want agriculture to be a prestigious, profitable career.

What is the best business book you

have read? Quiet: The Power of Introverts in a World That Can't Stop Talking. I have strong extrovert tendencies. My cofounder Jennifer is a strong introvert. The book helped me appreciate the way she needs to take time to think and turn things over in her mind. Also Buddha's Brain: The Practical Neuroscience of Happiness, Love, and Wisdom. I read it during an internship I took on a hazelnut farm in Bhutan. It explains the neuroscience of meditation, how it expands the workspace of consciousness of the mind.

What businessperson do you most

admire? Henry Kravis and George Roberts. Barbarians at the Gate is what they are remembered for, but people forget they built their firm starting in a diner and bootstrapped their first several businesses themselves — small mom-and-pop shops. They do business the old-school way, based on integrity. In company-wide meetings they talk about everything, including their executive coaches and what they are working on. They are still growing even at their level of lifetime achievement. ▲

For the full versions of these interviews and more insights from and about entrepreneurs, visit gsb.stanford.edu/insights/ entrepreneurship KATHRYN SHAW Entrepreneurship appears to be more of a craft than aptitude.

HINDINGHEEFE

The Power of Experience: A scholar shows why repeat entrepreneurs increase their odds of success.

BY ELIZABETH MACBRIDE

Are entrepreneurs born or made? New research by Stanford GSB Professor Kathryn Shaw adds to the evidence on the "made" side of the column. The research, which examined records of 2.8 million small retailers in Texas, found that entrepreneurs were more likely to succeed the more times they had run businesses in the past. Entrepreneurship appears to be more of a craft than an aptitude.

Practically speaking, an entrepreneur could also focus on the lessons and takeaways from that failed business, lowering the risk of failure in his or her new ventures. And an entrepreneur can view a business that didn't work out as a sign that he or she is not a failed entrepreneur but rather an experienced one. "If you are an entrepreneur, you want to continue to gain experience as an entrepreneur," Shaw said. "It's really a long-term commitment. Learning from that experience can shape your future."

Shaw, along with Francine Lafontaine of the University of Michigan, examined the successes and failures of retail entrepreneurs over a 22-year period, when 2.5 million retail businesses opened and 2.2 million closed. They found that, overall, the odds are overwhelmingly stacked against small retailers. The median length of time the businesses stayed open was only 24 months; the average was 40 months. "Failure is very, very common," Shaw said. "It remains common even for those businesses that are led by serial entrepreneurs."

Still, there are ways to increase a retailer's chances of success. Of the retail outlets studied, first-time business owners founded three out of every four, meaning only about a quarter of the retailers opened a second business. It was those more experienced entrepreneurs who increased their odds of success, adding

Kathryn Shaw is the Ernest C. Arbuckle Professor of Economics at Stanford GSB and the Director of the Summer Institute for General Management. She studies how firms attract and build star talent in the software industry and in a wide range of knowledge-intensive industries.

"Entrepreneurship is flourishing. Even as chain stores grow, the community is supporting momand-pop stores."

to their business longevity with each new venture. They experienced better success their second, third, or fourth time around, remaining open longer in each case. Shaw said the research's message that it is possible to learn to be an entrepreneur probably transfers to classroom experience as well as to on-the-job experience.

Previous research found that serial entrepreneurs were more likely to succeed

than first-time business owners. However, because much of the prior research has focused on tech entrepreneurs — a world in which outside capital plays a huge role in the success or failure of a business — it has been difficult to tell the extent to which the experience of serial entrepreneurship itself contributed to the success or failure of second or third companies.

This new research showed that there is learning. The researchers developed an equation that controlled for innate talent. An innately talented entrepreneur would have the same success rate in the past, present, and future. The evidence for the learning emerged when the researchers looked at all persistent entrepreneurs — and found that their success rate grew in the future.

The researchers also found that serial entrepreneurship increased the success rate across types of experience — in other words, the owner of repair shop who then opened a hair salon was more likely to succeed with that line of business even though his or her past experience was unrelated to hairstyling.

The counterintuitive result of the research was the degree to which

entrepreneurship is thriving, even in the face of chain stores and even as the odds are clearly stacked against small business owners. When they traveled to Texas, Shaw and Lafontaine found a surprisingly flourishing entrepreneurial scene in the suburbs. They saw independently owned shops and restaurants in small strip malls on their informal tour of the state. This is evident in their ongoing research: Communities that have a Walmart or a Starbucks also tend to have a greater number of mom-and-pop stores than chain stores. "We concluded that entrepreneurship is really flourishing," Shaw said. "Even as chain stores grow, the community is supporting more mom-andpop stores."

And, if the story of small retail entrepreneurs is one of a constant ebb and flow, the people who try and try again have a better chance of rising above the tide. \blacktriangle



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"People underestimate the extent that their

success is about context.

You can flourish in one context and not the other." —**Jesper Sørensen** PAGE 36 25



REPUTATION

Should You Trust Your Boss?

A scholar shares some signs that a leader has your — and the organization's — best interests at heart. BY LOREN MOONEY It can be easy to trust too quickly, especially when a leader is affable, has an impressive résumé, and tells you what you want to hear. In 30 years of surveying senior executives, social psychologist Roderick Kramer has found that 8 out of 10 report being burned at least once because they trusted too much or put their faith in the wrong person at some point in their careers.

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It's important for an organization to build trust among workers for several reasons, says Kramer. Employees who know they can trust their leaders are happy workers who believe in what they are doing. Creating this trust from within can also lead to public trust. "A lot of leaders talk about public trust, then they focus on the impression-management side of things," says Kramer, "it's much more important to establish genuine trust within your organization, which leads to trustworthy performance, which then builds over time into a public reputation of being trustworthy."

With surveys from Edelman, Harvard's Center for Public Leadership, and others reporting public trust in business and government leaders at near historic lows, Kramer says it's a good time for leaders to build a trustworthy reputation. "People are looking for leaders they can trust, and so there's a lot of capital sitting on the table for leaders who can get the equation right." So how do truly trustworthy leaders behave?

Roderick Kramer is the William R. Kimball Professor of Organizational Behavior at Stanford Graduate School of Business.



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Research shows that trustworthy leaders demonstrate that they have the skills and knowledge to steer the organization, that they don't shy from straight talk, and that they are acting in the best interests of the organization, rather than in their own best interests. "These things sound obvious, but still it's important to look for ways to communicate them," says Kramer. "Several people have written about the importance of leading by walking around — being present, accessible. Leaders like this leave a good impression as tangible, real people."

THEY SAY — AND SHOW — THAT TRUST IS AN IMPORTANT COMPANY VALUE.

In a way, good leaders are trust teachers, says Kramer. "They talk about the importance of trust, so that people know the leader values it, and that there will be consequences if that trust is violated." He notes that at Pixar, a company known for creating animated films that kids love and parents can trust, CEO Ed Catmull has instituted workshops specifically to educate colleagues about how the company views trustworthiness.

As an example of demonstrating trust in employees, Kramer cites Whole Foods CEO John Mackey and his policy whereby employees directly hire new people to work on their teams, rather than relying on a system of centralized hiring through HR. "He's pushing the decision-making process from the top down to the people who are going to have to live with the consequences of those decisions, and that doesn't happen in many organizations," says Kramer.

THEY ESTABLISH CLEAR ROLES AND SYSTEMS TO SPEED TRUST.

While one leader's behavior can set a tone of trustworthiness, the entire company needs to have rules that enable trust to permeate a group's culture, Kramer has found in his research. "When people know what they're supposed to do, and they know what other people are supposed to do, then they trust that system of roles to work."

He points to Pixar's "Braintrust," which Catmull describes in his book, *Creativity, Inc.*, the process by which the company's top minds relentlessly vet creative ideas and identify a project's problems. Because the system is so rigorous and well defined, it engenders trust in the ideas that are deemed good enough to move forward. "And once you've had a history of success with that culture of rules, it becomes a background expectation," says Kramer, a state he calls presumptive trust, which in turn leads to trustworthy performance.

THEY SHARE THE CREDIT, AND THEY TAKE THE BLAME.

Because leaders are highly visible, people both within an organization and outside the organization tend to overweight their responsibility for successes and failures, a phenomenon the late Harvard scholar Richard Hackman called the "leader attribution error." For example, look at the success of the late Steve Jobs, says Kramer. "Many creative minds at Apple contributed to the development of the iPhone, but in the mainstream Jobs got the credit."

Leaders can beneficially exploit this phenomenon to build trust by being out in front of the organization's decisions, says Kramer, so that when good things happen, people recognize that the leader was in charge of the process, even though he or she might share the credit. "And there's a little bit of evidence that suggests that when leaders are generous at sharing credit, they actually are more trusted," he says. "It shows that they are fully confident." Likewise, demonstrating confidence by admitting full responsibility when something goes wrong - even if the leader wasn't fully responsible — can in some cases enhance a leader's reputation.

While one leader's behavior can set the tone, the entire company needs to have rules that <u>enable</u> <u>trust to permeate</u> <u>the group culture</u>.

THEY DON'T MASK A CRISIS.

"One of the fatal mistakes many organizational leaders make is not the initial misstep that causes the crisis; it's the cover-up — the attempt to spin it or mask the problem," he says. People quickly lose confidence in leaders who do this, says Kramer, pointing to bankers during and following the 2008 financial crisis. "I think some of the disenchantment with Wall Street was that leaders didn't really take responsibility for their errors," he says. "They blamed the system or imprecise regulation — and people don't like that because it's a dodge."

Instead, Kramer suggests, acknowledge the problem quickly, take swift and decisive action to address it, and put in place measures to prevent its reoccurrence. If the problem involves a defective product, recall it "and make a very public display of the new safeguards or policies that will prevent it from happening again." In a recent book with Todd Pittinsky, *Restoring Trust in Organizations and Leaders*, Kramer suggests it is possible for leaders and organizations to regain the public's trust, but it isn't easy. ▲



POWER Lunchtime at the Four Seasons restaurant in Midtown Manhattan

FOOD

Does Breaking Bread Help Make a Negotiation a Success?

Dealmaking can be perilous. Here's where a nice meal can help — or hinder.

BY ELIZABETH MACBRIDE

People negotiating a deal commonly have a meal or two together. After all, who's going to fight in one sentence and then say, pass the sushi in the next? You might suppose, then, that negotiating while eating can only help bring good deals to fruition. Yet while such thinking propels the lunchtime scenes everywhere from the Four Seasons in New York City to Chateau Marmont in Los Angeles, new research calls it into question. Stanford GSB Professor Margaret Neale and doctoral student Peter Belmi find that sharing food does help create more valuable deals in competitive negotiations. But in situations that are cooperative, such as when the two parties are friends, meal sharing reduces the overall value of the deal. Here's what they said about their findings:



What are the lessons a negotiator could draw from this research?

Neale: Food sharing would be one of my tools in my tool kit. Having a meal where you share food would be a good strategy in a competitive situation where there is an adversarial relationship. If you're going to a lawyer's office, and it's you negotiating with your soon-to-be ex-spouse, you might want to suggest a plate of cookies on the table. If you are negotiating to end a dispute with another company, plan a meal at a restaurant.

Belmi: On the other hand, if you have a cooperative negotiation, food sharing may facilitate a quick resolution but not necessarily a good resolution. So it might not be a good idea in a cooperative negotiation.

How do you tell the difference?

Belmi: In more competitive negotiations, people want to have the best possible deal for themselves, and typically, they see their counterpart as having adversarial or opposing motives. In cooperative negotiations, typically people are more concerned about reaching an agreement for all parties involved.

Neale: In a competitive situation, you have that assessment that this is going to be really tough. We are really at odds. In the laboratory we can tell folks: This is a very contentious negotiation.

How did you do the research?

Belmi: We told participants they were negotiating in either a competitive or a cooperative situation, and then we asked them to negotiate while they ate food that was either shared or individually served during the interaction. At the end of the exercise, we measured their perception of the interaction and assessed value creation by examining the joint gain created by the two parties. We used apples and caramel sauce in one study, and then we used chips and salsa in another study. What we found is that when people were negotiating in a competitive situation, sharing the food — and by that we mean sharing, not just eating — they created significantly more value. On the other hand, people negotiating in a cooperative situation created less value.

What's your explanation for this?

Neale: When you have a competitive negotiation, the added presence of food makes folks uncertain about how to behave. It's that juxtaposition of that social ritual, which is cooperative, and the negotiation, which is competitive. That disconnect gets people to pay more attention to each other. They realize opportunities to create value that they wouldn't otherwise.

What happens in the cooperative negotiation? Is everyone just more relaxed?

Belmi: In a cooperative negotiation, sharing food creates a comfortable and familiar environment, and people can become more concerned about maintaining that atmosphere rather than finding the best deal. So, food sharing in that situation could restrict important information exchange and distract negotiators from finding the best outcomes. You're also probably concerned about maintaining the relationship. The deal may be less important.

Does it matter what people eat?

Neale: It is the shared-ness of the food that's important. In one of the studies, some participants were given their own plates of chips and salsa, and some were given a communal bowl. Those who ate from a communal bowl and were in a competitive negotiation created more value, and those who were in a cooperative situation created less value. It was the communal bowl that made the difference, not eating. The suggestion might be: If you're in a competitive negotiation, take someone to an Ethiopian restaurant.

Did this research address the effect of sharing food in places outside California?

Neale: We did not look at different cultures specifically; however, the ritual of sharing food among humans is typically a cooperative one — and not just in California or the United States. So, the specific answer to your question is no; however, we would not be surprised if sharing food has a similar effect on negotiators from other countries and other cultures.

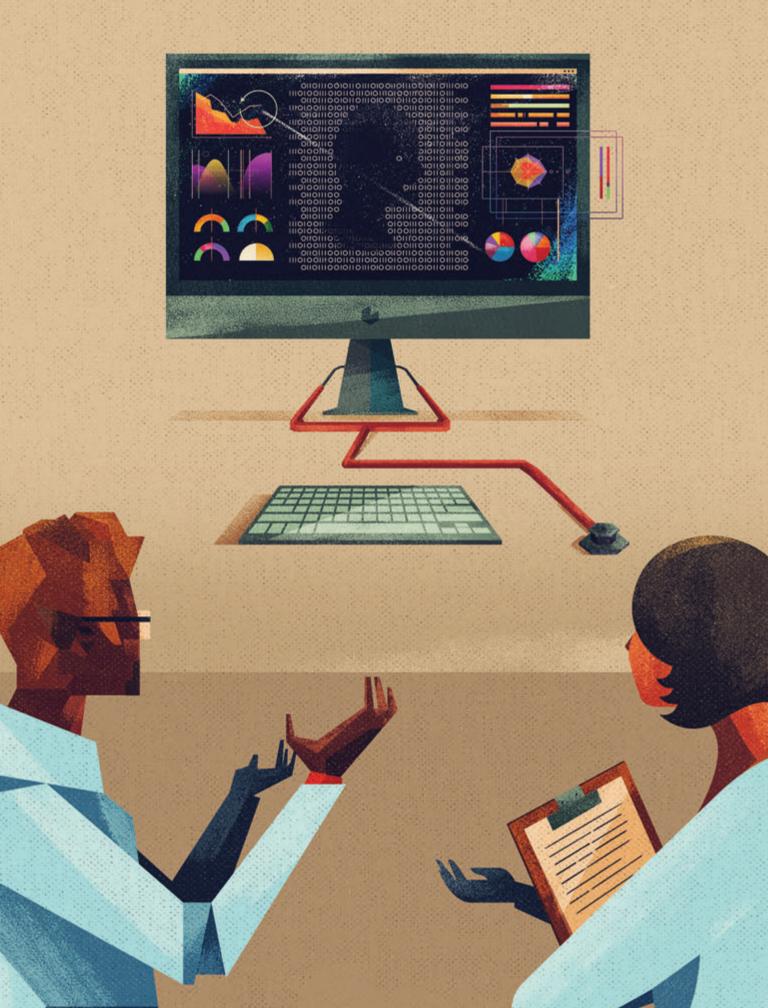
Isn't it possible that sharing anything not just food — would create the same effect?

Belmi: It's not the effect of sharing in general. We had study participants share a calculator and didn't see a similar difference in how our participants approached the negotiation.

What's different about food, then?

Neale: Food sharing is cooperative and communal in a way that sharing a calculator is not. Sharing a calculator is slightly cooperative, but it doesn't have the same kind of social overlay. With whom do we share food? Our families, people in our social circle. It's the inconsistency between the competitive negotiation and the cooperative nature of sharing food that makes the difference. The lesson here is that you're really trying to generate a sense of uncertainty. That helps you pay closer attention to your counterpart, and that, in turn, allows you to find ways to create more value. ▲

Margaret Neale is the Adams Distinguished Professor of Management at Stanford GSB, where Peter Belmi is a doctoral student.



MEDICINE

How Data-Aided Decision Software Can Improve Health Care

A scholar shows how data analysis can help lower patients' risk of hospital readmission.

BY KATHLEEN O'TOOLE

When your doctor sends you to the lab for tests, the two of you hope to get back clues to your most important health issues. In the near future, there may be computers analyzing those test results in a new way - along with prescriptions, doctors' visit notes, and other electronic medical records — to better predict your health risks and customize your treatment. Working to develop accurate methods for this kind of big-data science is Mohsen Bayati of Stanford GSB. A mathematician and engineer by training, he works with those trained in medicine to design and test algorithms for analyzing digitized medical data.

With enough records and carefully constructed algorithms, Bayati and others believe that we can have better health for the money spent on health care. That's because computers can harvest more knowledge about risk from electronic health records than humans alone can, and they can discover correlations more quickly than can be done now through controlled clinical studies. As aids to doctors and other medical professionals, these data analysis systems are expected to lead to more efficient, yet more customized, health care.

Mohsen Bayati is an assistant professor of operations, information and technology at Stanford GSB and assistant professor of electrical engineering by courtesy at Stanford School of Engineering.

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AUTUMN 2014 STANFORD BUSINESS

Using complex mathematical models, so far Bayati has learned that it is possible to improve the treatment of senior citizens hospitalized with congestive heart failure by better predicting who is likely to be rehospitalized within a month of discharge. In a study partially funded by Microsoft Research and the National Science Foundation, he was part of a team that looked for cost-effective ways to reduce the 30-day hospital readmission rate, which has been about 20% for this group of patients and costs about \$14,000 for each readmission.

"We found that we can rank patients according to risk much more accurately than before by applying machine learning on digital data," he says of the 2009-11 study at a large urban hospital in the U.S. "That means we can get quality improvements at less cost."

The idea, he says, is to move from "fee-for-service medicine to pay for performance. If you want to make pay for performance possible, the concept of assessing and adjusting risk becomes important, meaning the hospital needs to tell accurately which patient has a higher risk than other patients." Indeed, if only 20% of congestive heart failure patients need to be readmitted in a month, then providing such extra services to 100% of people with the condition is not cost-effective quality improvement and contributes to high medical bills for all. Programs for reducing readmissions are not new, but they are more likely to be emphasized now that the Affordable Care Act promises hospitals financial incentives for reducing their readmission rates. Some hospitals have been able to reduce readmissions by having nurse teams provide more counseling at the time of discharge or by hiring medical professionals to visit discharged patients in their homes or phone them for follow-ups.

Other hospitals have learned to be more effective by developing a risk score from a small number of variables about the health status of patients. Patients with the highest risk scores then get added services to bring down their risk.

With machine analysis of patient records, thousands of variables can be used to calculate a patient's relative risk of being readmitted. Furthermore, the risk can be updated automatically every few minutes, based on any new test results or observations entered into the patient's record by a health care professional.

In a summary of their congestive heart failure research, Bayati and colleagues said: "Improvements in the accuracy of classifiers lead to greater selectivity in the application of programs and greater overall benefits to hospitals and patients." For example, by using the patient-specific decision analysis, in one case involving a treatment that cost about \$1,300 but was effective only in about a third of patients, they were able to show potential to both reduce hospitalizations and save overall costs.

This particular research has been used by Caradigm, a joint venture by Microsoft and General Electric, in risk assessment software for hospitals. Other technology companies are also beginning to offer medical risk assessment software or services, but their methodologies differ and generally are not public, Bayati says. "I am continuing to research how we can do better."

Generating accurate risk assessments involves such complexities as accurately knowing the time lag between, say, a diagnosis of diabetes and starting drug A or the patient complaining to a doctor of a cardiovascular problem. Such sequential analysis of health-related events adds layers of complexity.



The cost for a hospital readmission within a 30-day period for every senior citizen with congestive heart failure.

But even after coming up with a risk assessment based on these medical events, the job is not over. "If you tell me the risk, then I want to know what I should do to lower it," Bayati says. That means a second research step with a new group of patients to make sure the recommendations suggested actually work to reduce various types of readmission. Another example is using electronic records to predict who is most at risk of acquiring an infection while hospitalized.

It's important to recognize that realtime decision analysis systems for guiding doctors would not yield net savings, he says, for interventions that are inexpensive and effective for large proportions of patients. In that case, the greatest efficacy and quality is achieved by giving the treatment to everyone identified with the diagnosis. Nor would it be effective for very expensive treatments that help only a few people who cannot be identified in advance of the treatment. In the heart failure population studied, however, the researchers found that for treatments with intermediate to higher costs and efficacies, a relative savings of nearly 10% could be achieved.

There are potential pitfalls, however, with correlations. Algorithms looking for relationships in data can be expected to find some relationships that aren't likely to be what they seem, Bayati says, and if not used judiciously, the results could lead to arbitrary discrimination against some patients, treatments, or health care organizations. "For example, in one of our studies on predicting general readmissions to the hospital, we discovered that 'cocaine test: negative' raises the likelihood that a patient will be readmitted. A subsequent inquiry revealed that clinicians usually only administer a cocaine screening if they had suspicions that a patient may be a drug abuser." Obviously then, avoiding cocaine should not be assumed to worsen your health.

Such examples help explain why human decisions will remain a critical component of health care for the foreseeable future, Bayati says, but they also point to the promise of teasing apart complexities that the best doctors and expensive clinical trials have not been able to find due to the smaller sample sizes of their experience. If not used judiciously, the results could lead to <u>arbitrary</u> <u>discrimination</u> <u>against</u> <u>some patients</u>, treatments, or health care organizations.

Take, for example, antiplatelet therapy, which has proved to be very effective at reducing the risks of blood clots among patients who have had heart attacks. Yet, in a subgroup of diabetic patients, Bavati points out, the therapy actually increases the risk. Clinical trials are not large enough to find such effects but they can be found in large data sets. That is why the U.S. Food and Drug Administration hopes to use electronic medical records to find interactions between various diseases with drugs and various drugs with each other that were not possible to find in the trials conducted before a new drug is on the market.

This is an exciting time, Bayati says, to apply his background in building complex mathematical models to medicine. "We do think we can improve quality and also lower cost." A



PURSUITS

Why Do People Become Entrepreneurs? Sometimes it's like they have no choice.

BY BILL SNYDER

Despite the romanticized image of billiondollar paydays for founders of tech firms, taking the leap into entrepreneurship is fraught with risk. So then why do so many workers give up the security of a steady paycheck and strike out on their own?

Researchers have pondered that question for some time, and many have theorized that a desire to be one's own boss is the driving factor. But research by Stanford GSB professor Jesper Sørensen takes a fresh look at the question and comes up with a very different explanation: People become frustrated when they are blocked from advancing in their careers. "But it's not just blocked mobility in the sense that I can't get ahead in the firm that I'm at. It's blocked mobility in the sense that I can't get a job with another employer that I feel is better than my current one," says Sørensen, who coauthored the study with Amanda Sharkey from the University of Chicago. "And because I feel stuck, I'm more likely to be tempted by an opportunity to start my own firm."

In many cases this applies to high performers as much as anyone else. Paradoxically, many people do well precisely because they are well-matched to the unique demands of their current job — so much so that their value is simply not as high to an outside firm. In fact, labor economists have long argued that well-matched employees tend to stay at companies longer than their poorly matched colleagues. As a result, they don't receive many job offers from other companies, while colleagues who are less well-matched move on to better, higherpaying jobs.

Those high performers could stay put, and if they work for a company that allows them satisfying moves up the ladder, they may well stay. But self-employment starts to look attractive to those who work at a small firm with little room to advance, or to those whose career trajectory is blocked at a larger organization.

If the decision were purely financial, they might be better to stay. A 2000 study by Burton Hamilton of the Olin School of Business at Washington University showed that with the exception of the very top earners, most entrepreneurs would be better off financially if they remained in salaried employment.

Sørensen says individuals who want to innovate don't have to do it on their own. Ideas that create value often develop within firms, a process sometimes called "intrapreneurship." He adds that most of the people who become entrepreneurs don't create very innovative companies — and they don't necessarily intend to. "When they start their corner convenience store, they aren't dreaming of creating the next Walmart or 7-Eleven," says Sørensen.

Sørensen and Sharkey argue that decisions about creating things within an existing firm versus striking out on one's own are made in the context of the opportunities an individual encounters in his or her career many of which arise due to factors out of their control. "People underestimate the extent that their success is about context; you flourish in one context and not the other," says Sørensen. "A talented sushi chef may not reach her full potential in the labor market if there are no sushi restaurants. Similarly, someone who is well suited for work in a collaborative entrepreneurial venture may be ill served by an organizational environment dominated by large bureaucratic firms."

Looked at that way, organizational diversity (or the lack of it) may have more to do with the choice of becoming an entrepreneur than the perceived appeal of being one's own boss, says Sørensen.

For managers who want to retain their most talented employees, Sørensen says one implication is that high performers who do not generate offers from other firms are at the highest risk of leaving to launch their own venture. "The key is to recognize that this may have less to do with their desire for independence than their desire for new opportunities to get ahead. Thinking creatively about how to provide such opportunities can help you retain your best performers." **A**

Jesper Sørensen is the Robert A. and Elizabeth R. Jeffe Professor and professor of organizational behavior at Stanford GSB, the codirector of the Executive Leadership Development Program, the faculty director of the Stanford Institute for Innovation in Developing Economies, and a Susan Ford Dorsey Faculty Fellow for 2014-2015.

but Renfrew or her primary investor, ignoring emails and phone calls from team members. Renfrew repeatedly confronted her about her lack of responsiveness, to which she replied with excuses ranging from "I didn't get the email" to "It was just more effective to talk with you directly." Renfrew was accustomed to stubborn, divaesque personalities, having been in the retail industry for years, and she knew that this kind of behavior was often par for the course. More important, Mitchell continued to provide strong guidance on the branding front and began taking on the crucially important job of designing Beautycounter's product packaging. In the interest of progress, Renfrew established herself as a buffer between Mitchell and the rest of the team and did her best to help manage the communication flow and handle the contretemps as they arose.

Throughout early 2012, Renfrew and Mitchell continued cooperating on a variety of marketing initiatives, and she proved herself to be the supportive and insightful adviser she so valued. Many of their communications took place over text, with Mitchell sending notes such as, "This is going to work, and I will do anything you want or need to make it succeed" and "I'm here however you need me. Lean on me." In late February, Mitchell was managing her team's work on the Beautycounter blog, product packaging, and product naming efforts in preparation for a trip to Los Angeles in early March. During this time she texted Renfrew, "Communicate with me as much as you can. I'm here for you to push on and to help carry this uphill. I'm ticking off everything on our list but can do more on the biz front with you if you need or want." In response, Renfrew replied, "Thank you for all your hard work. I am really looking forward to some face time with you."

Mitchell arrived on Monday, March 5, for two days, during which time she and Renfrew reviewed Beautycounter's blog and product names and began discussing messaging for the website and sales channel. However, foremost on Renfrew's mind was Beautycounter's product

H. Irving Grousbeck is the MBA Class of 1980 Consulting Professor of Management at Stanford GSB and was a cofounder of its Center for Entrepreneurial Studies, where Sara Rosenthal is a case writer.

CASE STUDY

Overcoming the Hurdles in Start-Up Life

In the third and final installment of a series, a case explores the challenges in launching a business — and shares what some of our readers had to say about it.

EDITED BY DEBORAH PETERSEN

In this final installment of a three-part series about Beautycounter, a startup specializing in safer cosmetics, founder Gregg Renfrew tries to navigate unrest among her team and move them toward completing the crucial task of designing her brand's packaging. In the previous installment, Renfrew had to talk to a consultant about her behavior toward colleagues, and we asked readers what Renfrew should do next. Find out if the entrepreneur's solution matches any of the suggestions made by readers at the end of this article. In this edited version of the 2012 case study written by H. Irving Grousbeck and Sara Rosenthal for the Center of Entrepreneurial Studies at Stanford GSB, some names and details have been changed.

Though Gregg Renfrew was not pleased with Pamela Mitchell's behavior and the disruption it caused, she was glad Mitchell was capable of an apology. She did not want to jeopardize or slow down the team's efforts in any way during this crucial time in the company's evolution.

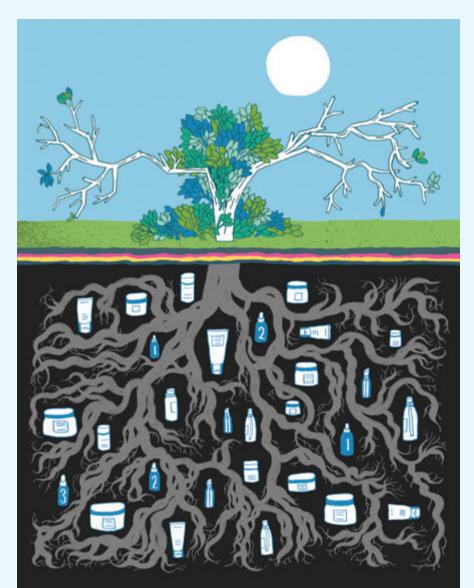
While Mitchell provided invaluable direction on Beautycounter's brand strategy, she continued to create speed bumps elsewhere in the business. She was at times reluctant to work with anyone

The delays in developing the package design were <u>threatening</u> <u>the company's</u> <u>ability</u> to make its early September launch date. packaging. Mitchell and her team were responsible for designing the tubes, boxes, compacts, and bottles that would house the company's extensive line of beauty products, but they had yet to land on a concept that resonated with Renfrew. The delays in package design were threatening the company's ability to make its early September launch date.

At one of their first meetings during the March trip, Renfrew proposed to Mitchell that she hire a packaging design consultant to come up with a new set of concepts. Though Renfrew anticipated a negative reaction, she was pleasantly surprised when Mitchell acknowledged that any further delays would jeopardize the launch date and agreed to Renfrew's proposal. When Mitchell returned to her hotel later that evening, she texted Renfrew, "I'll be an exceptional brand manager with any designer. No stress or worry. If it's time for another approach, we should do it."

Mitchell committed to fly down to Los Angeles the following week to meet with the new consultant to bring him up to speed on the current design concepts. However, the night before the meeting, Mitchell called Renfrew to let her know she was sick and would not be able to attend. After several more failed attempts to get Mitchell and the consultant together, Renfrew gave the consultant carte blanche to proceed, thinking that perhaps it was better for him to start from a clean slate.

One morning, Renfrew picked Mitchell up at her hotel on the way to Beautycounter's offices, where the consultant would present his initial packaging design concepts to Mitchell



and Renfrew later that afternoon. Given the sensitivity around the topic, Renfrew had prepped the designer, asking him to be respectful of Mitchell's contributions during his presentation. Renfrew similarly used the car ride to urge Mitchell to have an open mind when listening to the ideas, to which Mitchell amenably agreed. After both conversations, Renfrew was optimistic about the opportunity for a productive meeting.

That day, the Beautycounter team participated in a lengthy all-hands meeting. As the presentations came to a close, Renfrew stepped out of the room for a breakout meeting with another colleague at the same time the consultant arrived to set up for his presentation to Mitchell and Renfrew. Another colleague, unaware of the politics behind the situation, asked the consultant to share his concepts with the group. Unsure of how to proceed, and without Renfrew present to provide direction, the consultant complied and began walking the group through his slides. As they clicked by, Mitchell grew increasingly agitated until she finally got up and charged out of the room.

Oblivious to Mitchell's outburst, Renfrew was quickly checking messages at her desk after her breakout meeting when the new consultant approached, visibly upset. "Pamela lost it in there. There is no way I will work with her!" As the designer detailed what had happened, Renfrew felt stunned and angry. She was not sure exactly when or how things had gone awry, but it was becoming clear that Mitchell's situation could not go on. As much as it pained her, Renfrew knew she was going to have to ask her colleague and friend to end her relationship with Beautycounter, to prevent any lasting damage to the organization.

In the years since Gregg Renfrew launched Beautycounter, her startup has been growing steadily, building on its direct-selling model and online sales rather than opening brick-and-mortar stores. Here is an update from the CEO and founder:

Through August 2014, Beautycounter has placed 350,000-plus safe products into the hands of consumers. It currently has 4,000 consultants more than 150% growth since January 2014. Its revenues continue to grow year over year. ▲ Continued

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In the previous installment, company founder Gregg Renfrew had to determine how to manage a consultant's relationship with the rest of the team. What would you have done if you were in her shoes? Here are edited excerpts of what readers had to say following Part II of the series:

Design a protocol for meetings that prevents this type of situation in the first place, and have the meeting again. - MATTHEW ROSENDIN

There is nothing else you can do other than talking and receiving ideas with a calm and open mind. - VIKRAM SINGH MEHRA

Renfrew should call all of them

back and resolve the disagreement. Members of a team must disagree in order to agree. — UGWOKEH NNAEMEKA The colleagues aren't clear on the company's brand and positioning. I would hold another meeting to allow their input on this matter to be voiced. - SEBASTIAN HURLSTONE

My suggestion to Gregg Renfrew would be to first meet with them individually and listen to their individual views. Then, all three of them can sit and listen to each other so that Renfrew can resolve the conflict. - SHABA SHAMS I saw nothing personal in the criticism of Mitchell, and I think her emotional response is out of line and cannot be tolerated, especially in a startup. It seems to put extra burden on anyone voicing criticism, who now needs to think twice or thrice how exactly to put it so as not to upset Mitchell. This suppresses critical thinking.

To mitigate and defuse the situation, I would have Mitchell spend much more physical time rubbing shoulders with the rest of the team so she doesn't take everything so personally and so that she builds relationships with the others. This takes the edge off since you tend to know where they are coming from. The future criticism would rub off into the brand development process and shape it through interaction rather than in formal management meetings. - GABRIEL LOW

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"Investing more in innovation

isn't necessarily the right strategy for everyone." — Christopher Tonetti PAGE 42

CHRISTOPHER TONETTI Some nations are so far behind they can't even be good imitators. They just fall further and further behind.

INVESTING

When Imitation Beats Innovation

An economist shows how being first to market may not be the best approach for some countries and companies.

BY EDMUND L. ANDREWS

In economic debates, it is about as close to a mantra as you can get: Innovation is good, and faster innovation is even better. You can never have too much of it.

The World Bank, in a recent report, bemoaned what it called Europe's "innovation deficit" and questioned whether Europe had "fundamental flaws in its economic environment" that were making it a permanent laggard behind the United States.

But there may be another side to the story. Investing in imitation can have big payoffs for economic growth, and sometimes even bigger payoffs than investing in innovation.

A new paper coauthored by Chris Tonetti, a macroeconomist at Stanford GSB, shows that some countries are being entirely rational by tilting more toward adopting technology than developing it themselves. In a separate paper, Tonetti argues that the same is true at the company level: There are only a few Googles or Oracles in the world, but there are thousands upon thousands of companies that can generate big aggregate gains by using the innovations from the pioneers.

Christopher Tonetti is an assistant professor of economics at Stanford GSB.

The further the country lags behind the "innovation frontier," <u>the bigger the</u> <u>returns from</u> <u>imitation over</u> innovation.

"If America is willing to invest all this energy and expense into innovation, and European countries can get the benefits a bit later, that might be the optimal strategy for them," says Tonetti. "Investing more in innovation isn't necessarily the right strategy for everyone." Contrary to conventional wisdom, Tonetti and his coauthors say, a country's prosperity doesn't have to fall further behind just because it isn't at the frontier of innovation. European incomes may be lower than incomes in the United States, but Europe's prosperity can be stable. The gap between European incomes and the United States doesn't have to widen, they say.

Working with Jess Benhabib of New York University and Jesse Perla at the University of British Columbia, Tonetti has developed a model for how countries can think through the right balance between imitation and innovation. They call it the "productivity equilibrium," and say it can vary widely between nations. "It's not onesize-fits-all," Tonetti says.

The researchers are not saying that more innovation is bad for society as a whole. For the public, innovation is almost always a win. But "private benefits" — such as the profits that accrue to an innovator — are usually smaller because innovation leaks out to the public in all sorts of ways. For a company, or even a government, those private returns from investment in innovation can be smaller than the returns from an investment in imitation.

ECONOMIC GROWTH FROM IMITATION

One key issue is a nation's efficiency in technology diffusion — actually putting innovations to practical use. That can depend on a host of factors, from a nation's political institutions to its education levels and infrastructure. In general, the further a country lags behind the "innovation frontier," the bigger the returns from imitation over innovation.

"The returns to imitation depend on how far behind you are from the innovation frontier," Tonetti says. "If you are way behind, the returns are very high. As you get closer to the frontier, the returns shrink because eventually there's nobody left to imitate. That's when innovating becomes more attractive."

There are some exceptions to that rule, the researchers caution. Some nations are so far behind that they can't even be good imitators. For them, there is no "productivity equilibrium." They just fall further and further behind.

But many fast-growing nations have evolved from being almost pure imitators to being technology producers in their own right. Japan followed that path after World War II, as did South Korea a decade or so later. Today, China appears on a similar course.

Reducing barriers to trade can spur the spread of innovation. If a country opens itself to foreign imports, its domestic companies are likely to come under pressure from more sophisticated competitors. That's disruptive, but the competition can also push the domestic companies to upgrade technologies by imitating domestic or foreign rivals. That can ultimately make them more productive in their own right.

WHEN TO HANG BACK SLIGHTLY

"The frontier countries act as a locomotive, pulling the other countries behind them," says Tonetti. For most European nations, which are close to the frontier, the right balance may well be to hang slightly behind the innovation leader. Europe produces innovation, of course, but it doesn't invest in it with the same intensity as the United States. That may be OK, Tonetti suggests. Europeans can still reap substantial productivity growth by implementing technology that originated elsewhere.

In a separate paper, Tonetti and Perla develop a refreshingly unconventional model for how corporations can balance imitation versus innovation. Policy makers tend to focus on fostering cutting-edge companies that can grow at blinding rates and revolutionize entire industries.

But to generate more aggregate economic growth, Tonetti and Perla argue that it may be smarter to look at modest improvements in the legions of relatively inefficient old-school companies. There are only a few tech pioneers, but there are thousands of other companies that can reap significant increases in productivity at low cost by adopting technology from the pioneers. "The least productive agents in the economy can be vital in generating growth by spurring technology diffusion," the researchers write. "There are potentially enormous gains in aggregate output from marginally increasing the productivity of less productive agents."

The World Bank report on Europe's "innovation deficit" suggests that this is what many European companies have been doing for decades. "Europe's most successful companies seem to grow by doing what they are already doing — but better," the World Bank economists wrote.

It may not be a formula for the United States, but Tonetti suggests that it may well make sense for Europe. Δ

CLIMATE

What Would It Really Cost to Reduce Carbon Emissions?

Not as much as you might think, according to two scholars. BY LOREN MOONEY

Can the United States meaningfully reduce carbon dioxide emissions without crippling the economy? A new policy model suggests it's not only possible but also less costly than many think. The model, developed by Stanford GSB accounting professor Stefan Reichelstein and research associate Stephen Comello, sets a stringent limit for new natural gas power plants on CO_2 emissions — just 80kg/MWh — then gives electricity producers 10 years to develop and deploy carbon capture technology to meet the standard, with tax credit incentives for early adoption.

Basic carbon capture, in which "scrubbers" installed in a chimney selectively capture carbon dioxide

Stefan Reichelstein is the William R. Timken Professor of Accounting at Stanford GSB and the faculty research director of the Steyer-Taylor Center for Energy Policy and Finance, where Stanford GSB research associate Stephen Comello is a research fellow. The Steyer-Taylor Center is a joint initiative between Stanford Law School and Stanford GSB. The paper discussed here is forthcoming in the journal *Energy Policy*.

<u>BOREDURIN</u>

emissions, has been used in industrial applications for decades, though never on commercial-scale power plants. "The technology is expensive because it hasn't been fully developed for power plants, so there are few people who want to do it," says Comello. "Large-scale carbon capture has been caught in a cycle of high cost, low acceptance, and there has been no mechanism to help break it out of that."

In the hypothetical policy, the **Environmental Protection Agency would** issue the new 80kg/MWh CO₂ emissions standard for power plants built in 2017 or thereafter, mandating compliance by 2027. Investors in power plants would then need to decide whether to employ new carbon capture technology immediately or build according to the old standard and retrofit before the 2027 deadline. While the first plants to build to the more stringent standard initially would bear significantly higher capital and production costs, the policy model offers tax credits to offset increased costs and incentivize early adoption of carbon capture technology.

To develop their cost metric, Reichelstein and Comello used empirical engineering cost data on natural gas power plants from the U.S. Department of Energy's National Energy Technology Laboratory (NETL) and extrapolated it over the 10-year horizon.

THE COMPARISON

In 2009, the Obama administration announced a goal to reduce greenhouse gas emissions 83% by 2050, relative to 2005 levels. The scholars' Early Adoption of Carbon Capture plan would cut emissions from electricity production by 84% once old plants are retired. Here's how it stacks up against today's figures.

	Early Adoption of Carbon Capture Plan	Without Carbon Capture
Power Plant CO ₂ Emissions per Megawatt-Hour of Electricity Produced	80kg	360kg (natural gas fired) 720kg (coal fired)
Cost of Producing 1 Kilowatt-Hour of Electricity	7.8 cents	6.6 cents
Projected Cumulative CO ₂ Emissions of New Deployments, 2017–2027	16 million metric tons	70 million metric tons

Roz Engsons

"The surprises when we analyzed the data were that the tax incentives needed were not that large — substantially less than what solar and wind receive at the moment," says Reichelstein. "And the anticipated learning effects from early technology adoption would bring the cost of energy production down to something very manageable by 2027."

The tax incentives proposed are of the types used today to support the adoption of solar and wind technology: an investment tax credit to offset increased capital costs and a production tax credit refunded per kilowatt-hour generated. In the policy model, credits are substantial for the first two years, but decrease to zero over time as carbon capture technology cost declines with widespread deployment. Total incentive cost is projected to be \$6.6 billion over 10 years. (In 2013 alone, wind and solar received approximately \$5.4 billion in energyrelated tax preferences.) "The incentives are temporary to motivate power producers to get ahead of the curve," says Reichelstein. At the same time, early adoption will spur industry to master the process at a largescale commercial level, "so that in the future it is available to everybody on a cheaper basis," he says. According to their analysis, if every plant built starting in 2017 used carbon capture (rather than retrofitting), and thus technology cost fell rapidly, tax incentives could diminish to zero by 2026.

At the same time, CO_2 emissions would be reduced by 80% over today's natural gas power plants, and the cost of generating a kilowatt-hour of electricity would be 7.8 cents in 2027 (in today's dollars), just 1.2 cents more than today's average cost. "To put that into perspective, if the utility were to pass

"The surprises when we analyzed the data were that <u>the tax</u> <u>incentives</u> <u>we needed were</u> <u>not that large.</u>" the entire increase on to consumers, you could expect a 10 to 12% increase in the cost of electricity," says Comello.

Reichelstein and Comello believe that, if anything, their estimates are on the conservative side. They have looked only at the United States in an isolated scenario, not accounting for the impact that widespread adoption of carbon capture abroad could have on the price of the technology. And they haven't incorporated the potential for monetizing the captured carbon, which is presently sold for industrial uses, such as enhanced oil and gas recovery, creating an additional revenue stream.

In terms of the political will to enact such a policy, Reichelstein says that, Washington gridlock aside, business leaders are interested in early adoption of carbon reduction technology as an insurance policy. "There is a general expectation in the global business community that, sooner or later, there are going to be serious regulations on carbon emissions," he says. "So having mastered a technology like this and brought its cost down is going to put you in a much better position for the future." Δ

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HIGH DRAMA Sandra Bullock as an astronaut in the 2013 film Gravity

PROBABILITY

How to Avoid a Space Catastrophe

The likelihood of a major space junk collision is low. Space-faring nations must ensure it stays that way.

BY LAWRENCE WEIN AND ANDREW BRADLEY

In one of last year's most popular movies, *Gravity*, moviegoers worldwide experienced cinematic beauty and gut-wrenching drama while rooting for Sandra Bullock to survive a dangerous encounter with space junk.

Unfortunately, viewers may have also come away from this film with two other impressions: First, the risk of a catastrophic collision in space is high. Second, the main culprit is irresponsible behavior. (In this fictional story, Russia initiates the problem by shooting a missile at a defunct satellite.) The fact is, as people talk more of space travel, we are not doomed to pervasive space junk collisions. However, what determines the danger level is the behavior of people on the ground.



Indeed, there have been several recent collisions in space, including a 26,000-mph accident in 2009 between an American communications satellite and an inactive Russian satellite. However, complex 3-D computer simulation models, which track every object larger than a softball in low Earth orbit, have revealed that the likelihood of a satellite experiencing a catastrophic collision with orbital debris during its operational lifetime is very small during the next 200 years.

These computer models, developed at NASA and elsewhere, run for only 200 years because of their immense complexity. They $\frac{1}{2}$ predict the likelihood of collisions at less than 1 in 1,000 in the most congested region of space, which is 900- to 1,000-kilometers altitude. This risk is negligible compared to the risks of mission-impacting failure due to electromechanical problems. Those occur at a rate of 10-20%.

LIMITING SPACE JUNK -**A TIPPING POINT**

Importantly, relatively inexpensive mitigation measures are available to limit the amount of space debris that does clutter up orbit paths. Many countries adhere to an international 25-year rule for post-mission disposal, where sufficient fuel is left in the tank at the end of a mission to maneuver the satellite to an orbit from which it

will decay within 25 years. In addition, some satellites are capable of avoidance maneuvers in space in the event that a collision is imminent.

We developed a system of mathematical equations that is capable of predicting collisions for thousands of years into the future. We take an environmental

Lawrence Wein is the Jeffrey S. Skoll **Professor of Management Science** at Stanford GSB. Andrew Bradley is a postdoctoral scholar in the **Geophysics Department at Stanford** School of Earth Sciences.

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sustainability approach and measure the maximum risk over all future time of a catastrophic collision to a satellite over its operational lifetime. Our model suggests that the greatest risk occurs in about 1,500 years. As in a disease epidemic, the chain reaction eventually burns itself out for lack of targets.

We find that this risk can remain manageable — less than 1 in 1,000 — if deorbit compliance to the 25-year rule is very high. However, we appear to be near a tipping point: Our model predicts that the maximum future risk is 1 in 1,000 if compliance is 98%, but increases to 1 in 100 if compliance is only 85%.

Our computations assume no irresponsible behavior, which brings us to the second impression of moviegoers. In fact, Russia has not recently tested an anti-satellite missile, even though a legacy of the Cold War is that the majority of large objects in space are old satellite parts from the former Soviet Union and the United States. However, China's 2007 anti-satellite test created an enormous amount of debris in low Earth orbit, a piece of which destroyed a Russian nano-satellite last year. In 2008, the United States performed a similar operation, but the target was much lower and so the debris deorbited quickly.

Because the risk of a catastrophic collision increases by roughly 50% over the next 200 years, some have called for active remediation of the space environment, which means removing large inactive objects from space. Several technological approaches have been suggested for how to do this. Proposals include nets connected to 6-mile-long wire tethers to drag debris down, and balloons or robot-installed engines or lasers to alter objects' orbit. But these are early days, and no approach has been shown to be reliable and cost effective.

IMMEDIATE COMPLIANCE

In summary, current debris levels are sustainable without active debris removal only if 100% compliance with current voluntary standards is immediately "We find that this risk can remain manageable less than 1 in 1,000. However, we appear to be near a tipping point."

initiated. That is, countries must follow end-of-mission maneuvers to deorbit, expend excess fuel that can cause explosions, and not shoot objects in space.

This may seem simple, but as an example, less than 90% of upper-stage rockets have been deorbited from low Earth orbit in each major space-faring nation in the last decade. Hence, research into active debris removal is needed to address uncertainties in noncompliance and possible future space wars. Research into developing protective shields to ward off junk also is important to address subcatastrophic, more frequent collisions that routinely degrade solar panels and payloads (and that are not captured by models such as ours that ignore debris less than 10 centimeters in diameter).

Finally, it is essential to develop policies to assess noncompliance penalties and to share highest-qualityavailable orbital data among space-faring nations and corporations to anticipate avoidable collisions.

COST OF SPACE ACCESS COULD INCREASE

We are at a critical time when responsibility in space will determine the cost of access to space for generations to come. If we don't very soon initiate and maintain relatively cheap and mundane measures, we will be forced to deploy much more expensive ones and thereby increase the cost of access to space. In addition to providing a safe environment for the future Sandra Bullocks in space, we need access to space for security and to maintain the benefits of satellites that we all take for granted. **A** A scholar explores some of the world's most frightening possible scenarios and determines our best chances for surviving them.

BY SHANA LYNCH

Lawrence Wein applies complex mathematical models to disaster scenarios — calculating the odds of survival from toxic milk to pandemic flu to nuclear war. He has presented his work at the White House and helped influence U.S. policy. Here are some of the big issues he's studied over the last 10 years and what his research showed.



SMALLPOX

Smallpox, a highly contagious infectious disease, killed an estimated 500 million people in the 20th century. Its death rate hovers around 30 percent. This disease has been eradicated since the late 1970s, but some countries have worked to weaponize it.

The research: Wein created models of traced vaccination response — that is, treating only those infected and those who might have come in contact with the infected — and mass vaccination. He found that traced vaccination could lead to 100,000 to 1 million more deaths. He and his coauthor presented their findings at the White House and Centers for Disease Control and Prevention, which had previously advocated a traced response. Today the government has 300 million vaccines at the ready.



ANTHRAX

You remember the anthrax scare suspicious white powder showing up in the mail. This disease caused by bacteria is not contagious, but its fatality rate can be high: 90 to 95% without intervention. Anthrax also stays viable for decades, meaning the spores won't fade away with time and disinfectant. Several countries, including Iraq under Saddam Hussein, have weaponized it, and an aerosol release of 100 kilograms could kill up to 3 million people.

The research: Wein created a model to examine the hypothetical release of 1 kilogram of anthrax in a metropolitan area the size of New York City. His calculations showed that each day without antibiotics, this city would lose 10,000 people. And even with an efficient response, this city would lose more than 100,000 people. His research showed intervention must begin after the first case, the government must rapidly distribute antibiotics, and hospitals and health clinics must be prepared to handle a surge in capacity. But how to distribute drugs efficiently and effectively? In 2008, Wein proposed in the *New York Times* that postal workers could do so. In 2009, the government and postal unions agreed to hand-deliver antibiotics in large cities in case of an attack.



BOTULINUM TOXIN

Botulism is poisoning by the toxin secreted by the bacterium *C. botulinum*. One of the most lethal toxins known to humans — one millionth of a gram could prove fatal — botulinum toxin could potentially be slipped into milk, fruit juices, and possibly even grains.

The research: Wein analyzed the model of milk distribution (and weaknesses in the supply chain) in the United States to find that 4 grams slipped into a milk production facility could cause serious harm — even death — to 400,000 people. He also determined that industry investments costing the public about two pennies more per gallon of milk would prevent that scenario. He suggested deterrents such as locks on tanks. a 15-minute toxin test on milk before it gets released into silos, and an intensified heat pasteurization process. After 9/11, the government scaled up that pasteurization process, which may mean this toxin is less of a threat today.



PANDEMIC INFLUENZA

The flu kills about 36,000 people in the United States each year, according to the Centers for Disease Control and Prevention. A pandemic outbreak of it would dwarf all these other disaster scenarios, Wein says. With influenza, there may be no vaccine or prophylactic antivirals during the first wave of a pandemic, and there's little hospitals can do.

The research: Wein studied the routes of influenza transmission to determine the most common is aerosol. That means hand washing, a favorite prevention technique, would do little, but proper ventilation could help. His research found by far the best way to prevent transmission was face protection, particularly N95 respirators. These masks filter at least 95% of airborne particles and are commonly worn, for example, by construction workers. Surgical masks are also effective, though slightly less so.



NUCLEAR ATTACK

Should a terrorist succeed in setting off a nuclear weapon, how should people react? What's the best course of action to hope for survival?

The research: Wein modeled the impact of a 10-kiloton nuclear device, slightly smaller than the bomb that the United States unleashed on Hiroshima, Japan, in 1945, that hypothetically explodes in Washington, D.C., on a weekday morning. Immediately, about 80,000 people would die. If the city attempted to evacuate, he found, about 180,000 people would be killed overall. If instead people took shelter for 12 to 24 hours, about 120,000 people would die in total. He recommended the government update its recommendation from selective evacuation to sheltering, which it did.

Illustration by Josh McKible



VOLATILITY

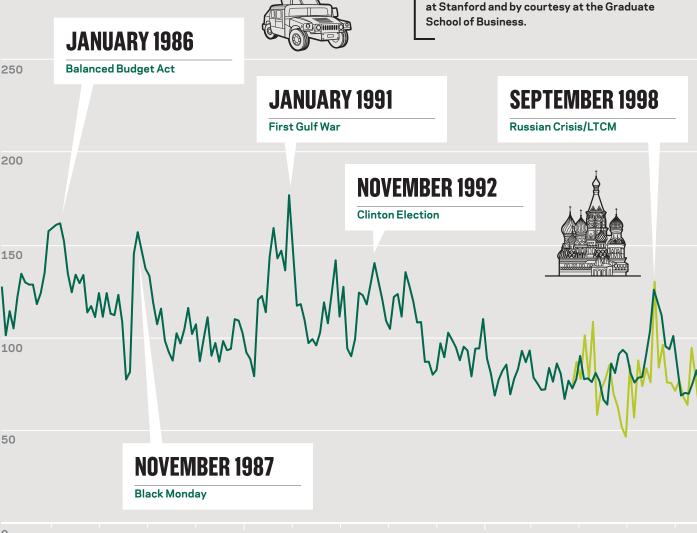
What Causes Uncertainty?

An economist suggests government growth, increased political polarization, and recession. BY SHANA LYNCH

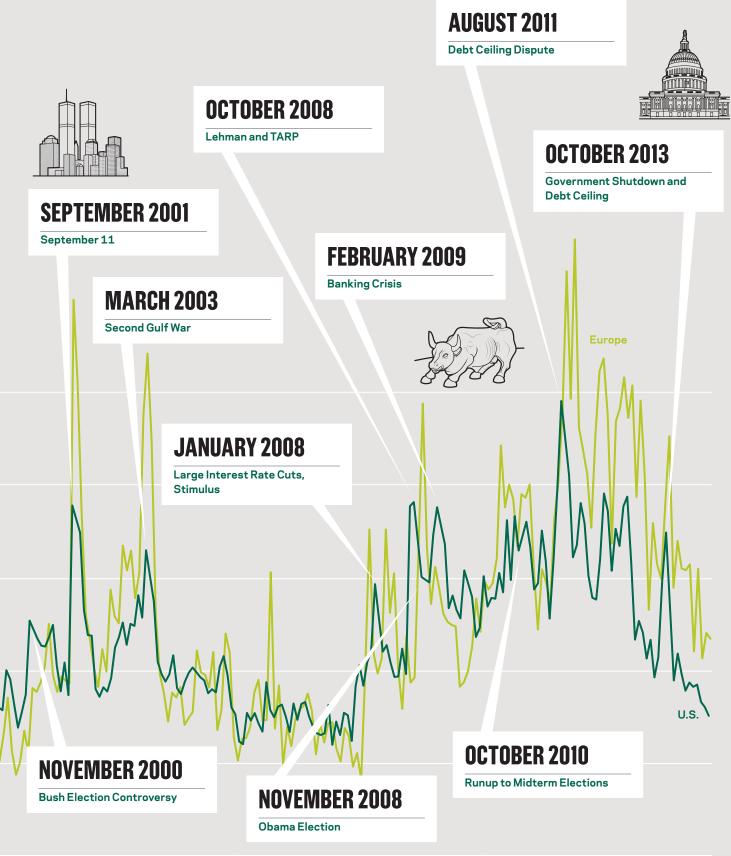
Policy uncertainty is driven by three key catalysts, says Nicholas Bloom: recessions, elections, and major events like war or natural disasters. But how do you measure something as nebulous as "uncertainty"? To track this riddle, Bloom created an index that examines economics stories in the top 10 major American newspapers that reference uncertainty, any federal tax codes set to expire over the next 10 years to highlight uncertainty in taxing, and disagreement among the Federal Reserve Bank of Philadelphia's Survey of Professional Forecasters, particularly their predictions of state and federal expenditures and levels of inflation.

He has found that uncertainty has steadily increased in the U.S. since the 1960s, with a big jump during the Great Recession. Blame two trends: government growth and the increased polarization of U.S. politics. The former causes new, untried policy, he says, while the later means more squabbling or down-to-the-wire decisions in Congress. In the European Union, he says, the Eurozone crisis that began in 2009 set off a spike in uncertainty. ▲

Nicholas Bloom is a professor of economics



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BUSTS

Risk Analysis or Risk Paralysis?

A lesson on post-crisis financial stress disorder from 18th-century Amsterdam.

BY EDMUND L. ANDREWS

It was a confident, high-powered investment firm with credit lines at top financial institutions. It made big bets using borrowed money to buy assets and generate higher returns. But when the market for those assets went south, lenders demanded more collateral until the firm suddenly collapsed. Many frightened lenders clamped down on all borrowers, setting off an overall credit crunch.

The implosion of a giant subprime mortgage lender in 2007? The collapse of Lehman Brothers in 2008? No. This crisis hit Amsterdam in 1772, after a respected Dutch investment syndicate made a disastrous bet on shares of the British East India Company.

A paper on the Dutch debacle, coauthored by Peter Koudijs at Stanford GSB, turns up modern-day lessons about the not-so-scientific ways in which personal experience rather than market information can determine optimism, pessimism, and access to credit.

It's no surprise that credit is "procyclical." When asset prices are booming, optimistic lenders tend to make more loans and often feed the euphoria. When markets sink, lenders rein in risk and sometimes make the downturn worse.

But what drives the underlying optimism or pessimism? Koudijs, working with Hans-Joachim Voth at the Universitat Pompeu Fabra in Barcelona, found surprising answers. Though the Dutch financial markets then had none of today's technology, they employed many of the same practices that traders use today. Investors bought securities, sometimes borrowing money with loans secured by the shares they were buying. In today's language, they bought shares on margin. Lenders protected themselves by demanding a "haircut" collateral in cash or securities that exceeded the loan amount by a specified percentage. If the value of the securities dropped below that specified percentage, the lender would

demand that the investor put up additional money to stay in line with the haircut. If the investor couldn't come up with the added margin, the lender was entitled to liquidate the securities and recoup the loan amount.

The Amsterdam crisis began when a Dutch group known as the Seppenwolde syndicate made a big, contrarian bet on the shares of the East India Company. Those shares had plunged in 1771 mainly because of losses in Bengal, but the company kept paying high dividends and covered up its shortfalls by borrowing money. Convinced that East India shares would quickly rebound, the Seppenwolde group aggressively bought them on margin. But instead of rebounding, the shares fell even further after the company slashed its dividend.

To make a long story short, the Seppenwolde group went bankrupt shortly after Christmas of 1772. The disaster was a top story in Dutch newspapers. It ruined some of Amsterdam's merchants and bankers. To prevent a general credit collapse, the city of Amsterdam stepped in temporarily as a lender of last resort. Sound familiar? As it happened, the lenders to Seppenwolde never lost a guilder. Within weeks, they had liquidated all the East India shares and had recovered the money they had loaned.

But then the story took a strange turn. Koudijs and Voth found that Dutch lenders reacted to the Seppenwolde collapse in strikingly different ways. Those who had made loans to Seppenwolde but hadn't actually lost money became far more pessimistic and demanded much bigger haircuts from all new borrowers. But those who had dodged the bullet by not lending to Seppenwolde didn't tighten their requirements at all. In fact, those lenders slightly reduced haircuts to their borrowers — a sign they were at least as sanguine as before. Why the difference? It wasn't because of a difference in the available information. As Koudijs and Voth point out, everybody in Dutch financial circles knew and understood the magnitude of what had happened. Nor was it because the Seppenwolde lenders had to rebuild their own finances. Within weeks of the default, the lenders knew they hadn't lost any money. Yet, the disparity in haircuts lasted for almost two years. In fact, the pessimism and risk-aversion of the Seppenwolde lenders reduced the overall availability of leverage in Amsterdam.

In a rigorous analysis of Dutch financial records, Koudijs and Voth conclude that the only real difference between the pessimists and the optimists was whether they had gone through a harrowing personal experience. Koudijs compares it to the behavior of people who lived through the Great Depression, and who avoided financial risk for decades after trauma had passed.

The Dutch case involved sophisticated financial professionals, people accustomed to analyzing financial and economic trends. Yet, they too focused on their personal experience. "It suggests that people put more weight on what happened to themselves and less weight on other information that might be available," Koudijs says. The more personally removed people are from an important event, the less likely it is to affect their appetite for risk.

It's not clear which group of Dutch lenders was wrong. It's possible that the Seppenwolde lenders ignored the evidence about broader financial conditions and were too pessimistic. It's also possible that the other lenders were too casual in brushing off the implications of the East India mess. Either way, the Dutch episode suggests that even sophisticated investors become optimistic or pessimistic for myopic reasons.

To Koudijs, this has important regulatory implications for heading off 21st-century bubbles and busts. "If lenders are too optimistic during market booms and too pessimistic in downturns, that could be a good reason for authorities to set conservative capital requirements," he suggests. "Higher haircuts might dampen the initial run-ups, but they could also dampen the subsequent fallouts when tides turn." ▲

Peter Koudijs, an assistant professor of finance at Stanford GSB, specializes in the history of financial markets.

The 7 day of June Lirfuant to One AttAnno 6. Diorg. Ligis; for making forth new ExcHEQUER BILLS, not exceeding One Million; And for lending the fame for the SOUTH SEA COMPANY, & C. Chis Bill entitles the Beaver to One Hundred Pounds with Intereft at i and is to be curren Grown & to be Exchanged by Exchequer for Ready. Honey upone temand.

SOUTH SEA BUBBLE From Aug. 31 to Oct. 1, 1720, the share price of the South Sea Company, which had taken on England's war debt, crashed from £775 to £290.

A History of Bubbles

The word "bubble" has become a common way to describe an economy at risk of overheating. Consider the dot.com and more recently the real estate bubble. But long before the term joined the financial vernacular, there were moments in history when economies in pockets throughout the world strained as bubbles blew up and burst. Stanford GSB's Peter Koudijs says a bubble is "where investors buy an asset not for its fundamental value, but because they plan to resell, at a higher price, to the next investor."

Perhaps the most beautiful one came in the Netherlands when trading of tulip futures — especially bulbs infected by a virus that caused the flower's petals to develop spectacular colorful patterns brought rampant speculation in the winter of 1636-37. Bulbs, which have to stay in the ground for most of the year, naturally lent themselves to futures trading with the demand fueled by a highly unequal society looking for rare status symbols. The future contracts provided a cheap way for people to speculate. Hardly any money down was required — when the future contracts came due, prices had fallen and a large number of defaults rippled through society.

The term bubble came into official use with the passage of the "Bubble Act" in 1720 by the British Parliament. England had recently granted the South Sea Company the right to take over its war debt in exchange for exclusive trading rights in the gold and silver rich South American colonies. Investors quickly inflated the share prices of South Sea, similar trading companies, and other "bubble" companies that the act sought to curb.

The collapse of the Spanish empire a century later, brought an opportunity to invest in debt for newly formed Latin American countries, and in 1822, Gregor MacGregor of Scotland took full advantage. He persuaded investors to purchase bonds in the government of Poyais, located in today's Honduras. The only problem? Poyais only existed on his fictitious map. The overall bubble burst at the end of 1822, when among other things, investors grew worried that the Latin American governments would not be able to service their debts. Investors put their bonds up for sale and prices crashed. Faced with this capital flight, the countries had no choice but to default. — DEBORAH PETERSEN





TULIP MANIA During the height of the Dutch tulip craze, the price of a bulb could run as high as 5,500 guilders, the equivalent of a nice canal house in Amsterdam. The collapse probably had little impact on the overall economy, but it damaged trust and financial markets would never be the same.



MISSISSIPPI BUBBLE In 1716, John Law, an economic theorist born in Scotland, promised to revitalize a French economy ravaged by wars. He obtained permission to open a bank with the authority to issue notes and that would fund the government debt. A year later, the bank took over control of French trade in the Mississippi River valley. Law started to print banknotes to inflate the bank's stock price, but the scheme collapsed when note holders rushed to convert their notes into coin.

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LATIN AMERICAN DEBT CRISIS Valuable timber and a strategic location near where a canal would be built were among the amenities Gregor MacGregor touted to lure investors in his fictitious land of Poyais, depicted here in his publicity material.





GREAT DEPRESSION The heady years of the 1920s gave rise to technological innovation and towering skyscrapers in Manhattan, such as the 77-floor Chrysler building. But by the time it opened in 1930, the country was already mired in the Great Depression.

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NATURAL RESOURCES

Supply Solutions

Two innovators look to tackle big problems — one in the water, the other on the ground.

BY MARGUERITE RIGOGLIOSO

'Aulani Wilhelm: Bringing Clean Water to the Pacific Islands

THE PROBLEM

Nearly one-tenth of the world's population lives on islands, yet islanders receive disproportionately little attention and investment to address their growing social, environmental, and economic problems. In the Pacific Islands alone, at least 3 million people lack access to clean water. Since being colonized, many once self-sustaining island communities have lost their fresh water sources due to deforestation, overpopulation, the presence of animal waste from agriculture and introduced species like rats, and changes in rain patterns caused by climate change. Technology has also enabled people to live on formerly uninhabitable islands, imposing a need for water in places where nature does not consistently provide it.

Over the past two decades, the trend has been to import water in single-use plastic bottles, setting off a cascade of health and environmental problems. Plastic chemicals that leach into bottled water are known to cause a variety of serious health issues. Meanwhile, bottles pile up in open landfills, wash into the ocean, and contribute to the growing number of floating "garbage patches" increasingly being reported in the news. As a result, more than 100,000 marine mammals and 1 million seabirds die each year from ingesting or becoming entangled in plastic. Plastics do not biodegrade, they "photodegrade" — dissolving into smaller and smaller particles that further invade the waters and enter the digestive systems of wildlife. Humans at the end of the food chain face an endless stretch of long-term health problems as a result.

On the economic side of the issue, water vendors on islands could capture more of the profit margin if a different approach was used.

Since being colonized, many once selfsustaining island communities <u>have lost their</u> <u>fresh water</u> sources.

THE NOVEL IDEA

'Aulani Wilhem's nonprofit, Island Water, aims to alleviate the health, environmental, and economic problems caused by water scarcity by bringing new water capture and bottling technology to islands. Specifically, it wants to help vendors produce water on the islands themselves through a bottle return and reuse system. Instead of sharing earnings with bottlers and distributors and absorbing the costs of shipping, this solution will allow them to capture more revenue while reducing the waste generated on island. On-island bottling would also reduce islanders' dependence on imports.

Wilhelm is consulting with island leaders and plans to work closely with communities to assess and address their needs. She aims to help local entrepreneurs finance, design, and set up on-site purification and bottling systems that capitalize on the supply chain already established on many islands for glass bottled products such as beer, soda, and juice. "It's important to reduce island dependence on water consumed in singleuse plastic bottles," Wilhelm says. By producing and distributing water on island, vendors will be able generate more revenue while also directly reducing the amount of waste being generated.

Island Water is presently raising support to adapt existing technology for small, developing island communities where



lives in mud or mud brick huts with dirt floors, and typically inadequate roofing, as well. During the dry season, dust kicked up from dirt floors carries pathogens that, when inhaled, can cause respiratory illness and diarrhea. In the wet season, moisture coming in from leaky roofs can pool on the floors, creating a muddy breeding ground for mosquitoes and other insects that carry infectious diseases. Makeshift solutions, such as floormats, lead to other sanitary problems, including mold and decay.

Gayatri Datar: Working from the Ground Up

Billions of people around the world live in homes with dirt floors, a situation

that can cause serious health problems.

THE PROBLEM

Research has shown that concrete floors can reduce incidences of diarrhea by 49% and parasitic infections by 78%. However, given the high cost of materials and distribution, this kind of flooring solution can cost \$300 to \$500 for a 20-squaremeter home — a prohibitively expensive proposition in Rwanda. As a result, living and sleeping on dirt floors are an everyday reality for the majority of the population. This problem is not limited to Rwanda. A substantial unmet demand for clean. durable, and affordable floors exists globally across developing countries.

The discomfort and disease caused by substandard housing materials also present an emotional burden, Gayatri Datar has discovered in her research. "Our key insight from interviews was that while poverty is the cause of poor-quality homes, such homes lead people to feel poor and not upwardly mobile," she says. "This further contributes to productivity and motivation losses."

THE NOVEL IDEA

Through her new social venture, EarthEnable, Datar is working to provide an affordable alternative to dirt floors: locally sourced, "earthen" floors at \$70. Earthen floors are made without industrial machinery from a mixture of packed, locally sourced materials - gravel, sand, clay, and fibrous substances (such as corn husks or dung) - and are then sealed with

a drying oil (usually linseed oil). A proven technology in the United States, and gaining popularity among environmentally conscious homeowners, earthen floors have been refined over the past few decades to become easy to clean, abrasion-resistant, and attractive in even the most modern and stylish of settings.

Earthen floors have not reached Rwanda or other emerging markets due to two fundamental challenges: Linseed oil is extremely expensive and difficult to source, and masons are not aware of and trained in the technique for constructing them. EarthEnable has developed a cost-effective chemical process to convert a locally available vegetable oil into a suitable drying oil costing a mere \$2 per liter, thereby eliminating the need to import linseed oil priced 10 times higher.

The enterprise has also developed a training workshop that equips Rwandan masons with the skills they need to market, construct, and install high-quality earthen floors. After the training, masons will be granted rights to purchase the EarthEnable drying oil and serve as the network for distribution, installation, and maintenance of EarthEnable floors in partnership with homeowners.

'Aulani Wilhelm and Gayatri Datar received their MSx and MBA degrees, respectively, from Stanford GSB in 2014. Both are 2014 Social Innovation Fellows. The fellowship provides \$110.000 to \$150.000 in funding, advising, and support to fellows who want to start a nonprofit venture to address a pressing social or environmental need during the year after graduation.

the trend toward single-use plastic can be slowed or reversed, and launch a pilot to test and refine the water-bottling process and distribution model. Long term, Wilhelm sees potential for such technology to be used also on developed islands and beyond, and plans to test the concept in Hawaii.

THE INNOVATOR

Born and raised in Hawaii with relatives who were fishermen and with ocean sports a regular part of her life, Wilhelm has always held a deep love for the ocean. For the past 15 years, she has worked in the Pacific on marine conservation efforts to protect remote islands and atolls and draw global attention to the importance of oceans. That work brought home to her the dual problem of water scarcity and pollution caused by single-use plastic bottles. "As manager of Papahānaumokuākea, one of the world's largest conservation areas that suffers from the continuous onslaught of ocean debris, I have witnessed first hand the horrific impacts of plastic pollution on wildlife and human health," she says.

Both in setting up field camps in remote island environments and working with small island communities, Wilhelm had to face the challenges of energy generation, water purification, and sanitation. She learned through experience just how profound the water scarcity problem is. "In some places, concern over where we would find clean water would consume us. Even if water was available, we worried about whether or not it would make us sick," she says.

The origins of what Wilhelm refers to as her "calling" to be a voice for islands and culture runs deeply, and Wilhelm is inspired by deeply rooted Hawaiian beliefs about the interconnectedness of people and the natural world. "I feel an ancestral obligation to those who come after me to mother of three amazing boys, and inspire me every day to contribute the world a better place for them." preserve our islands and way of life. I'm the mother of three amazing boys, and they inspire me every day to contribute and leave 62

"While poverty is the cause of poor-quality homes, such homes also lead people to feel poor and not upwardly mobile." The organization is working directly with housing NGOs in Rwanda as marketing channels for earthen floors and as a means of directing business to trained masons.

In addition to Stanford GSB's Social Innovation Fellowship, EarthEnable has raised money through other business plan competitions, grants, and an Indiegogo campaign to fund startup costs. "We expect to be sustainable in a few years," says Datar. Eventually, fees collected will help the nonprofit to expand into new markets.

THE INNOVATOR

Datar was born and raised in the Boston area by Indian parents. "We went back to India nearly every year, and I was disturbed by the poverty and suffering I witnessed there," she says. A semester in college spent doing tsunami relief work



led her to conclude that, "there was a lot I could do about it." Datar decided to take several semesters off to work with NGOs in developing countries. After earning an undergraduate degree in 2009, she worked for the World Bank and then Dalberg Global Development Advisors, helping socialsector organizations address development issues by integrating private-sector solutions. She came to Stanford GSB to further enhance her understanding of how business could be harnessed to generate positive social outcomes.

The idea for EarthEnable was born out of a course Datar took at Stanford's d.school called Design for Extreme Affordability. Paired with MASS Design in Rwanda, an architecture firm focusing on optimizing health and sustainability through their designs, her team aimed to design a product or a service for low-income Rwandans that would improve health within the home or community. Part of the course entailed traveling to Rwanda on a two-week trip to utilize the tools learned in the class, such as empathy building, human-centered design, and rapid prototyping. "People would constantly mention roofing and flooring as something they would want to change in their home. This issue was especially pronounced as we were visiting in the rainy season, which meant that many of the floors were muddy with puddles, breeding insects," she says.

Gayatri returned to Stanford determined to find a solution, and after many iterations (from plastic tiles to waterproof mats), her team discovered earthen flooring. "After seeing how easy it was to make this type of flooring ourselves — and after realizing that it was a much more sustainable solution than concrete - we knew this needed to be scaled across Rwanda and across the world." she says. Δ

EXCHANGE

SOME FINAL THOUGHTS ON RISK

"Risk-taking and

are the essence of transformation." — **Mindy Grossman**, CEO of HSN Inc., speaking at a Stanford GSB View From the Top event

EDITED BY NATALIE WHITE

"Learn to take risks. Live life every day and feel the

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because that's what brings the passion." — **Sarah Friar**, MBA '00, CFO of Square Inc., speaking at Stanford GSB's 2013 Women's Initiative Network Conference

"Trusting

employees with the freedom and resources to excel leads to more creativity and risk-taking in the workplace." — **Joel Peterson**, Robert L. Joss Consulting Professor of Management, writing for LinkedIn

"There is absolutely no career



- H. Irving Grousbeck, MBA Class of 1980 Consulting Professor of Management

"How do you connect with people on a gut level? By doing things that are



and taking a risk." — **Thomas Friedman**, New York Times columnist, speaking at a Stanford GSB View From the Top event

"Thinking big

means taking risks. Own your career path." — **Maria Renz**, CEO of Quidsi, speaking at the 2014 Women in Management Banquet at Stanford GSB

"If you are not willing to take a risk, you will

achieve

very little." — **Ajay Banga**, president and CEO of MasterCard, speaking at a Stanford GSB View From the Top event **fail fast** and be proud of your failures. If you don't fail often, you are not trying hard enough."

"I believe you have to

 Jessica Herrin, founder and CEO of Stella & Dot, in an interview for *Stanford Business*

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