Futurizing Workers For Future Work

By David Pearce Snyder

As we move from the Information Age and into the Cyber-Mental Age, many new jobs are left unfilled. The goal of developing the advanced competencies of available workers, like self-directed learning and creativity, will best be met through partnerships among employers, educators, and local governments.

Edward Gordon brings a good deal of data, insight, and clarity to a hotly debated topic: the skills required by the workers of the Post-industrial Age. Readers familiar with the extensive literature on this subject will find this assessment of the facts refreshingly free of political posturing or sweeping policy pronouncements (e.g., "Send everybody to college").

Future Jobs maps out the dimensions of an underappreciated crisis confronting the United States, as well as many of the world's developed and emerging economies: the rapidly growing shortage of adults who possess the basic skills to qualify for the high-growth, information-intensive jobs of what the author calls the age of "cyber-mental work."

The first half of *Future Jobs* is largely devoted to summarizing the multiple demographic, econometric, and technological trends and developments that have combined to render our once notably successful school-to-work education system outmoded and increasingly ineffective. At the heart of today's employment/skills crisis, Gordon concludes, is the restructuring of our economy caused by information technology and globalization, which is occurring at the same time that a shrinking entry-level labor pool will increasingly fall short of replacing the retiring baby boomers.

While the central focus of *Future Jobs* is the U.S. economy and workforce, the author spends an entire chapter to show that the same dynamics—i.e., techno-economic restructuring and demographic discontinuity—are at work throughout all developed nations, as well as in most of the major developing nations. Coping with millions of underemployed, inappropriately skilled workers is already a crisis for the United States, Europe, and Japan. Gordon shows that it will soon become a crisis for China, India, and other emerging economies, as well.

U.S. workforce demographics for the coming decade are straightforward and compelling. Even at its current modest growth rate, the U.S. economy is projected to create 21 million new jobs during the next 10 years, at the same time that 33 million baby boomers are expected to retire. This means that U.S. employers will need to fill 54 million vacancies during the coming decade. However, the U.S. Census Bureau projects that the nation's labor pool will only grow by 11 million workers, so more than 40 million vacancies will have to be filled by recruits who are already in the labor pool today.

Gordon notes that U.S. employers have long relied on imported labor to mitigate shortages of all kinds of workers, from field hands to physicists. But slowing population growth
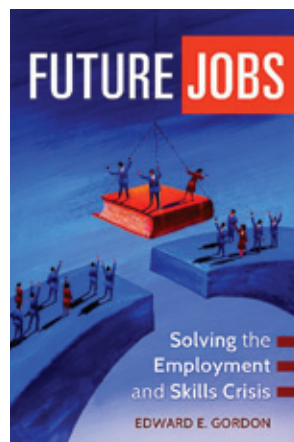
Future Jobs: Solving the Employment and Skills Crisis by Edward E. Gordon. Praeger. 2013. 203 pages. $37.

and prospering domestic job markets in the emerging economies are already diminishing the appeal of emigrating to America. The author also cites evidence of a growing "reverse brain-drain," as increasing numbers of recent immigrants to the U.S. are returning to their home countries to pursue their careers. Within a decade, Gordon forecasts, the United States will be largely "on its own" in supplying employers with workers.

The prospects for robust U.S. job demand would seem to offer reason for hope among the nation's more than 20 million unemployed and underemployed workers. But Gordon's assessment of the projected job market suggests otherwise. While around 45% of forecast U.S. workplace vacancies during the coming decade will require some form of postsecondary degree or certificate, *all* jobs from now on will require employees "to be able to use information to make non-routine workplace decisions."

Such higher-order cognitive competencies, Gordon asserts, are quickly becoming basic minimum requirements for essentially all U.S. employment. The general absence of these skills in the U.S. workforce, Gordon believes, helps explain why employers report having 4 to 5 million unfillable vacancies just when more than 20 million unemployed and underutilized Americans are unable to find jobs. He cites evidence that those unfilled vacancies are causing a measurable drag on U.S. economic growth, both nationally and at the local community level.

Future Jobs makes a convincing case that there is an urgent need to provide tens of millions of U.S. workers—both the unemployed and

employed—with advanced cognitive skills, which include *systems thinking, problem analysis, teamwork, self-directed learning, cyber-literacy,* and *applied creativity*. As Gordon points out, no such formal curriculum is currently offered by any American educational institution. Higher-order cognitive skills are incorporated in the new Common Core Standards of Learning that are now being adopted throughout most U.S. public schools. But, as the author observes, it will take more than a decade for the new curriculum to be fully implemented, and it will do nothing to address the cognitive-skills deficit afflicting tens of millions of U.S. adults.

The author accepts the available evidence showing that college graduates typically acquire advanced cognitive skills in the process of earning four-year baccalaureate degrees. In particular, he cites surveys of CEOs indicating that employers believe liberal arts and humanities curricula are sources of such skills. But Gordon concedes the implausibility of scaling up the nation's colleges and universities to provide advanced cognitive skills training to millions of adults, more than one-fourth of whom never completed high school! The business model of our current postsecondary institutions, he concludes, is simply too expensive, too inefficient, and too labor-intensive to solve the employment/skills crisis.

Throughout *Future Jobs*, as the author documents the size and makeup of our evolving job market and workplace skills set, he makes recurring references to spontaneous local initiatives in small and large communities nationwide. In these initiatives, employers, educators, and civic leaders collaborate to create new learning programs targeted at providing workers with the skills required by specific, hard-to-fill local jobs. First appearing during the mid-1990s as economic development initiatives, such programs now exist in dozens of communities across the country. Gordon provides a number of case studies detailing these successful initiatives, which he refers to collectively as "Regional Talent Innovation Networks" or RETAINs. He also describes successful RETAINs in other countries as evidence of the concept's general practicability.

Having spent his professional career in human resources development, Gordon is able to augment his "big picture" analysis with important insights from workplace realities. In particular, he points out that once-robust U.S. business investment in worker training has fallen steadily since the 1980s, as corporate leadership adopted policies aimed at maximizing short-term profits and shareholder returns. While noting recent increases in training expenditures by some multinational firms, the author argues that, in light of rising skills shortages, employers should be encouraged to invest in workforce development by permitting companies to treat their training expenditures as capital investments rather than as a business expense.

If the U.S. tax code and accounting standards were revised so that employer investments in worker training were treated the same as investments in capital goods (e.g., equipment, facilities, etc.), businesses would be able to depreciate their spending on human resource development over a number of years, reducing the impact of such spending on corporate bottom lines.

Gordon points out that depreciating the cost of training would be entirely appropriate, since today's rapid rates of workplace innovation and job redesign renders the content of much workplace instruction outdated within just a few years. Changing the tax treatment of training expenditures, he believes, would lead to a substantial increase in corporate spending on human resource development, permitting business and the marketplace to deal directly with the workforce skills crisis, and reducing the need for new public sector programs.

Notwithstanding the intuitive appeal of his proposal, Gordon realistically concedes that today's fractious partisan politics make such a tax reform unlikely. Given the improbability of either major new public sector education expenditures or corporate tax reform, he concludes that the only effective means to address the workplace skills crisis is through local initiatives: employers collaborating with educators, government, and civic leadership to provide millions of individuals with the specific skills required to perform the jobs of the Cyber-Mental Age.

About the Reviewer
David Pearce Snyder is a consulting futurist, principal of The Snyder Family Enterprise, and THE FUTURIST's Lifestyles editor.

Annual Report Card On Our Future

By Rick Docksai

The Millennium Project assesses where the world is gaining or losing ground.

The world community is in better shape than it should be, states the Millennium Project's leadership team in its *2013-14 State of the Future* report. This volume, the international think tank's acclaimed annual "report card on the future of the world," finds that human health and living standards are trending upward but are doing so despite deficient stewardship of the planet and widespread occurrences of poor governance, political corruption, crime, and violence.

"When you consider the many wrong decisions and good decisions not yet taken—day after day and year after year around the world—it is amazing that we are still making as much progress as we are," the authors write.

The Millennium Project has been producing annual State of the Future reports since 1996. Each report makes a full-scale assessment of where life on Earth is heading, based on constantly incoming data from an international network of more than 4,500 contributing researchers. Like its predecessors, this year's report integrates the data into a list of 15 Global Challenges that require collaborative action by the world's leaders, along with a State of the Future Index (SOFI) that marks areas of life in which we are "winning," "losing," or experiencing "unclear or little change."

2013-14 State of the Future
by Jerome C. Glenn, Theodore J. Gordon, and Elizabeth Florescu. The Millennium Project, www.millennium-project.org. 2014. 239 pages plus a CD-ROM containing 10,000 pages. $39.95.

This report's SOFI cites some encouraging firsts. For the first time, we are "winning" on renewable energy—worldwide renewable capacity has been growing and is on track for a much larger growth spurt this decade. We are also winning for the first time on Gross National Investment Per Capita, Foreign Direct Investment, and Health Expenditures Per Capita.

Also, some positive trends from earlier years are still running strong. The number of physicians per capita is growing worldwide, as it was in 2011. The world is likewise winning on energy efficiency, a winning streak that started in 2012.

Other trends are not good. For the first time, we are losing on forest area. Also, greenhouse-gas emissions and our overall ecological footprint, two areas that have been on the "losing" side of the ledger for the past few years, are still losing areas today. Glaciers are melting and coral reefs are dying at accelerating rates as climate change gathers steam.

"The global situation for humanity continues to improve in general, but at the expense of the environment," the authors write.

All is not trending well for human life, either. The SOFI notes little or no progress on nuclear nonproliferation and HIV prevalence—areas in which we were winning in 2011. Some trends from 2012 or earlier are continuing to worsen, too—namely, income inequality, terrorism, and political corruption.

This year's 15 Global Challenges list additionally notes that global material waste increased tenfold last century and could double again by 2025. The authors also voice concern over shrinking supplies of potable water. They call for new agricultural approaches that would consume less water, such as new ways to synthesize meat without growing animals, genetic engineering for higher-yielding and more drought-resistant crops, and cultivating insects as animal feed.

On the upside, literacy and IQ scores keep rising, and the growth of online educational resources could accelerate intellectual growth even further. Also, the prospects for a more peaceful world are on the upswing, thanks to democracy, international trade, Internet use, and news media all gaining ground; prosperity rising and poverty declining; cross-cultural dialogues flourishing; and NGOs and regional organizations fostering community-led social reforms and peace accords.

Efforts to affirm women's rights are also making crucial gains. New worldwide campaigns to stop violence against women are expanding, while new mobile-phone apps and Internet sites are making it easier to report and publicize incidences of violence. Overall, the report projects that "slow but massive shifts in gen-

der stereotypes will occur in the next few decades."

The Global Challenges section breaks each problem area down to the regional levels, as well. Readers will see specific takes on the energy, governance, and human and environmental health situations of Africa, Europe, North America, Latin America, and Asia and Oceania.

Some new issues have surfaced since 2012, such as poor nutrition. The authors explain that, while hunger is down throughout the world, much of the world's daily caloric intake is "empty calories" that satisfy hunger pangs but do little for overall health and contribute to weight gain and diabetes risk.

"It is not clear that food nutrient density will keep pace with human needs," they write.

The report lists several dozen steps that could remedy the situation. Among them are taxing unhealthy foods more heavily to subsidize healthier ones, posting "low nutritional value" warning labels on food packaging, breaking up agribusiness and food market monopolies, increasing investment in developing countries' agricultural R&D, and organizing school-based campaigns to encourage healthier eating.

Another concern is major construction along the world's coasts, where there is vulnerability to numerous environmental hazards. The authors give several pages of recommendations for safer development, such as more interdisciplinary and participatory urban planning that involves NGOs, ecologists, and the urban poor; building green, floating cities with newer materials; imposing compensation fees and higher taxes on activities that pollute; and organizing youth environmental groups to carry out habitat restoration.

The world has the means to further improve human life while preserving the planet's natural systems and resources, but it must marshal global intelligence and activism across national borders to an entirely new degree, the authors conclude. They stress the value of better infor-

mation-gathering systems as guides to the process.

"Some of the world's toughest problems affect everyone almost instantly and do not end at national borders. In the future, solutions as well as problems must also cross boundaries—ideological as well as geographic," they write.

The *2013-14 State of the Future* is an authoritative compendium of what we know about the future of humanity and our planet. Policy makers and advocates will find it to be a vast yet very readable source of insight on where the world's thorniest problems begin and where they might end.

About the Reviewer
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The Outer Limits of Quantum Computing

Computing with Quantum Cats: From Colossus to Qubits by John Gribbin. Prometheus. 2014. 295 pages. $28.95.
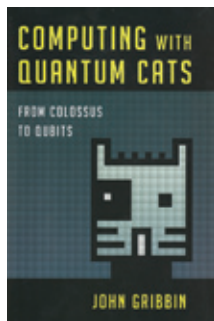
A whole other reality exists at the quantum level, and we are learning how to access it via quantum computers. In his latest book, science journalist John Gribbin gives readers a detailed look at this technology area and its capabilities—including the prospect that quantum computers might hold the key to true artificial intelligence.

He starts by retracing computer history and the series of breakthroughs that eventually brought the specialized field of quantum computing into being. Along the way, he explains what we now know about quantum mechanics and describes how engineers have succeeded in reproducing some quantum phenomena in experimental quantum computer systems.

Quantum computers generate much excitement due to their ability to construct multiple simultaneous calculations of the same problem, a feat that would theoretically enable them to far surpass conventional computers in certain types of functions. For example, a single quantum computer could calculate all of the activities occurring in an area of space, and thereby give scientists exceptionally accurate models of the universe and physical reality—or even, if the operators wish, of the "multiverses" that many physicists argue exist alongside our universe. Also, quantum computers can encrypt data so that no conventional computer can intercept it—thus raising the possibility that quantum computers could give all of us greater safety from identity theft and other pilfering of our personal data.

But this technology has considerable limitations, as well. Gribbin describes the present-day difficulties of building quantum computers that are large enough to compete with conventional computers at most tasks, as well as possible solutions. The approaches that engineers are now attempting include using trapped ions to perform computations; the Josephson function, which uses photons of light to store data; and quantum teleportation, by which two photons become "entangled," such that, when one goes into a quantum state, that state transfers to the other photon.

Computing with Quantum Cats is a highly technical read. Nonscientists may find it intimidating, but the book is a worthy find for tech-savvy readers who want a well-informed look at quantum computing's present state and future potential.

—*Rick Docksai*

Big Data Keeps Getting Bigger

Data Crush: How the Information Tidal Wave Is Driving New Opportunities by Christopher Surdak. AMACOM. 2014. 280 pages. $27.95.

Our world is awash in ever-growing amounts of data, ranging from detailed breakdowns of what consumers are buying to macro-scale indicators of which businesses are growing and why, notes technology consultant Christopher Surdak. He explores the driving forces behind the data accumulation and the tremendous opportunities that it offers to businesses and organizations, as well as to individual consumers who make an effort to utilize it.

Surdak recaps the recent history behind the rise of Web-enabled mobile phones, mobile apps, and the

"Internet of Things"—e.g., household appliances and other consumer products communicating with each other through Wi-Fi. Among the industry trends he describes are cloud computing; consumer analytics; "contextualization," by which individuals' mobile devices give them targeted ads and entertainment suggestions based on where they are located; and personal wellness apps, which consumers use to keep track of their health.

Companies will have to manage larger influxes of data than they have ever before seen, and achieve innovations in both their products and their production processes more quickly than ever. None of this will be easy, but those companies that are up to the challenges will find a gold mine of wealth-generating opportunities. Surdak lays out his own forecasts on how companies might learn to collect and use this data, and the information-technology sectors that might have to grow to help them manage it all.

He concludes with a compilation of scenarios for life in 2020. Each scenario imagines hypothetical new technology products and services that embody all of the trends he's described in the chapters preceding. A few examples:

• A weight-loss app that advises its user throughout each day on exercise options and meal plans, based in part on the user's buying habits and Facebook likes.

• Personalized genome maps that, when coupled with mobile apps that monitor a user's physical health indicators nonstop, enable doctors to preempt and treat health problems years before any visible symptoms of them occur.

• Online tutoring and educational programs that students receive and watch as e-videos on their own pairs of iGlasses, which also send and receive e-mails—perfect for students who are working while studying, which will be most students by 2020.

Data Crush is an informative guide to the information-technology ecosystem and where it is heading. It's optimal reading for business professionals in any industry.   —RD

Making the Most of Our Brains

The Future of the Mind: The Scientific Quest to Understand, Enhance, and Empower the Mind by Michio Kaku. Doubleday. 2014. 377 pages. $28.95.

Theoretical physicist Michio Kaku has not only been exploring some of the deepest mysteries of science over the years—he co-founded the string field theory of the universe and its alleged parallel multiverses—but he's also been breaking these mysteries down to lay audiences worldwide as a professor, radio show host, and author. In *The Future of the Mind,* he tells readers of the latest scientific discoveries of the human brain and the startling impacts that those discoveries could have for life as we know it.

Kaku recaps brain science from the 1800s through the present and fills readers in on what we have learned about how the brain works and how our brains create our perceptions of reality. He also illuminates the progress that medicine has been making more recently in decoding brain chemistry to figure out how the very foundations of memory, dreams, and emotions form on the one hand, and mental disorders and addictions on the other.

This knowledge could lead us to new methods of boosting health by directly interfacing with—or altering, in some cases—brain processes. He shows, for example, how brain science might one day restore mobility to people suffering paralysis, eliminate mental illnesses and addictions, and boost individuals' intelligence to unprecedented new levels.

Even steeper challenges could later fall within our grasp: Kaku examines the prospects for implanting human-level intelligence in apes and dogs, creating truly "conscious" robots, and transferring our minds onto software for virtually enabled immortality. We might even communicate telepathically through brain-to-brain interfaces, break free of our bodies altogether and live forever as humanoid machines, or, if we'd rather, roam the universe as free-floating entities of pure consciousness.

Kaku offers readers a stunning exercise in imagination that's grounded in hard scientific fact. *The Future of the Mind* is a great find for all readers who take an interest in scientific discovery and its capacity to enhance human life.   —RD
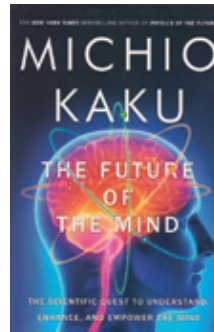
What We'll Need to Know to Bounce Back from Armageddon

The Knowledge: How to Rebuild Our World from Scratch by Lewis Dartnell. Penguin Press. 2014. 340 pages. $27.95.

What if a horrific global disaster brought civilization to an end? Lewis Dartnell, a BBC science correspondent and University of Leicester space research fellow, considers the aftermath of a worldwide catastrophe such as a nuclear war, a global pandemic brought on by a supervirus, or even an unusually intense coronal mass ejection from the Sun. All of these are very unlikely events, but all are destructive enough to lay waste to global commerce, electrical grids, and civic order around the world if they ever did come to pass. We had best have some survival action plans ready, just in case, he argues.

Dartnell looks at how the survivors might salvage usable items from the rubble and eventually rediscover the technologies of building construction, energy generation, computers, and modern medicine. His account starts with their foraging for supplies in the abandoned cities, after which they'd take cover out in the country—ideally, in loca-

tions near the coasts.

Then he lays out step-by-step how these plucky survivors could scrape together the necessities of everyday living: They could stitch together clothes and fabrics from naturally cultivated cotton and wool; sow and fertilize crops when the tools of modern farming are gone; and derive heating fuel, soaps, and candles from animal fat, plant oils, and charcoal. He also describes how they could purify the charcoal prior to use, minimizing pollution.

More-sophisticated creature comforts are feasible for these postapocalyptic humans, too. Dartnell continues with makeshift processes for making glassware and ceramics, generating electricity, creating some form of motorized transportation, and providing basic medical care.

All of these are innovations that took early humans tens of thousands of years to discover, he notes. But we could bring them back far sooner. We just need to hone our survival skills ahead of time and know where to look for the technical knowledge before it is lost.

The Knowledge is a well-organized and engaging guide to life in a truly worst-case global scenario. While we can all hope that readers will never have to use its advice, it's certainly good to be prepared. Who's to say: If

civilization's end does come, those who keep this book close by just may have the knowledge they need to restart civilization while avoiding a protracted Dark Age.　　—*RD*

Toxicity and Mobile Technologies

Overpowered: What Science Tells Us About the Dangers of Cell Phones and Other WiFi-Age Devices by Martin Blank. Seven Stories. 2014. 271 pages. $23.95.

Mobile phones are incredibly useful, but what effects do they have on our long-term health? Martin Blank delves into this question and presents a heavily science-backed case for concern.

Like any electronic device, mobile phones emit electromagnetic radiation. As dozens of studies over the years have shown, recurring exposure to even small amounts of this radiation brings on higher incidence of numerous adverse health effects. Blank reviews a multitude of these studies, the findings of which include higher incidence of cancer, Alzheimer's disease, and mood disorders such as depression, all stemming from overexposure to radiation from telephones and telephone lines.
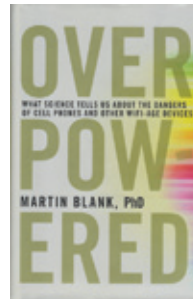
Concerns over phone-related radiation harms have arisen since the early 1980s, when researchers first noticed increased cancer rates in people living near telephone lines. The concerns heightened in the

1990s with the profusion of mobile phones, and have gained an even higher pitch in more recent years, not only because far more consumers now own mobile phones, but also because the amount of time that they spend on their phones in an average week has increased by five- or sixfold. Meanwhile, scientists who sound the alarm on the radiation's dangers get sidelined and silenced by telecommunications industry groups and the government officials who are beholden to them.

It's not only we humans who are at risk. Blank documents additional harms to birds, plants, and insects—three vital links to food chains everywhere—stemming from electromagnetic radiation exposure. All show damage to DNA and reduced ability to respond to stresses in the environment.

We don't need to give up our cell phones, Blank explains, but he advises us to modify our devices and how we use them. Otherwise, he warns, our radiation exposure and the health effects associated with it will only grow, as more electronic devices continue to populate our surroundings.

Electromagnetic radiation and its health risks are a complex subject, but Blank breaks it down effectively for lay audiences everywhere. Readers who want to know the hard science behind the issue will find an accessible and helpful resource in *Overpowered*.　　—*RD* ❏