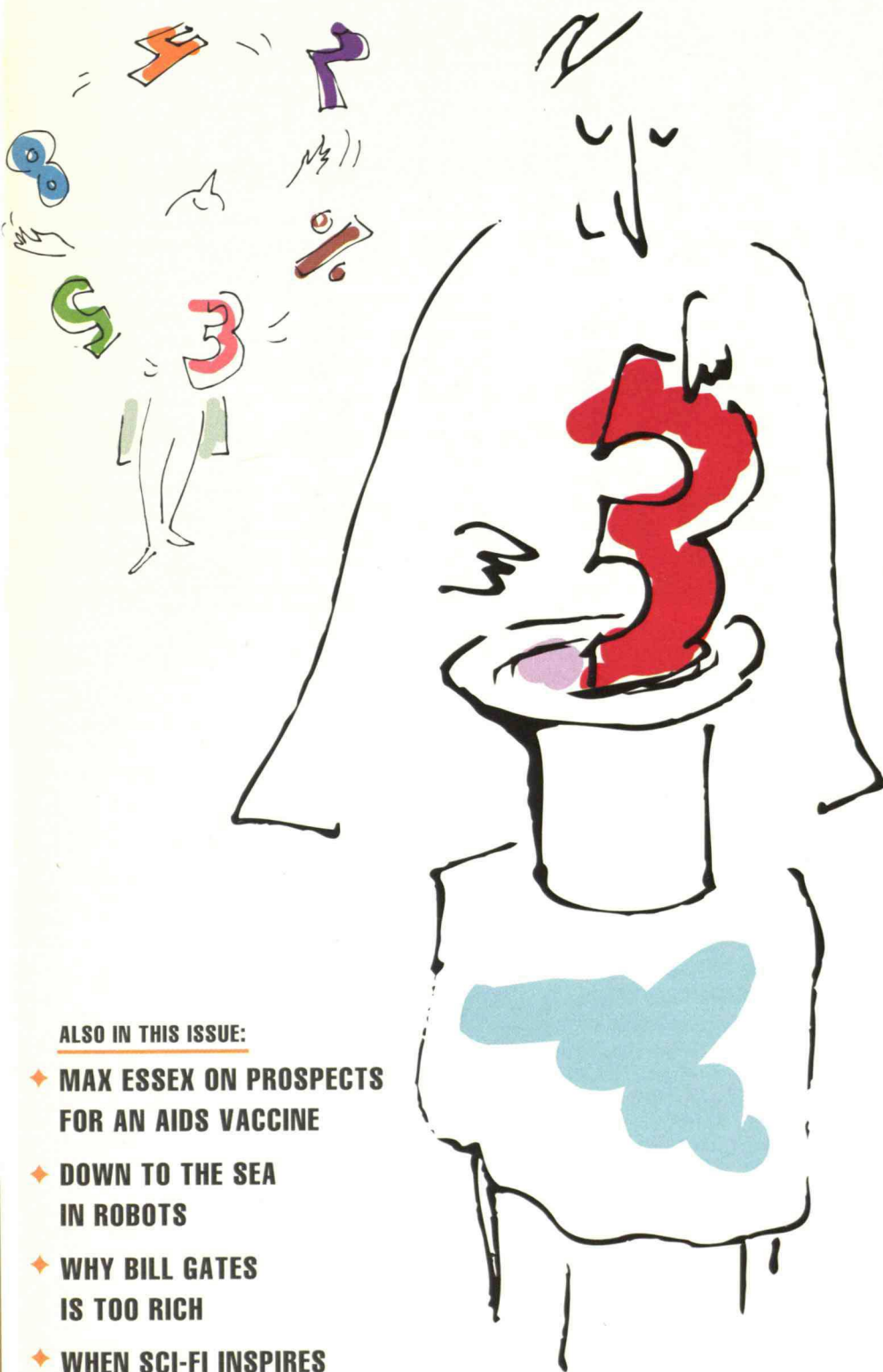


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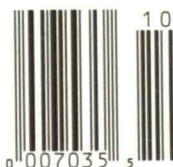


How Numbers Can Trick You

*The Six
Deadly Sins
of Statistical
Misrepresentation*

ALSO IN THIS ISSUE:

- ♦ MAX ESSEX ON PROSPECTS FOR AN AIDS VACCINE
- ♦ DOWN TO THE SEA IN ROBOTS
- ♦ WHY BILL GATES IS TOO RICH
- ♦ WHEN SCI-FI INSPIRES REAL SCIENCE



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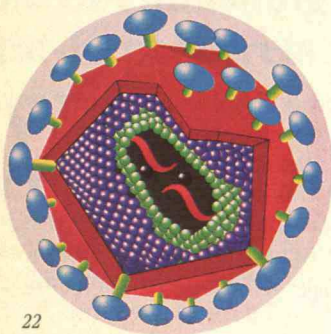
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Contents

FEATURES

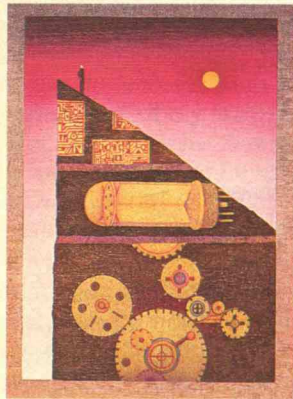


22

22 CONFRONTING THE AIDS VACCINE CHALLENGE

BY MAX ESSEX

Although HIV, the virus that causes AIDS, has proven an extraordinarily elusive foe, researchers are devising innovative ways to prevent its growth. Still, because HIV mutates so quickly, numerous vaccines will be needed to defeat the proliferation of the disease in different parts of the world.



30

30 DISTRIBUTING OUR TECHNOLOGICAL INHERITANCE

BY GAR ALPEROVITZ

Entrepreneurs such as Microsoft's Bill Gates often appropriate vast riches for themselves, though their individual contributions are actually modest: we all stand atop a Gibraltar of knowledge, accumulated over generations and contributed to by numerous people, that provides most of the basis of present-day advances. Communities are now experimenting with a variety of mechanisms that allow citizens to better share in the resulting wealth.



38

38 HOW NUMBERS CAN TRICK YOU

BY ARNOLD BARNETT

Media accounts of studies on health, safety, and the physical and social sciences are often compromised by subtle errors in mathematical reasoning that produce not-so-subtle errors in understanding. Herewith a field guide to the Six Deadly Sins of Statistical Misrepresentation.

46 DOWN TO THE SEA IN ROBOTS

BY J. ROBERT FRICKE

Swarms of miniature subs, controlled by on-board artificial intelligence and chock-full of scientific instruments, may soon be roaming the seas. Besides conducting detailed oceanographic surveys, these autonomous vehicles could aid in oil exploration and production, monitor marine pollution, track endangered species, and enable a new kind of fish farming.



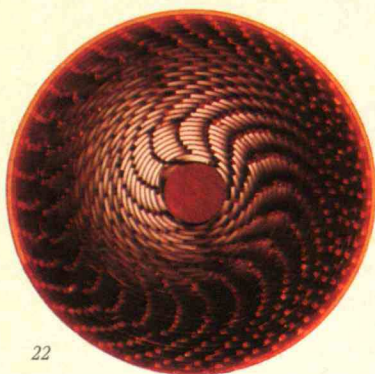
57

57 SCIENCE FICTION: STEPCCHILD OF SCIENCE

BY FREDERIK POHL

Although science fiction often "don't get no respect," it has inspired the likes of Leo Szilard, Werner von Braun, and Stephen Hawking. It also explores serious social change. And besides, it's just plain fun.

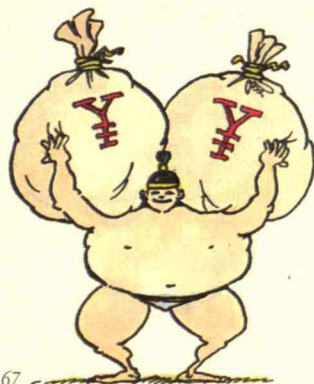
DEPARTMENTS



22



62



67

3 FIRST LINE

6 LETTERS

10 MIT REPORTER

Enhancing Air-Traffic Control; Artificial Sensations

14 TRENDS

Smart Sea Charts; Synthetic Spider Silk; The Coolest Sound; Using Thoughts to Control Computers

62 FORUM

ELLEN RUPPEL SHELL

The vast majority of U.S. schools continue to track students by ability, despite claims to the contrary by advocates for gifted children. The result is a caste system that serves neither the fastest nor the slowest learners.

65 THE HUMANE ENGINEER

SAMUEL C. FLORMAN

Overpopulation is a challenge that daunts even the most hard-core optimist. Still, it can be met, though not by technical means alone. Engineers therefore need to combine forces with professionals from many other fields.

66 THE ECONOMIC PERSPECTIVE

BENNETT HARRISON

The Technology Reinvestment Project, which aims to help wean contractors from the Department of Defense, shows that the federal government can mount an effective new program without a cumbersome new bureaucracy.

67 REVIEWS

Eamonn Fingleton on how the Japanese keep it up.
Kathleen Courrier on reforming the World Bank.

72 PHENOMENA

My Mind Explores the Universe

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First Line

One of Publishing's Best-Kept Secrets

WHEN I was a kid in Brooklyn, New York, during the 1940s and '50s, to be skinny was a curse. Connoting undernourishment, weakness, ineffectuality, and poor long-term prospects, thinness was something to grow out of as soon as possible or, better yet, to strenuously avoid in the first place. By contrast, to be *zaftig* (a Yiddish word I interpreted as "pleasantly plump") was a sign of robustness, attractiveness, and staying power.

"He has no *tuchess*" (only a wisp of a rear end), one of my father's friends once lamented about his skin-and-bones young son. If the poor boy had little to sit on—no bottom to build on—how well could he fare in this ruthless world?

In the magazine business, we have a similar though slightly less colorful image. It is the "tripod" of the three elements—editorial content, circulation, and advertising—that are essential to a magazine's health. If any of these legs are short or fragile, the tripod either cannot stand or leads a precarious existence.

At *Technology Review*, two of the legs are extremely strong. The editorial content is well regarded by readers and journalist colleagues alike, who find it not only timely and informative but enjoyable to read. And the circulation—the roster of subscribers—is rock solid. The magazine is not quite so strong, however, when it comes to advertising. Without more of it, we are literally too skinny. And because this translates into insufficient income to cover costs, it's a matter of some importance over the long term that we round out that *tuchess*.

Easier said than done. Though *Technology Review*'s circulation is a respectable 100,000, and much of this audience is very well-educated, affluent, and influential—just the kind of people advertisers love to address—we are, compared with the mass-circulation magazines, what's known in the trade as a "small book." Unfortunately, small begets skinny.

Remember that old joke about the drunk fruitlessly searching for his keys under the street lamp? He lost them elsewhere, he explains, but the lamp is where the light is. Similarly, to the media buyers on Madison Avenue, the big books are the universal outlet of choice because that is where the largest audience is.

This rigid mindset applies even if the advertiser, product, or service appeals only to a small percentage of that audience, which can be found with higher density—and might respond more fa-

*We may be small
by Madison Avenue
standards, but you get
a big bang for the buck.*

vorably—in smaller and more sophisticated venues better attuned to their own needs and style, and at far lower cost. In particular, the upscale demographics and purchasing power of *Technology Review*'s audience, together with the magazine's relatively modest advertising rates (the price of one full-color page in one issue of *Newsweek*, for example, buys almost three years' worth of the same ad in *Technology Review*), makes it a truly cost-effective buy.

But I cannot lay all the blame on the unreceptiveness of advertising executives preoccupied with first-tier, *Fortune* 100-type accounts. We in smallbookland also tend to search under that proverbial street lamp ourselves by targeting the biggest companies. There, we assume, is where most of the money is. That's true, of course, but little of it is earmarked for us, and if we do occasionally get in the door, we're last in and first out. Meanwhile, thousands of "second-tier" companies—smaller than the biggest guys but not small, and with nonastronomical but nontrivial advertising budgets—could find *Technology Review* to be just what the doctor ordered.

We need to direct much of our advertising-sales efforts to these and related

strategies, well tailored to our niche and inherent strengths. But therein lies another self-perpetuating problem: our resources are modest. In the magazine business, as in any other, it takes money to make money. Because we are based not at a company (much less one in the publishing business) but at a university—an entity that breathes great intellectual energy into the enterprise but is obliged to put higher spending priority on more traditional academic pursuits—we face a tight limit on the money we can invest.

So we could use a little help from our friends. If you, dear reader, are convinced by the above remarks that *Technology Review* may indeed be a highly rewarding medium (and available at a real bargain) for some of your organization's advertising efforts, and you are in a position to make or recommend such decisions, we ask that you act. Helping to make the magazine a little more *zaftig* would not only be useful to us and a value to your colleagues but a service to fellow readers: matching advertisers and audience is a benefit that cuts both ways. Needless to say, our associate publisher Peter Gellatly and his business staff will be happy to assist.

Our institutional parent, MIT, does not put out *Technology Review* to make a financial killing. Its motivations are largely altruistic, involving service to the public. Even the small self-serving component of its support, I believe, revolves around image enhancement more than the hope of long-term monetary reward. Yet although the intangible benefits of publishing the magazine may be vast, they are difficult to measure; meanwhile, the costs are easy to measure.

Though substantial dollar profit is not necessarily the goal, neither is a negative balance sheet. As Teyve, the earnest but struggling milkman in *Fiddler on the Roof*, observed, "It's no shame to be poor. But it's no great honor, either." At the very least, to paraphrase the time-honored rule of that ivy-covered institution down the street, "Every tripod on its own bottom." ■

—STEVEN J. MARCUS

Holiday Gift Ideas!

from Technology Review

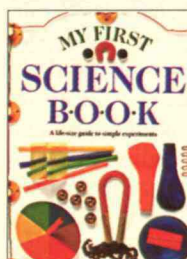


Technology Review books explore and explain, fascinate and delight. Readers young and old will welcome these carefully chosen titles to their library—as well as the learning that only great books can give!

My First Science Book

by Angela Wilkes

Kids can learn about the weather by making a rain gauge, barometer, and wind vane, or test acidity and alkalinity with their own litmus test. Includes instructions with color photographs, and clear explanations of why things happen. Over a dozen experiments.

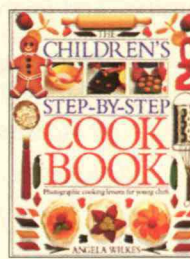


Ages 6–10, Hardcover, 48 pages, \$13.00

The Children's Step-by-Step Cookbook

by Angela Wilkes

The first cooking course for aspiring young cooks, with page after page of mouth watering dishes. More than 50 easy-to-follow recipes that are fun to make and delicious to eat! Clear step-by-step photographs show each stage of the recipe. Beautiful photographic cooking lessons.

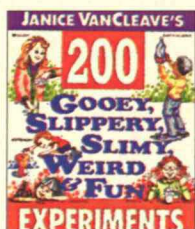


Ages 4–12, Hardcover, 128 pages, \$18.95

200 Goopy, Slippery, Slimy Experiments

by Janice VanCleave

Zany, wacky, entertaining, this book engages children's imaginations while answering their favorite questions about the environment. Your kids will have so much fun conducting these 100% fool-proof experiments they'll forget they're learning.

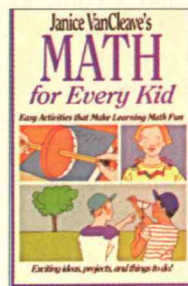


Ages 8–12, Paperback, 113 pages, \$12.00

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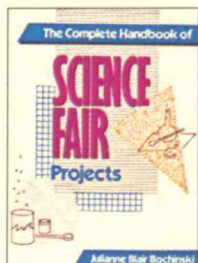


Ages 8–12, Paperback, 215 pages, \$10.95

The Complete Handbook of Science Fair Projects

by Julianne Blair Bochinski

The only book you'll need for selecting, preparing, and presenting award-winning science fair projects. Written by a veteran contestant and judge, this step-by-step guide describes 50 projects in detail and suggests 500 other topics suitable for grades 7 and up.

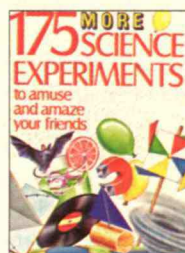


Ages 12 and up, Paperback, 206 pages, \$12.95

175 More Science Experiments

by Terry Cash, Steve Parker, & Barbara Taylor

A sequel to the popular *175 Science Experiments*, this book brings further enjoyment to curious kids. Within four main sections—Sound, Electricity, Simple Chemistry, and Weather—it provides a lively menu of experiments, tricks, and things to make.

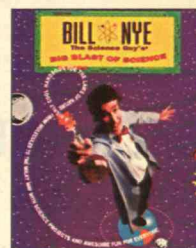


Ages 8–12, Paperback, 172 pages, \$12.00

Bill Nye The Science Guy's Big Blast of Science

by Bill Nye

A highly cool handbook for the laws of nature from molecules to the Milky Way. With science projects and awesome fun for everyone. Bill Nye the Science Guy knows how cool science can be! After all, everything in the universe involves science. You already think scientifically every day, even if you don't know it!

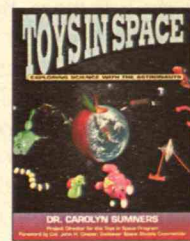


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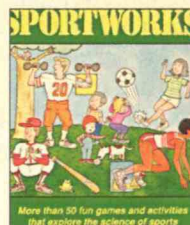


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Illustrated by Pat Cupples

Why does a curveball curve? What makes a good football helmet? How do figure skaters spin so fast, and don't they get dizzy? You find answers to these sports mysteries and much more in this fun-filled book by the world-famous Ontario Science Centre.



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Letters

THE MYTH OF THE DEFENSE GHETTO

In "Why Defense Reinvestment Won't Work" (TR July 1994), Bruce Berkowitz defines defense reinvestment in such a way that nobody could make it work. The Clinton administration is not trying to "use the existing defense industrial base as the spearhead for economic growth." What we are trying to do is break down the barriers between the military and commercial sectors that Pentagon rules and defense-procurement policy have built up over the past few decades, so we can maintain our technology-based military advantage with a much smaller defense budget. Dual use is not a strategy for "defense conversion," as the author suggests. Rather, it is a strategy for allowing DOD to draw more easily from the commercial sector to meet defense needs.

For example, the Department of Defense's Flat Panel Display Initiative, designed to foster a *commercial* U.S. display industry, is part of this strategy. By targeting investments in information technology, advanced manufacturing, advanced materials, and other areas, DOD is ensuring that commercial firms in this country can supply defense needs with leading-edge technologies at affordable costs.

The Technology Reinvestment Project is another part of this strategy. The TRP offers firms the opportunity to develop technologies that have both commercial and military applications. Eighty percent of the winning teams in TRP are partnerships between defense and commercial companies. Although defense stands to gain the most from the dual-use strategy, the civilian side of our economy will benefit as well. Certainly, DOD spending is small in relation to our whole economy, but it has a disproportionate effect since it is heavily weighted toward fostering leading-edge technologies, many of which will help to strengthen our commercial industries and, down the road, lead to the creation of high-quality jobs.

Berkowitz is on target in observing

that the federal government's needlessly cumbersome acquisition system is the greatest barrier to commercial-military integration, but he neglects to mention that, despite failures in past administrations, we are making progress in streamlining acquisition laws. The Senate recently passed legislation to reform the acquisition system, and the House is expected to take similar action soon. Moreover, DOD is aggressively eliminating unnecessary military specifications and standards in favor of commercial counterparts. There is more to do, but this is a substantial beginning.

President Clinton's defense reinvestment policy also includes first-class reemployment and retraining assistance to workers who lose their jobs at closed-up defense plants or shut-down military bases; a range of programs to help departing service men and women make the transition to civilian life, from the traditional GI Bill to the new "troops-to-teachers" and "troops-to-cops" opportunities; and redevelopment assistance to communities that have relied on defense spending for their economic livelihood.

Finally, the best defense transition strategy is a comprehensive one. This means government investments in things such as world-class education and training for all our children and workers, sustained support of fundamental research, technology extension services to help small businesses perform better, and partnerships with industry to develop commercial as well as dual-use technologies—thus fostering the growth of the knowledge-intensive, wealth-generating industries that are the source of good jobs and rising standards of living for all of us.

JOHN H. GIBBONS
Assistant to the President
for Science and Technology
Washington, D.C.

Berkowitz argues that defense workers with specialized skills will be able to magically find employment in the commercial sector after their defense employers collapse. This contradicts the

rest of his argument, in which he claims that defense-industrial skills are not easily adapted to harsh commercial realities. If the latter is true, then programs like the Technology Reinvestment Project may be effective tools for easing defense firms and their workers into the commercial sector.

MICHAEL TOPPA

ERIK PAGES

Defense Transitions Project

Business Executives for National Security
Washington, D.C.

Bruce Berkowitz's arguments concerning defense reinvestment policies are based on a distorted though common view of the defense industrial base. Berkowitz believes that defense companies are "hopelessly ill-suited for competing in commercial markets" because their management and organization are incompatible with the skills, knowledge, and culture needed to compete commercially.

This is an old and tired refrain that simply overlooks most of the firms in the defense industrial base. Although 100 defense contractors receive about two-thirds of defense prime contract awards, they pass a huge portion of those funds right through to subcontractors. Lockheed Fort Worth, Allied Signal, and Pratt & Whitney, for example, all estimate that they purchase 60 to 70 percent of the value of their output from suppliers. And this supplier base is vast. According to data from the U.S. Census, there are tens of thousands of facilities doing defense-related work, including half of all U.S. durable-goods manufacturers.

What's more, despite Berkowitz's unflattering comparison of defense firms with Ford and Honda, mass consumer markets are hardly the only kind of commercial market. Mack Truck and Cincinnati Milacron sell hundreds or thousands, not hundreds of thousands, of any particular model truck or industrial robot and would have as hard a time competing with Honda in mass markets as Lockheed would.

Berkowitz points to a few high-profile

cases where defense work is cordoned off from commercial manufacturing, but this unfairly belittles the technical and managerial skills of most establishments. At GE Aircraft Engines, commercial and military engines share management, inventory, R&D facilities, and manufacturing workstations. So too, Hewlett-Packard's Microwave Semiconductor Division, Hughes Aircraft's satellite operations, and Wyman-Gordon Co.'s Casting and Forging Division all integrate commercial and military production. These are some of the most commercially successful companies in America. Even Texas Instruments' mostly segregated Defense Systems and Electronics Group operates a production line for application-specific integrated circuits that sells half of its output to commercial customers.

As Berkowitz says, defense procurement makes up only a small percentage of the national economy. Thus, the tens of thousands of facilities in the defense industrial base cannot all be doing anything close to 100 percent defense-related work. Policy wonks on both sides of the conversion debate might begin to find common ground if they'd stop perpetuating the myth of the defense ghetto.

TODD A. WATKINS

Department of Economics
Lehigh University
Bethlehem, Pa.

Bruce Berkowitz is correct in stating that the nation should not invest "heavily in the defense sector to produce new job-creating economic growth." I would have been blunter. The federal government should not invest at all in the military-industrial sector in a futile effort to produce new job-creating growth. When automobiles became popular, manufacturers of wagons either adapted or went out of business. There is no point in trying to save obsolete industries, whether equine-powered or military-powered. Unfortunately, Congress finds it difficult to allow these industries to be phased out because it fears new industries will not move in to replace them.

But in Lebanon, Pa., where I grew up, steel mills, textile-knitting mills, and shoe and shirt factories closed after World War II. Today there is little unemployment because new industries are now taking advantage of that productive workforce.

WARREN HIMMELBERGER

Wellesley, Mass.

A NEW GENERATION ON ROUTE 128

For the past 25 years, I have pursued my career in New England at three of the firms Annalee Saxenian mentions in "Lessons From Silicon Valley" (*TR* July 1994): Digital Equipment, Apollo/Hewlett-Packard, and Data General. I have also spent many hours in Silicon

Valley as a developer, manufacturer, and employee. In my experience, Saxenian's hypothesis—that

the cultural and social differences between "laid back" California and the "buttoned-up" East Coast

are the underlying cause of Silicon Valley's relative success—has merit.

But I would point out that companies such as Digital, Prime Computer, and Data General had no alternative but to develop proprietary technology and to remain vertically integrated during the '70s because disk drives, central processing units, high-speed memory, magnetic tapes, and operating systems were not available at any price from other firms. These pioneering companies invented both new technologies and the processes to build them.

It wasn't until the Japanese began to manufacture these components as commodities during the early '80s that West Coast companies such as Apple and Sun Microsystems could produce computer systems cheaply, since the basic "stuff" of computers was available to everyone at competitive prices. These companies had an undeniable advantage in that



they had no history to overcome or existing customers to support.

A new generation of companies is forming in the East that is learning from past mistakes and combining the best East and West Coast characteristics. Many of us at such companies have had to leave our old jobs to start or join new companies to break away from the past. What's more, regional differences such as job switching and after-work beer blasts typical of Silicon Valley will become less important or practical as these new companies form global partnerships with other companies using information technology, as my current employer is doing.

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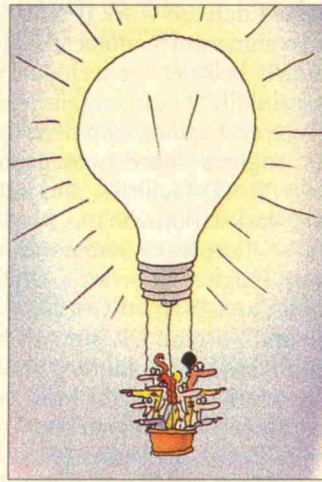
ORGANIZATIONAL TEAMWORK

"Innovation Congregations" by Tom Kiely (*TR April 1994*) leaves the mistaken impression that team product design originated quite recently in companies producing commercial goods. In fact, the team approach to development began almost a half-century ago in the military-industrial-university complex of the 1950s.

Development groups were then so large and included individuals from such heterogeneous backgrounds that the team approach—then called the systems approach—had to be institutionalized. Gen. Bernard Schriever, head of the Atlas intercontinental ballistic missile project, relied on a collective development process that involved hundreds of major contractors.

Study groups of academic and industrial engineers and scientists created the conceptual design of the SAGE air defense systems, and interdisciplinary teams at Lincoln Laboratory and elsewhere developed the second generation of Whirlwind-genre computers, computer networks, and advanced radar.

Parallel development—simultaneous pursuit of several solutions, which Kiely also describes—can be traced back to the Manhattan Project and was also commonplace in the military-funded



aerospace projects of the 1950s. At the beginning of the U.S. Navy-funded Polaris project to develop an intermediate-range ballistic missile, an interdisciplinary and interorganizational team launched propulsion, guidance, and structure sub-projects simultaneously. The complexity of managing concurrent development led the Navy and its industrial contractors to introduce computer planning and monitoring.

We too rarely acknowledge the remarkable impetus that the military-industrial-university complex gave to the development of new managerial approaches and technical problem-solving. In cooperation, the three could once again foster such innovations, especially in the realm of large-scale non-military-funded projects.

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I enjoyed Tom Kiely's article on teamwork—especially new-product development teams. Too often, such teams have been described in unrealistically positive terms, and some executives believe that teams will immediately produce positive results. The reality is that, in most cases, teams pose difficult organizational challenges and require significant time, energy, and resources.

While the transition to teams can be taxing, teamwork does offer tremendous

potential payoffs if it is introduced effectively. Improved productivity, quality, worker satisfaction, and reduced turnover and absenteeism are among the positive outcomes that organizations have enjoyed. Some might argue that they are becoming so prevalent that work teams no longer represent a real competitive advantage but simply a path that must be taken to keep up. Personally, I believe that tremendous competitive advantages are still available to organizations that prepare for and do teams well. Effective team systems require commitment, preparation, and realistic expectations.

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STRIKE LABOR UNIONS

I take exception to the notion raised in "Creating a Level Playing Field" (*TR May/June 1994*), by Richard J. Barnet and John Cavanagh, that all the good things in America come from labor unions and government regulations, and that we should force other countries to implement similar measures. Taiwan, Korea, and other Asian Tigers have prospered without the help of an extensive labor-union movement. If we really want to help Third World workers, we should encourage free markets, not "New Deal" socialist regulations.

Wages in Taiwan are 10 to 20 times higher than in China primarily because of capitalism, not because Taiwan has more labor regulations. The British economy after World War II was nearly destroyed by overpowerful labor unions. The decline of U.S. manufacturing was exacerbated by labor unions that interfered with the innovations needed for competitiveness. If we truly want a level playing field, we will allow the U.S. union movement to continue its downward spiral into the dustbin of history and begin the process of dismantling oppressive U.S. labor regulations.

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