

Technology Review

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BEYOND THE SHUTTLE

GETTING THE SPACE PLANE INTO ORBIT

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"Grown-ups tell us, 'Just say no.' That's easy for them to say."

"Maybe they forgot what it's like.

"At parties, at school, kids are saying to try this or do that, and they're my friends. I mean how many times can I hear I'm a loser.

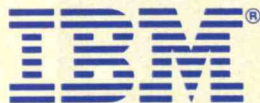
"Sure I'm scared of drugs. It's just there's so much pressure. You want to say no. But you can take a lot of heat for it."

Simple yes-no decisions aren't so simple when they involve kids and drugs.

That's why IBM has helped develop a computer-based, interactive video program that's now in schools. It simulates realistic social situations, and allows kids to make choices—about drugs, about alcohol, about themselves—and to experience the consequences, but without getting hurt.

The program is sponsored by the National Federation of State High School Associations, and preliminary results have been extremely encouraging.

To learn more about this program, write to us at IBM, P.O. Box 3974, Dept. 973, Peoria, IL 61614.



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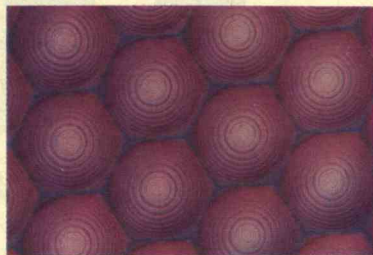
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PHOTO ESSAY/TEXT BY LAURA VAN DAM

Breakthrough in the effort to bore a tunnel under the English Channel may come as early as November. Billed as the largest civil-engineering project in Europe, the Chunnel is expected to open in late 1993.

COVER: Illustration by Ralph Mercer / Design by Kathleen Sayre

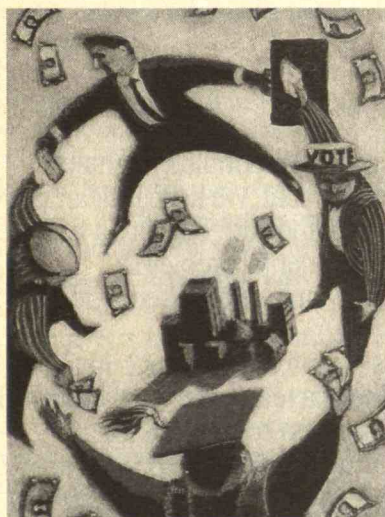
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"KEEP IT CLEAN."



Madeleine Marchese
General Manager, Marketing
Texaco Syngas Inc.

"For five years, Texaco's gasification technology lighted 100,000 homes with clean energy from coal. We keep it clean with a gasification process that we invented and perfected. It's a very workable solution to a difficult environmental problem."

Madeleine Marchese is General Manager, Marketing for Texaco Syngas Inc.

"Our coal gasification process has produced over 2.5 billion kilowatt hours of electricity for California residents. That's a record no other coal gasification process has even come close to."

"The Texaco process has not only been proven economically, it exceeds the clean air standards proposed by the Bush Administration. That proposal is for the year 2000. Texaco is ready now."

"As a technology, coal gasification is a powerful tool in the fight against acid rain. As an alternate energy source, it makes us more energy self-sufficient. We have a 300 year supply of coal at current consumption rates."

"Texaco people have even devised ingenious methods to expand the technology for the gasification of municipal sludge. Our process is designed not only to get rid of sludge but to *transform* it into usable energy."

Clearly, there is enormous potential for America and its environment. And for the future.



Star of the
American Road

TEXACO-WE'VE GOT THE ENERGY.

FirstLine

Truth, Beauty, and Peer Review

READERS not infrequently write to upbraid me for some outrageous statement perpetrated by a publication that they had always considered authoritative. They may readily agree that newspapers, as H.L. Mencken once put it, never report anything accurately and fairly except perhaps professional baseball. But to ensure that *Technology Review* doesn't again deviate from the path of truth, these readers often propose peer review of our articles: submitting them for approval to panels of experts. We decline.

Peer review is widely seen as the modern touchstone of truth. Scientists are roundly drubbed if they bypass it and "go public" with their research. Science writers count on it as the test for what to report on. Artists hold it up as the rebuttal to Sen. Jesse Helms, who would distribute arts funding according to his own morality. Ming Cho Lee, a professor at the Yale School of Drama, huffed in a letter to the *New York Times*: "The only criterion artists or arts organizations must meet to be entitled to my money is that they pass the vigorous scrutiny and evaluation of a panel of their peers, based on a standard of artistic excellence."

Peer review is doubtless useful to help evaluate articles for journals focused on a particular discipline and as one mechanism, albeit fallible, to allocate grants. But our society often wants to see peer review as a mechanical certification of truth for which no one has to take responsibility. No such mechanism is conceivable.

The first limitation of peer review is that nobody can say quite what it is. Journal editors give manuscripts to a panel of scholars who remain anonymous. Some journals publish only articles that receive a majority of votes, but articles rejected by one peer-reviewed journal are often published by another: this touchstone is wobbly. Reporting on

an American Medical Association conference on peer review in June 1989, Lawrence K. Altman of the *New York Times* noted that journal editors may reject articles that the panel praises or accept articles it criticizes. No one knows how often this happens because journals do not report their policies.

Rep. John Dingell (D-Mich.), who chairs the House Oversight and Investigations Subcommittee, treated the nation to a detective drama on this theme, sending Secret Service agents to sleuth through the raw data for an article that had received the peer-review seal of ap-

*There is no
mechanical way to
certify truth.*

proval through publication in *Cell*. (Full disclosure: one of the article's principal authors, David Baltimore, now president of Rockefeller University, is a columnist for this magazine.) The specific case aside, Dingell's fundamental question is: can we unequivocally trust results of peer review?

Of course not. At a conference held last April by MIT's Science, Technology, and Society Program, Marcia Angell, executive editor of *The New England Journal of Medicine*, stated flatly that despite the scrutiny of peer panels and editors, "fraud can't be discovered if it is plausible." This problem is less dreadful than it might seem. In practice, scientists regard journal articles skeptically, as statements in an ongoing debate. Time and replication of experiments are the real mechanisms science relies on to weed out error.

A more pernicious danger is that peer review may reject important work, particularly for research funds. As Charles W. McCutchen, a physicist at the National Institutes of Health, has put it, peers on the panel reviewing a grant applicant "profit by his success in drawing money into their collective field, and by his failure to do revolutionary research

that would lower their own ranking in the profession. It is in their interest to approve expensive, pedestrian proposals." He cites the case of Donald Glaser's research on the bubble chamber, an apparatus to display nuclear reactions for which he ultimately won the Nobel Prize in physics. The National Science Foundation and other agencies considered it "too speculative" to fund, but fortunately the University of Michigan scrounged up \$750 to support his work.

In our offices in what is known around MIT as W59, a two-story brick building from which Heinz ketchup was once distributed, we hope to emulate the University of Michigan. We look for the important idea that has not yet received official certification, the thinker the media do not yet consider a valid source.

We don't eschew expert advice: we may well ask informal opinions on unusual articles from knowledgeable people, often at MIT. But there can be no peer review of articles that inextricably blend fact and opinion. We have even had informal readers refuse to comment on manuscripts on the grounds that they don't want to become "silent co-authors." So we scratch our heads, discuss manuscripts, and make the best decision we can.

Then begins the editing process, an intellectual exploration involving countless further decisions to help authors clarify their thinking as well as their writing. Even if the original had been peer reviewed, the final result would not be. Editing ends at 6:00 in the evening of the day the final page proofs go to the printer with titles, blurbs, and captions. That's a frightening moment.

If the article is truly foolish, I can expect a barrage of letters, and time will likely set the matter straight. If we made the opposite mistake, failing to publish important new thinking, I can rest assured that I will never be blamed, except perhaps by one author. But that is the worst mistake possible. ■

JONATHAN SCHLEFER

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Letters

ANOTHER LOOK AT BRITAIN

To many of your British readers, Robert F. Makalevy III's remarks about social unrest in the United Kingdom are as offensive as they are ill-informed ("Dis-sent in Britain," *Letters*, *TR* April 1990). He paints a picture of civil unrest, rampant violent crime, repression of the "working class," and state killing of innocent and gentle Irish Republican Army supporters. I do not expect to shake his deep-seated prejudice, but your readers should know that the real picture is quite different.

In fact, the number of offenses recorded fell last year and is continuing to decline. Industrial strikes are at their lowest level in 40 years. More people are now employed than ever before in our history, and—the important bottom line—the take-home pay of the average head of household is at record level.

Furthermore, the dismal polemic on British industry fails to point out that manufacturing output is at its highest ever. The average British manufacturing employee produces over 50 percent more now than 10 years ago. Britain is at the top of the European investment-growth table, and we have the strongest public finances of any major industrial country.

As for Ireland, we make no apology for enforcing the law and defeating terrorism at home or abroad. Those who maim and murder innocents in the name of Irish nationalism should find no sanctuary or sympathy in either of our countries.

ANTHONY NELSON

London, England

Anthony Nelson is a member of Britain's House of Commons.

THE TRUTH ABOUT OIL

I object to John F. Flynn's remarks about the U.S. Council for Energy Awareness ("Propaganda in Advertising," *Letters*, *TR* July 1990). The advertisements my organization has created provide truthful and factual information. Each ad is researched, and none can justifiably be

called "hysterical propaganda."

Moreover, the situation to which the ads refer is serious. Through June 15, 1990, America's net oil imports this year were 46 percent of total consumption, 35 percent higher than before the oil embargo of 1973. We cannot allow ourselves to remain at that level of energy dependence. It is dangerous for our nation's economy and security.

Finally, to refer to U.S. use of nuclear-generated electricity as "irresponsible" displays a poor understanding of the technology. Nuclear energy currently supplies almost 20 percent of the electricity we use in this country, which makes it our second largest source after coal. It does the job cleanly, safely, and efficiently.

EDWARD L. ADUSS

Washington, D.C.

Edward L. Aduss is vice-president for advertising at the U.S. Council for Energy Awareness.

EXPENSIVE LIVES

I was somewhat stunned by Renee Twombly's "Saving Young Lives" (*Trends*, *TR* April 1990), which uses my name in its first sentence. The author says that machines like my company's high-frequency ventilator, which helps premature infants breathe, "can be a burden as well as a blessing," and the article as a whole is discouraging, asking whether technology might simply be adding to the high cost of medicine or postponing infant deaths.

Twombly notes that 30 percent of infants weighing less than 1,500 grams at birth have special medical problems, including cerebral palsy, blindness, and mental retardation. That figure may be going down every year as improvements in care are perfected, or it may not be. More and smaller infants are being saved as we continue to push the limits of survivability. But even if the percentage remains constant, it's worthwhile to look at the other side of the coin, which is that 70 percent of infants with such a low birth weight are going home

**NOW YOU'LL HAVE TO BLAME
SOMEONE ELSE IF YOU'RE LATE.**

Say that a dog ate your pants. Or that you had a dental emergency. But whatever you say, don't say it was because of Northwest Airlines. It's not very likely, and truth is, no one will believe you anymore. Among the top five U.S. airlines, we have the best on-time performance this year. We know that in the dog-eat-dog world of business, sometimes there's no excuse for being late. For U.S. reservations, call your travel agent or call Northwest at 1-800-225-2525.



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NORTHWEST AIRLINES



with no special problems. That means several thousand normal, healthy babies who would have died at birth only 15 years ago.

The expense of saving some of these children is staggering. I'm certain that few prospective parents expect their newborns to cost \$33,000 before they get them home. On the other hand, what about the burden families would have to bear if we were to choose to let babies die without a fight? Also, premature infants aren't the only ones whose lives are expensive to save. My trauma-physician friends tell me that victims of serious auto accidents encounter costs of \$60,000 to \$100,000.

Certainly prevention is superior to heroic treatment. We all wish there were no preemies, just as we all wish there were no auto accidents. And it would be nice if doctors had foolproof ways of knowing ahead of time how severe the complications of treating these patients would be, so a system for assessing the quality of life might be established. But we're a long way from being able to perform such feats.

For those of us in the field of developing better ways of caring for babies that are born too soon, the trends are not discouraging. Not every infant we help save is a miracle, but miracles far outnumber tragedies in this business. And while they are expensive, most of us consider them a bargain.

J. BERT BUNNELL
Salt Lake City, Utah

DEVELOPMENT IN INDIA

"Development Without Growth: The Kerala Experiment" by Richard Franke and Barbara Chasin (*TR April 1990*) is excellent, but the authors ignore some areas in their list of suggestions for future initiatives.

First of all, garbage and storm water in low-lying urban areas of the Indian state not only pose a threat to road transportation but could also create an environmental hazard. While it is clear that any socialist government, including Kerala's, will tend to emphasize redistri-



bution, this approach is questionable when an infrastructure is in such a state of disrepair.

Moreover, a significant portion of the state's net income originates from expatriate labor, and the remittances these workers have received may have played a role in inflating wage expectations in Kerala. Such income may have also laid the basis for many development-oriented programs. A question arises: Is further development possible now that layoffs in the Persian Gulf states are causing the remittances to dry up?

Another problem is that the influx of money has helped create social tensions. That is, Keralites who missed the "Gulf Airbus" sometimes seem to be telling their more fortunate fellow citizens, "Your money is welcome but you are not." Increasing crime in urban areas is often the result.

Keralites have a built-in classification scheme that favors decentralized, small-scale efforts. Centralized, large-scale efforts, by contrast, receive little support—even though they could provide important benefits such as subsidized education and welfare disbursements. A more balanced approach

should be stressed.

NAGENDRA SUBBAKRISHNA
Philadelphia, Pa.

The information that Richard Franke and Barbara Chasin supply about development without growth in Kerala, India, may not apply to many other places, but it does mark a unique approach to the problems of poverty.

The thing that puzzled me was the lack of reference to Christianity. The area happens to be the oldest and most Christian part of the subcontinent; tradition holds that St. Thomas established the church there in the first century. Certainly the state saw later enhancements of Christianity, along with Judaism, in the mission era that followed the age of explorers and commercial interests.

My sources indicate that the mission effort created the high literacy rate, and that this improvement in turn helped the communists spread their doctrines. Today Islam, Christianity, and Hinduism all thrive in Kerala, and the Syrian Orthodox Church of South India, the Mar Thoma Church (largely under Protestant influence), and the Eastern Rite Roman Catholic Church continue to provide education, often subsidized by the state of Kerala.

CLIFFORD H. FIELD
Shelton, Conn.

The authors respond:

In answer to Nagendra Subbakrishna, environmental hazards indeed plague Kerala. The state's radical political tradition has produced India's broadest ecology organization, led by the People's Science Movement, which attempts to respond to such problems.

Middle East remittances deserve detailed study, but they are not directly relevant to the redistribution issue, since they are not specially taxed. We are unaware of any research linking urban crime with them or attitudes toward them.

Mr. Field is correct in saying that Christianity played an important part in *Continued on page 75*