

tional regulation and taxes to spur conservation, concentrating instead on encouraging energy production.

The report, which was requested by Congress, notes that if current trends continue, the concentration of greenhouse gases in the atmosphere would climb to roughly double the pre-Industrial Revolution level by the middle of the next century. The result, says the report, would be somewhere between a modest 1°C increase in global temperatures and a catastrophic 5°C jump—a broader range than many other scientific analyses, which generally predict a rise of 2°C to 5°C. The committee adds that it cannot rule out nasty surprises, such as a sudden increase in atmospheric methane caused by the melting of high-altitude tundra, or significant melting of the West Antarctic ice sheet, resulting in a sea level “several meters higher than it is today.”

In the short term, the panel points out that the biggest reduction in greenhouse gas emissions will come from phasing out chlorofluorocarbons (CFCs), which currently account for about 10% of global greenhouse gas emissions. Fortunately, the United States, along with most other major CFC users, agreed last year to stop using these compounds by 2000 in an effort to arrest erosion of the ozone layer (see page 204).

Carbon dioxide, which accounts for two-thirds of greenhouse gas emissions (methane and CFCs account for most of the rest), is a tougher problem. The trick in setting public policy will be to encourage individuals and businesses to do what is in their own long-term economic interest: conserve fossil fuels by making investments in technologies that eventually pay for themselves in lower energy costs. “The efficiency of practically every end use of energy can be improved relatively inexpensively,” the report notes. But it may require higher energy prices, low-cost loans, and regulations to convince consumers and businesses of the wisdom of switching to more efficient lighting, heating, and cooling, and making vehicles that get more miles to the gallon. The federal government should also “sharply increase the emphasis on energy efficiency in the energy research and development budget,” and put more emphasis on alternatives to fossil fuels, including R&D on solar energy and safer nuclear plants, the panel says.

Sound familiar? Perhaps that is because many of these ideas first circulated in the late 1970s and early 1980s in response to rapidly increasing oil prices. They went out of vogue in the laissez faire economic climate of the Reagan years. But now concern over greenhouse warming, rather than fears of OPEC, have brought them back to center stage. ■ COLIN NORMAN

## Microbes and “The Trabi Problem”

One of the most popular films now showing in Germany (both east and west) is a comedy called *Go Trabi Go*. The plot has an east German family celebrating post-unification freedom to travel by piling into the family sedan and heading for Italy. One of the running gags is their vehicle: the Trabant (“Trabi” for short), a smoke-belching product of socialist engineering with a two-stroke engine and a plastic body. Along the way to the Mediterranean, the family car suffers many indignities, including being mistaken for junk at an auto graveyard.

And that’s where, like all comedies, this one cuts close to a home truth: The Trabi is on its way to the junkyard. Last year Volkswagen signed a deal to begin building cars at sites where the boxlike sedan has been produced; the plan was to phase out the Trabant by 1993. But that will present an enormous waste-disposal problem. It seems that, while the Trabi’s two-stroke engine was famous for breaking down, its plastic shell is all but indestructible. The reason is that the shell is made of cellulose filling covered by phenol formaldehyde resins that make up a “duroplastic” which, unlike ordinary thermoplastics, cannot be melted down.

That is what some German officials—all joking aside—refer to as “The Trabant Problem.” In addition to the Trabis already moldering in auto graveyards, there are still 2 million of them on the road. Each time a proud new east German capitalist replaces his Trabi with a shiny new VW or BMW, more than 1400 pounds of unrecyclable plastic heads for the scrap heap. At the moment, the only way to get rid of all those Trabi bodies is to burn them (giving off toxic gases that only add to east Germany’s foul air) or dump them into overcrowded landfills.

Which is where science comes in. During the past few months, an east Berlin biotech company has been looking into the possibility of a biological solution to the Trabant problem—microorganisms capable of biodegrading Trabi resins. A team of microbiologists at IFZ Biotechnology Research and Development Company (a former east German state enterprise with a staff of about 100) has identified several species of bacteria and fungi that might be up to the tough job of having a Trabi body for dinner.

Those strains, which the German newspaper *Das Bild* has lumped together under the fanciful name *Trabicilli*, are found naturally in the environment—mainly in the area around production plants where resins are synthesized, as well as in landfills where plastic products have been dumped. The microbiologists at IFZ are still working out the details of how the bugs metabolize the resins. If the process turns out to be practical on a large scale, the plastic from the Trabant would have to be broken down into particles of about 2 square millimeters. They would be introduced into a reactor, yielding biological residues, carbon dioxide, and water. The residues would be converted to nontoxic gas in a separate chamber.

Promising as the *Trabicillus* approach may be, it isn’t right around the corner. Franz Weissbach, the chemist leading the company’s project, acknowledges that he doesn’t yet know “whether our process will be practical or economical. We hope that within the next 2 years we will have an answer to that.” Nevertheless, the group has already come up with a process based on fungi from the genus *Penicillium* for degrading the cellulose part of the Trabant body.

And in a clear sign that the capitalist ethos is taking root, and that socialism is going the way of the Trabi, Weissbach declines to identify the precise microorganisms involved. “It’s a trade secret,” he says slyly.

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On the junkheap of history. Trabant bodies in eastern Germany.