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believes that, before long, the hierarchical firm must yield to the "information-based organization," if U.S. business is to remain competitive.

Industry's increasing reliance on "knowledge workers" necessitates the change. Computers can generate so much data that top executives "risk being swamped" if authority is not pushed down to lower levels. The pushing will mean a paring of middle-managers who now "neither make decisions nor lead," but function primarily as information "relays."

The information-based firm will resemble the owner-managed corporations of the 19th century, with a difference. In those companies, expertise—about products, markets, and so forth—rested with the proprietors. In the future, it will rest with specialists who report to the boss. Companies, says Drucker, will be like an orchestra, where a conductor may direct 100 musicians without a "half-dozen division VP conductors." Specialists will be organized for specific tasks, just as hospitals form teams—internists, radiologists, anesthesiologists, et al.—to treat a patient.

The new streamlined corporate structure will reduce management ranks by almost two-thirds, sharply curbing promotions from within. Career paths will increasingly lead from firm to firm, both for the would-be bosses *and* the specialists, who may seek to move to a larger or more prestigious employer even without a gain in rank. As Drucker notes, while "bassoonists presumably neither want nor expect to be anything but bassoonists," they might aspire to play for a better orchestra.

Stripping Genes

"Biotechnology and the Regulation Hydra" by Peter W. Huber, in *Technology Review* (Nov.-Dec. 1987), Building W59, Mass. Institute of Technology, Cambridge, Mass. 02139.

Biotechnology may yet yield dozens of valuable new products and a thriving new U.S. industry. But a regulatory mess is dimming such prospects.

By law, the federal government oversees the testing of *all* genetically engineered products, whether or not they are ever marketed. In theory, notes Huber, a Manhattan Institute fellow, researchers have only to get an agency's permission before beginning gene-altering experiments. In practice, the process is one of "ponderous disorder." At least five federal agencies—led by the Department of Agriculture (USDA), the Food and Drug Administration (FDA), and the Environmental Protection Agency—regulate biotechnology. The costly result: "high regulatory barriers very early in a product's lifecycle." Genentech was barred from testing an interferon vaccine for cows for a year while U.S. officials debated whether the product was a "veterinary biologic" under USDA's purview or a "new animal drug" to be controlled by the FDA.

Increasingly, meanwhile, the courts are intervening. In a 1984 case, U.S. District Judge John Sirica cited the National Environmental Policy Act of 1969 to halt a University of California test of frost-inhibiting bacteria: No environmental-impact statement had been filed.

Conventional genetic engineering—crop breeding or animal husbandry—faces "few regulatory obstacles," notes Huber. But such engineering *in the laboratory* stirs suspicions among public officials and envi-

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ronmentalists, even though a National Academy of Sciences panel found that genetically altered organisms “pose no unique ecological hazards.”

Stringent regulation is forcing some scientists to do their work abroad. Philadelphia’s Wistar Institute has tested a cow rabies vaccine in Argentina. Oregon State University researchers studied an antiviral animal vaccine in New Zealand. Some biotechnology companies, Huber reports, are considering partnerships with Japanese firms, so as to be able to experiment “without U.S. government oversight.”

Huber calls for a reformed approval process in which a biotechnology firm would deal with “one division of [one] agency,” and courts would resist “endless fine-tuning” of prior agency decisions. Otherwise, continuing regulatory unpredictability will surely “sink many undertakings regardless of their scientific and economic merits.”

Safety in the Skies

“Air Safety, Deregulation, and Public Policy” by Steven A. Morrison and Clifford Winston, in *The Brookings Review* (Winter 1988), Brookings Institution, 1775 Massachusetts Ave. N.W., Washington, D.C. 20036.

In 1978, Congress stripped away the comfortable regulatory cocoon within which U.S. airlines had operated for 40 years. Decisions on “economic” matters (routes, fares, launching new carriers), long made by the Civil Aeronautics Board, were left to the executives in the industry.

Since then, some critics contend, airline safety has suffered. Facing intense competition, they argue, operators have slashed maintenance and hired less experienced, less expensive mechanics and pilots.

But Morrison, an economist at Northeastern University, and Winston, a Brookings fellow, find that deregulation “has not impaired air safety.”

According to National Transportation Safety Board records, between 1965 and 1975, a period of strict regulation, there were 42 fatal crashes. Between 1976 and 1986, however, the number of such accidents *dropped* to 15—even though airline flights rose by eight percent and airplane passenger-miles increased by 52 percent over the previous decade.

Moreover, the pilots involved in the fatal 1976–86 crashes were, on average, older and more experienced than those in the 1965–75 accidents. This, the authors suggest, shows that “less-experienced pilots” are not “increasingly involved in accidents.” Only *one* of the post-deregulation crashes was caused by improper maintenance.

The authors calculate that, as a result of deregulation, aviation insurance rates are 22 percent below what underwriters might be charging if regulation had continued. The insurers, whose profits come from successfully gauging risk, have judged that “the strength of market forces” has increased airline safety; they have cut premiums accordingly.

Stricter government-mandated safety policies, the authors believe, might decrease *overall* transportation safety, if resulting higher air fares persuade many travelers to drive instead of fly. Rather than re-regulate the airlines, the government should assign more air traffic controllers to busy airports, and press for “peak-load pricing systems” under which passengers would pay more to fly during congested periods.