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SCIENCE

Associations and Democracy

"Americans of all ages, all conditions, and all dispositions constantly form associations. They have not only commercial and manufacturing companies, in which all take part, but associations of a thousand other kinds, religious, moral, serious, futile, general or restricted, enormous or diminutive. The Americans make associations to give entertainments, to found seminaries, to build inns, to construct churches, to diffuse books, to send missionaries to the antipodes. If it is proposed to inculcate some truth or to foster some feeling by the encouragement of a great example, they form a society. Wherever at the head of some new undertaking you see the government in France, or a man of rank in England, in the United States you will be sure to find an association.

"The first time I heard in the United States that a hundred thousand men had bound themselves publicly to abstain from spirituous liquors, it appeared to me more like a joke than a serious engagement, and I did not at once perceive why these temperate citizens could not content themselves with drinking water by their own firesides. I at last understood that these hundred thousand Americans, alarmed by the progress of drunkenness around them, had made up their minds to patronize temperance. . . .

"[I]f these hundred thousand men had lived in France, each of them would singly have memorialized the government. . . . In aristocratic societies men do not need to combine in order to act, because . . . every wealthy and powerful citizen constitutes the head of a permanent and compulsory association, composed of all those who are dependent upon him or whom he makes subservient to the execution of his designs. . . . Among democratic nations, on the contrary, all the citizens are independent and feeble; they can do hardly anything by themselves, and none of them can oblige his fellow men to lend him their assistance. They all, therefore, become powerless if they do not learn voluntarily to help one another. Governments, therefore, should not be the only active powers; associations ought, in democratic nations, to stand in lieu of those powerful private individuals whom the equality of conditions has swept away."*

De Tocqueville in his prescient way predicted the vital role of associations in a pluralistic and increasingly specialized society. Associations of scientists have proliferated, from subspecialties such as clinical chemists to umbrella organizations such as the AAAS and the National Academy of Sciences. They compete for attention with associations of lawyers, nurses, and librarians. How can Congress and the Executive Branch respond to messages from all these associations? On the basis of the numbers? Ideally no, but practically somewhat. On the significance and wisdom of the message? Ideally yes, but practically, not entirely. If the content of the message were all important, would not that of a farsighted individual contribute more than the blandly worded compromise of an association? It is often said that "a camel is a horse designed by a committee." A message from an association involves a filtering process. Politicians are comforted that crackpot ideas are eliminated. The price may be elimination of the most brilliant ones also.

Are, in fact, our associations doing their jobs well? In certain respects—publishing journals, providing communication, and running meetings—they have proved most adept. In others—evaluating the future of their professions, identifying employment prospects for students, explaining their needs to Washington—their performance is episodic. Some do well; others poorly. If science is to play an increasingly important role in modern society, then the associations that de Tocqueville predicted would be so important to a democracy must constantly prove their effectiveness. We scientists should both contribute to and demand performance from our professional societies.—DANIEL E. KOSHLAND, JR.

*A. de Tocqueville, *Democracy in America*, first U.S. edition 1840, quoted from Knopf edition (New York, 1946), vol. 2, chap. 5.

spread recognition that ambiguities in the treaty language facilitate such claims. Warnke, for example, says that he is "troubled because the SS25 obviously pushes the treaty pretty hard. The provision is not a masterpiece of clarity, however." Similarly, Spurgeon Keeny, director of the Arms Control Association, believes that "it's not a definitive case." And Turner also says that he is "skeptical—it's simply not that precise."

Thus far, the Reagan Administration has demanded only that the SS25 tests be stopped until the dispute can be resolved through negotiation, a demand that the Soviets have obviously ignored. Beyond this, various parts of the bureaucracy have been unable to come to an agreement. Ironically, at the Pentagon, where the violations have been bitterly denounced, many officials actually favor deployment of the SS25, so long as the United States can test and deploy a prohibited new missile of its own in response, the single-warhead Midgetman.

In addition, there is now a fairly broad consensus in Washington that small missiles of the SS25 type may actually increase global stability, because they threaten fewer military assets and present a somewhat less inviting target. As President Reagan's special Commission on Strategic Forces concluded in April 1983, "over the long run, stability would be fostered by a dual approach toward arms control and ICBM deployments which moves toward encouraging small, single-warhead ICBMs."

Mark Crawford, formerly a correspondent with *Business Week* and other McGraw-Hill publications, has joined the News and Comment staff of *Science*.

At his most recent press conference, Reagan indicated that a final decision on U.S. abrogation of SALT II would be delayed until the U.S.S. *Alaska* is ready to embark. Earlier, he had promised that the United States would continue to respect the treaty, only to be corrected by some of his appointees at the State Department, who said that any decision would hinge in part on a willingness by the Soviets to accede to U.S. demands in the ongoing Geneva arms talks.

Some officials doubt that the prospect of continued compliance with SALT II will offer much bargaining leverage, however. They believe that the Soviet Union has more to gain if the treaty is abandoned, because it could pack additional warheads atop existing missiles, and deploy a fleet of new Soviet submarines, hundreds of new long-range cruise missiles, and several additional types of land-based missiles, all without retiring existing strategic weapons. The officials also argue that such a decision would outrage U.S. allies. This view is also taken by much of the arms control community—even by those who concede that Soviet behavior has exposed significant defects in SALT II.

It is, in short, one of Washington's most unusual arms control debates. On one side are those who fault the treaty overall, yet firmly believe that two of its key provisions are clear enough to sustain a public claim of Soviet cheating. They want the treaty scrapped. On the other side are those who drafted the treaty and continue to support it, yet firmly believe that the provisions at issue are inherently defective. A reasonable middle ground is that both sides should work to repair the defects, and then continue to respect its limitations. But this is highly improbable, given the generally poor climate engendered by the cheating allegations and the small chance that Reagan would eventually submit even an amended version of the treaty to the Senate for ratification. No real progress is likely for some time.

—R. JEFFREY SMITH

This is the third in a series of articles on United States–Soviet treaty compliance. The next will examine additional allegations of Soviet treaty violations.

Japan and the Economics of Invention

A meeting on innovation was dominated by discussion of how the United States can shore up its international competitiveness

Palo Alto, California. Two hundred business and academic leaders got together at Stanford University last month for a conference on the economics of invention.* That was the official topic, but unofficially, the subject became Japan.

The business speakers came from companies that use a lot of basic research and from investment firms that channel money into high-risk ventures. They talked about inventiveness and worried about Japan's success in high-tech fields. The electronics executives were especially edgy, as many seemed to be searching for survival strategies. Not so long ago they would have been worried about keeping up with clients' orders.

A few speakers argued that competitors like Japan are not to be feared or, in any case, not to be prevented from joining the game. According to this view—articulated by Harvey Brooks, professor of technology and public policy at Harvard—America should avoid seeing the competition as a zero-sum game in which one player's gain is another's loss. Rather, America should welcome an expanding market for high-technology goods and should expect to benefit.

Gordon Moore, founder and now chairman of Intel, the silicon chip maker, warned that high-tech industries will find "no salvation" from foreign competition. "In electronics," he said, "the U.S. trade with Japan last year was minus $15 billion. . . . Our electronic trade deficit with Japan is greater than our automotive trade deficit . . . and it is projected to grow to minus $20 billion this year. Even in leading-edge semiconductor technologies, the balance of trade turned negative in 1980 and was $800 million negative last year. It is increasing rapidly in that direction." He added that electronics manufacturing is "going offshore" (especially to Asia) at an "extremely rapid pace," and that technological leadership will probably go with it.

Stanford economist Masahiko A[illegible]i predicted that Japan will becom[illegible] largest capital exporter in the [illegible] 1980's." Japan exported $[illegible] 1984 alone and invested $[illegible] common stock and [illegible]

*"Symposium on Economics and Technology," 17–19 March 1985, sponsored by the National Academy of Engineering, the Center for Economic Policy Research, and the Departments of Chemistry and Chemical Engineering at Stanford.

called baculovirus, has attracted attention by researchers as a potential commercial pesticide. Lois K. Miller of the University of Idaho and Max D. Summers of Texas A&M University noted that baculoviruses infect and kill a variety of insects, including species of caterpillars, gypsy moths, and mosquitoes. Miller is studying the regulation of baculovirus DNA, which could lead to a better understanding of how to enhance the virus's toxic characteristics and expand its host range as well.

Summers also noted that baculoviruses may help produce commercial quantities of biologics. Biotechnology companies are already using bacteria and yeast to pump out large yields of biological material, but baculoviruses may prove to be more efficient. These viruses naturally produce a substantial amount of protein and Summers and others are probing the genetic makeup of the virus to tap into this system with foreign genes coding for other proteins. In fact, Summers reported that he and colleagues have succesfully modified the virus to produce beta-interferon at high levels.

Scientists are also studying the use of viruses in the transmission of genes to alter the germ cells in mammals—for example, to enhance milk production in cows.

While the research appears promising, EPA scientist Daphne Kamely is concerned about the potential impact of modified viruses on human health and the environment. Kamely, who is in the Office of Research and Development, noted that the fate of baculoviruses and retroviruses is not well understood. Studies are now being conducted at Harvard and at the National Institutes of Health to develop risk assessment models that may help EPA to evaluate the consequences of the release of viruses into the environment. Bernard Fields of Harvard observed that based on his studies, "the more one modifies a virus, the more attentuated it is in the host and the more weakened it becomes in the environment."

Kamely said she is collaborating with scientists at Johns Hopkins in studies of the environmental fate of these viruses.

EPA has not received any requests to field-test modified baculoviruses, but several companies and researchers are seeking permission to test microbial pesticides made through gene splicing.

David Miller of the Genetics Institute, a Boston-based biotechnology company, noted that much more research will need to be conducted before viral pesticides become commercially useful. He said that the environmental stability is not long enough and the viruses do not act fast enough to satisfy farmers. But the tools of genetic engineering may change that. "This is an area of burgeoning interest," he said.—MARJORIE SUN

High Energy Physics

Hard Sell for SSC

A proposal by European physicists to build the world's next big particle accelerator went over like a proverbial lead balloon at a symposium organized by their U.S. counterparts at the annual meeting of the AAAS. "Scientifically, I think it would be better for everyone to cooperate on the construction of a new accelerator in the United States," said Leon Lederman, director of the Fermi National Accelerator Laboratory.

Lederman and four other eminent particle physicists organized the symposium in an attempt to convince the U.S. scientific community that a mammoth new accelerator, known as the Superconducting Super Collider or SSC, will be worth its estimated $4- to $6-billion cost. Congressional approval will not be sought until 1987, but already those involved are a bit defensive because, as Lederman explained, scientists in many other fields, such as astronomy, are seeking substantial new appropriations, and some fear that the government will insist on compensating cutbacks in existing research.

Not surprisingly, the greeting for a proposal by the European Laboratory for Particle Physics (CERN) to construct a similar accelerator at one-sixth the cost was not warm (*Science*, 24 May, p. 968). "We don't think it addresses the crucial scientific problems," Lederman said. He and Stanley Wojcicki, chairman of the Stanford physics department, emphasized that the design of the CERN accelerator would necessarily limit its power to a fraction of that planned for the U.S. device, allowing it to reach the level of greatest scientific interest with scarcely any safety margin. "If you're going to spend billions of dollars, you want to address the problems solidly," Lederman said. "We will have a considerable safety margin in both power and luminosity," which may be needed to detect the most basic particles.

The participants agreed that it is unlikely for both a U.S. and European machine to be built. "We certainly would welcome European participation in all phases of our design," as well as in experimentation, Wojcicki said. Along with the others, he used terms such as "scientific imperative," "impasse," "scientific drive," and "scientific crisis" to describe the set of events that gave rise to the accelerator idea. Specifically, Lederman said, research with less powerful accelerators had revealed defects in common understandings about the composition of matter. The concept of a new accelerator, capable of operation in the range of 40 TeV collision energy, was endorsed in 1983 by a federal advisory panel headed by Wojcicki, who is now deputy director of the accelerator design group.

The AAAS symposium was actually only the latest effort in a long -running sales campaign. Other aspects include the publication of glowing articles by the principal scientists in *Scientific American*, *Physics Today*, and *American Scientist*, as well as wide distribution of a colorful booklet on the accelerator with chapters titled, "The cosmic connection," "Particle physics and society," and "SCC and the environment." The publisher is Universities Research Association, the primary recipient of federal funds for the accelerator's design.

—R. JEFFREY SMITH

Future AAAS Meetings

Changes in the Wind

This year's meeting focused attention on a troubling question about the future of broad-based scientific gatherings such as this. Attendance at the meeting, the 151st sponsored by the AAAS, was the lowest in more than 5 years, the latest reflection of steadily dropping enthusiasm and sharply rising costs associated with such a large, multidisciplinary, conference.

Paid registration was only 2300, which meant that at some sessions, journalists outnumbered scientists. Some of the speakers attended only their own session. A daylong seminar on the 1990 census, held on the final day of the conference, attracted an audience of one.

"We have some basis for believing that some people attended without registering," says William Carey, Executive Director of the AAAS. "But the attendance was clearly less than it should have been." A study committee, composed largely of AAAS section officers, has been formed to recommend improvements in the meeting format and management.—R. JEFFREY SMITH

Supercomputer Restrictions Pose Problems for NSF, Universities

A remote possibility that Soviet or Eastern European citizens could gain access to U.S. supercomputers to run military programs has prompted a high-level review by an interagency committee. Although such concerns are dismissed as groundless by some observers, they have caused problems in the contractual arrangements between the National Science Foundation (NSF) and the four supercomputer centers the foundation is establishing on university campuses. Some federal officials want access to the computers to be strictly limited, but the universities are anxious about the threat this would pose to their academic freedom, and NSF has found itself caught in the middle.

The concern stems from the fact that the Soviet Union does not possess supercomputer technology and thus cannot perform some highly complex calculations that require huge amounts of machine time. Such applications include many in the national security area. For example, supercomputers are widely used by U.S. intelligence agencies for such tasks as signals processing and by weapons designers to perform a variety of calculations and simulations.

Recently, Defense and State Department officials have been arguing that Soviet bloc scientists visiting the United States might clandestinely run such programs on U.S. machines, and the matter has been taken up by an interagency committee chaired by William Schneider, under secretary of state for security assistance.

Schneider's office is concerned in particular about access to computers in the academic supercomputing centers being established by NSF at the University of Illinois, Cornell University, Princeton University, and the University of California at San Diego. NSF was asked to put a clause in the contracts for the centers that would deny access to the machines by citizens from countries that are subject to international export control regulations—essentially the Soviet bloc countries and China. The clause would not have stopped them from participating in research projects but would have prevented them from actually logging on to the supercomputers to run programs.

The universities objected, however, because such a clause would infringe directly on their academic freedom. After negotiations that one participant describes as being "a mutual problem-solving effort between NSF, the security agencies, and the scientific community," the clause was dropped and replaced by language stating that the centers will adhere to whatever policy is finally adopted by Schneider's committee.

So far, the contracts have been signed by the John Von Neumann Center at Princeton and the San Diego center. Cornell and Illinois are still deciding what to do. They are reluctant to sign a contract that could tie them to a policy that has not even been developed yet. "We have a difference of opinion on how to preserve our academic freedom," says one university official. "It is against the policy of this university to discriminate on the basis of citizenship," he said. People on both sides say they are hopeful that an accommodation will be reached, however.

In the meantime, Schneider's committee is trying to develop a policy governing access to all supercomputers owned by the federal government or under government control. According to one participant, the problem has been greatly exaggerated. Those who have been raising concerns, he said, "don't understand that people can't just come in and bring a weapons code in their briefcase" and run it on a machine.

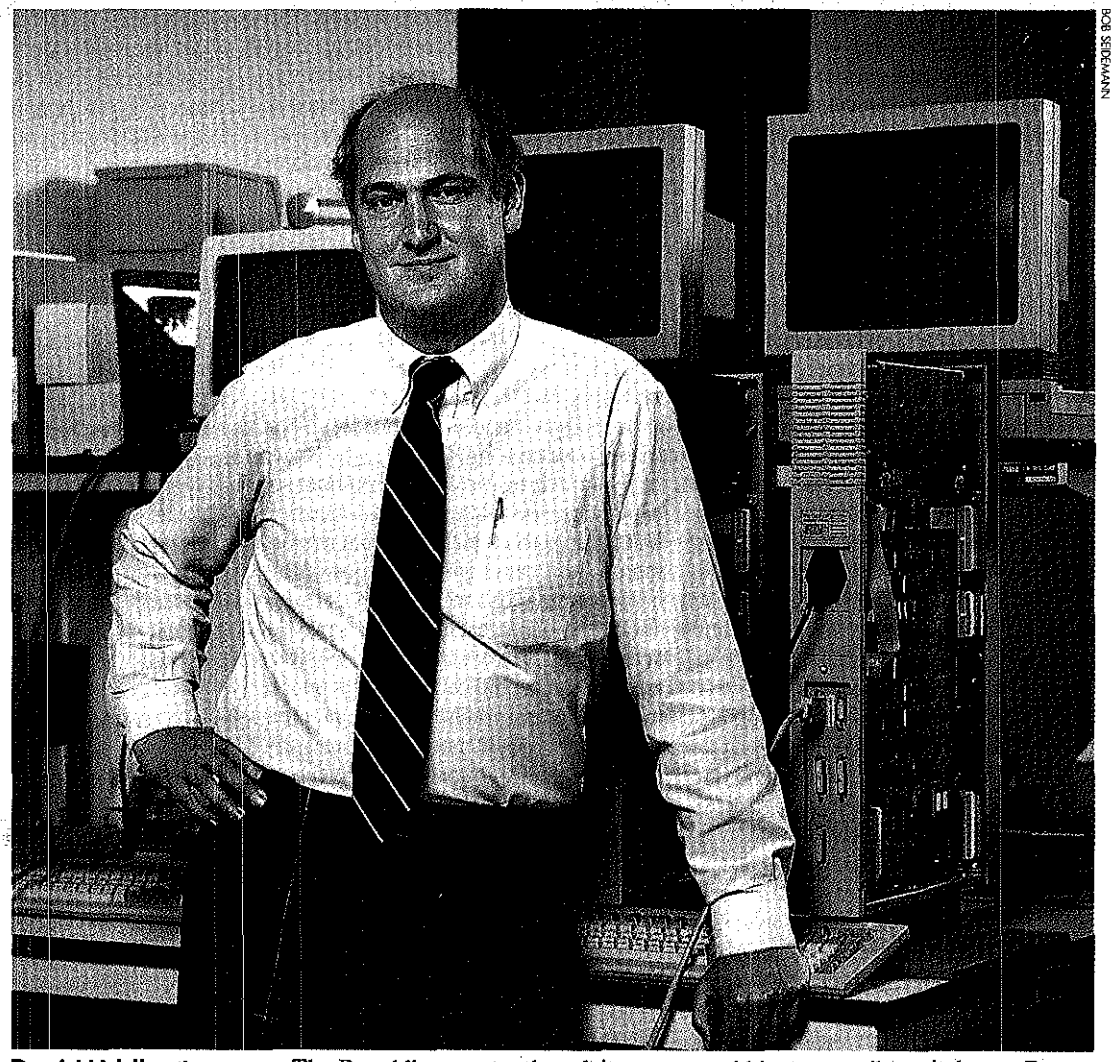
The kinds of uses that would pose a threat would be very sophisticated and chew up large amounts of machine time. Such uses could be guarded against by a variety of measures including program sampling, watching for very long runs, and so on, this official believes.

At present, the committee is at an early stage of its deliberations and will be collecting information over the summer. A final policy is not expected until the fall. —**COLIN NORMAN**

tives prodded NIH to expand its role, without advocating that it go very far outside of the medical field, other speakers at the advisory committee meeting defended the value of the status quo. Theodore Cooper of Upjohn, a former director of the heart institute, was summoned as a heavy-hitter for the institutes. Said Cooper, "U.S. leadership in science was created by science itself," and not by government policy or any directed effort. Arguing that research development is best left to industry, Cooper said that the way to maintain a competitive edge in basic science is to "let the NIH be the NIH." He did, however, raise one troublesome issue that several other speakers noted also—namely U.S training of foreign scientists, particularly the Japanese who become competitors. It is noteworthy that the United States has no major program for sending American scientists either to Europe or Japan for biotechnology training, speakers observed.

Two other participants who urged NIH to maintain its focused mission were former NIH director Donald S. Fredrickson, now president of the Howard Hughes Medical Institute, and Stanford University president Donald Kennedy. "NIH cannot and should not radically change," said Fredrickson, who added that NIH "can't supply all of industry's needs." Kennedy took the position that NIH should continue to focus on biomedical research, in part because he believes that much of what the biotechnology industry requires competitively includes things that NIH could not supply even if it wanted to. Issues regarding industrial collaboration with universities, he said, are for universities to settle. Availability of venture capital and other investment funds are not within NIH's purview. Nor, he said, are regulatory issues related to industry's belief that U.S. laws place it at a competitive disadvantage. "Stay with what you're good at," he said.

If the advisory meeting was meant to resolve the issue of NIH's biotechnology role, it probably failed. Wyngaarden summarized Keyworth's view when he said, "Keyworth is asking us to expand our sense of boundary." But in large measure, Keyworth's position remained unpersuasive to those who think NIH should stay exclusively in the health business. Likewise, rebuttals to Keyworth's position lacked sufficient force to settle the matter. Cooper suggested that the heart of the debate is more a matter of communication and perception than of substance, which may well be the case.—**BARBARA J. CULLITON**



BOB SEIDEMANN

David Liddle, *the 40-year-old chairman of Metaphor Computers in California, opposed the Vietnam war in the Sixties, but has no illusions about Hanoi: "Notwithstanding Ho Chi Minh writing poetry, the Hanoi regime has clearly shown itself to be the quintessence of cruelty."*

The Republican party, though it now seems to have greater claim on the new libertarian vote, could get bitten the next time around. In voting strongly for Reagan last year, says Atwater, baby-boomers gave great weight to economic issues. But the Republicans could be more vulnerable on social issues next time. *New York Times* columnist William Safire predicted in 1980 that the real fight within the Republican party after it took power would be between libertarians and traditionalists, not moderates and militants. "That enormous split in conservatism is not a difference in degree ('moderate vs. extremist') but a difference in kind on the subject of government intervention in citizens' lives," he wrote. "Later in the Reagan years, the Libright and Tradright will clash over the social issues."

Should the traditionalists dominate the party in the future, the libertarians could just as easily switch to a Democrat who wises up on economic issues. They have little party loyalty. In the primaries last year, over 53% of voters for Gary Hart—a sometime libertarian on foreign policy, personal liberties, and some economic issues—were under 40 years old. But 34% of the Hart supporters voted for Reagan in the general election.

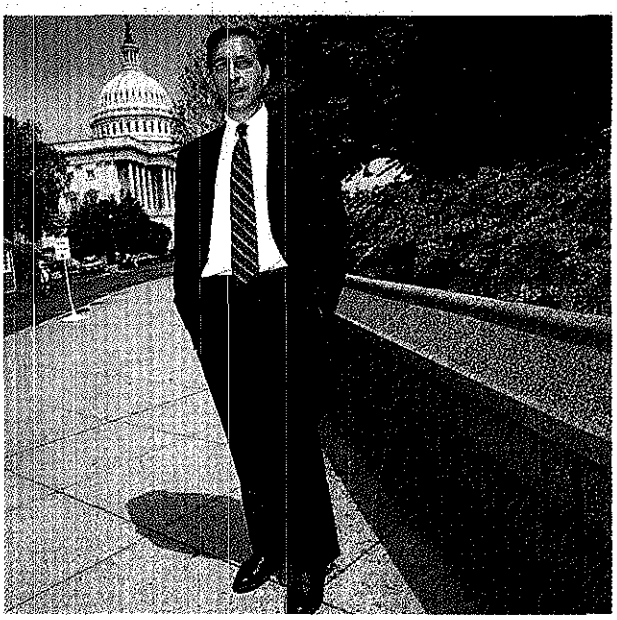
A few leading politicians are starting to adopt and feature libertarian positions. Jack Kemp, the high-profile Congressman from Buffalo, seems the most appealing Republican figure to new libertarian managers. His tax simplification proposal is the flattest, he is against protectionism and government subsidies to business, and he proposes a return to the gold standard because it would lessen opportunities for the government to meddle in monetary affairs—one of the more extreme libertarian positions.

Among Democrats with libertarian appeal, New Jersey Senator Bill Bradley, like Kemp, was one of the first to make an issue of lowering tax rates and simplifying the tax system. Gary Hart caught the eye of libertarians by opposing the Chrysler bailout and makes regular pilgrimages to Silicon Valley searching for "new ideas." Even Senator Edward M. Kennedy, the archetypal liberal Democrat, made some libertarian overtures this year in a much-publicized speech at Hofstra University. Invoking Thomas Jefferson, he suggested that government is not always the best solution to every problem, that more taxes cannot redeem every costly program, and that some Great Society programs, such as public assistance and public housing, failed. He also couldn't resist sprinkling some salt on the libertarian-traditionalist split within the Republican party. "At home," he said, "the party that promised to take government off our backs now proposes to put it into our bedrooms."

SOME YOUNG business people are entertaining the radical notion of entering politics themselves one day. Among the tempted is Mitchell Kapor, the 34-year-old chief executive of Lotus, a Massachusetts-based software firm. His endorsement was sought by both senatorial candidates last year and won by Democrat John Kerry. Says Kapor, "I realized that I had better get a sense of which way my political compass was pointing."

A new libertarian entrepreneur who has already made the jump into politics is Ed Zschau, the Republican Congressman who represents Silicon Valley and is organizing a run for the Senate against Alan Cranston in 1986. He's a free trader, he's against industrial policy, and he believes abortion is a decision for individuals to make. He disagrees with the Moral Majority down the line, he's an internationalist economically but voted against the MX missile and military aid for the contras in Nicaragua. He thinks other entrepreneurs are bound to follow in his footsteps, if only out of competitive spirit: "There will be more people who say, 'Jeez, if that turkey Zschau can get elected, I can do it too.' " F

PHOTOGRAPHS BY JOYCE RAVID (3)



Congressman Zschau

Senator Hart

Pols with Libertarian Appeal

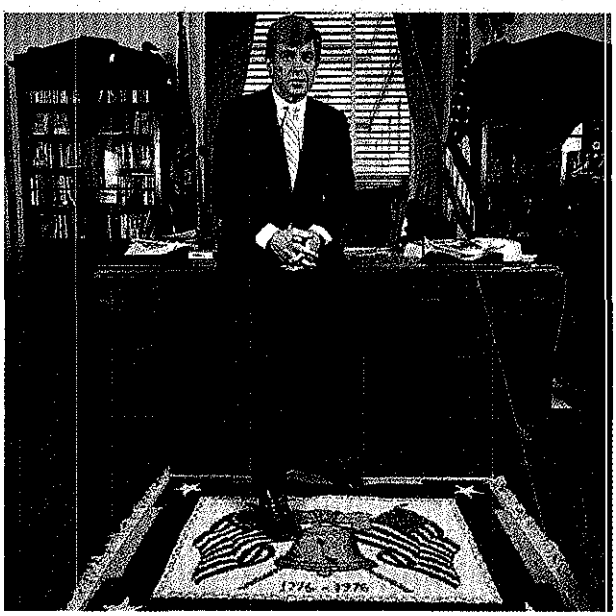
Aiming for higher office, they seek new ideas and money from baby-boom managers.

Ed Zschau, *45, a Republican and former entrepreneur who represents Silicon Valley, is organizing a run for the Senate. He voted against the MX missile and military aid for the contras in Nicaragua.*

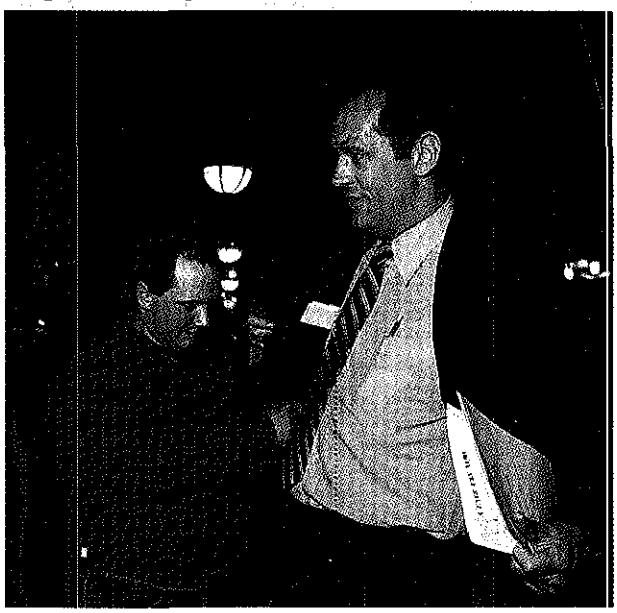
Jack Kemp, *50, a Republican presidential hopeful from Buffalo, is against protectionism and doesn't apologize for wearing those Italian-made Gucci loafers.*

Gary Hart, *49, captured the imagination of many baby-boomers in his 1984 campaign for the Democratic presidential nomination.*

Bill Bradley, *42, of New Jersey was one of the early Democratic backers of flatter tax rates. Presidential candidate Walter Mondale ignored his ideas last year.*



Congressman Kemp

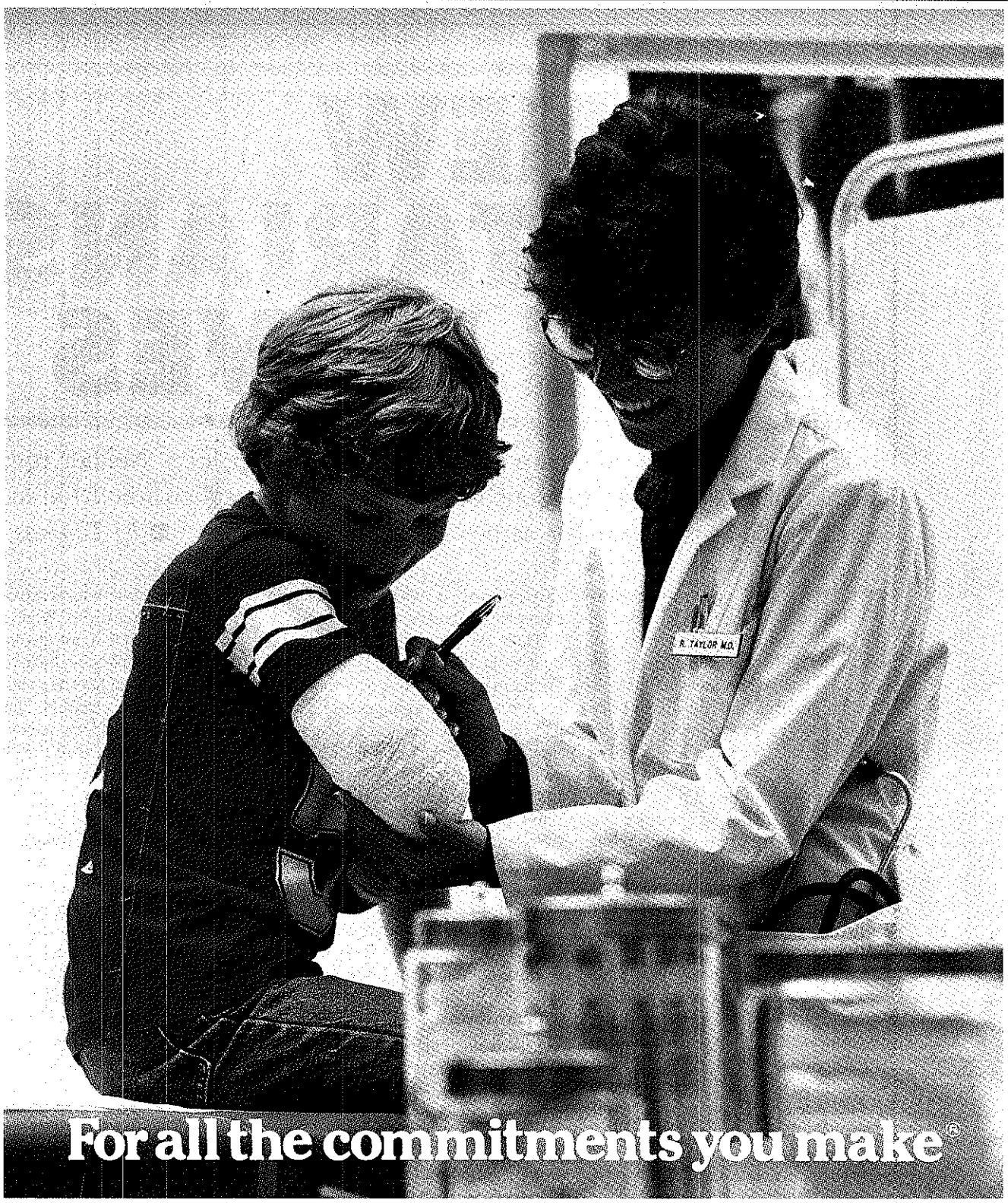


ANDY FREEBERG

Senator Bradley

good for the country and that it is not the proper role of government to make sure everyone has a job. Younger executives, like older ones, want tax rates cut for both business and individuals; many say they are not looking for tax breaks and most tend to support flat-tax proposals. They agree with Budget Director David Stockman, a self-described libertarian, that the federal government ought to be cut back radically. They believe government bureaucracy is by definition inefficient and are intrigued by the idea of turning over more government services to the private sector.

They tend to split with older executives, particularly those in old-line industries, by more consistently supporting free markets and free trade. Parting company with Lee Iacocca, for one, many say they are against government subsidies to business, bailouts of troubled companies like Chrysler, and protection against foreign competition. Young managers in untroubled high-tech fields are apt to be the most vocal on this score, but some in smokestack industries feel the same way. "If you can't compete with foreign producers for whatever reason, even if they are being subsidized, then get into a business where you can compete," says John Correnti, 38, general manager of a highly efficient steel mini-mill owned by Nucor in Plymouth, Utah. "Quotas and regulations just delay the inevitable." While some young executives have been tempted by the idea of a government industrial policy to smooth transition from an industrial to a high-tech service econo-



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