

SPECIAL REPORT: BUSH AND DUKAKIS STATE POSITIONS ON SCIENCE ISSUES

The moment the new Administration begins next January, the new President must make critical judgments on policies and projects that will affect US society for decades. Many of those decisions possess scientific, technological and educational components. Yet, for the most part, the election campaign has lacked any deeply serious and substantive discussion of those matters.

Both Vice President George Bush and Massachusetts Governor Michael S. Dukakis have expressed their interest in improving academic standards and protecting the natural environment, in supporting scientific research and promoting the country's competitiveness in global markets. In connection with "competitiveness," a Washington catchword in 1987 that still hasn't caught on with the general public, neither candidate has spoken much about the nation's investment in research and development as one of the best ways of making sure the US raises its GNP and trade balance. In terms of GNP, America's expendi-

tures on civilian R&D are running at 1.8%, compared with 2.75% for those of Japan and West Germany. When military R&D is included, the US spends about the same fraction of GNP as the other countries, but the spinoffs of defense technology do not result in the kinds of commercial products that have contributed so markedly to the economic success of Japan and West Germany.

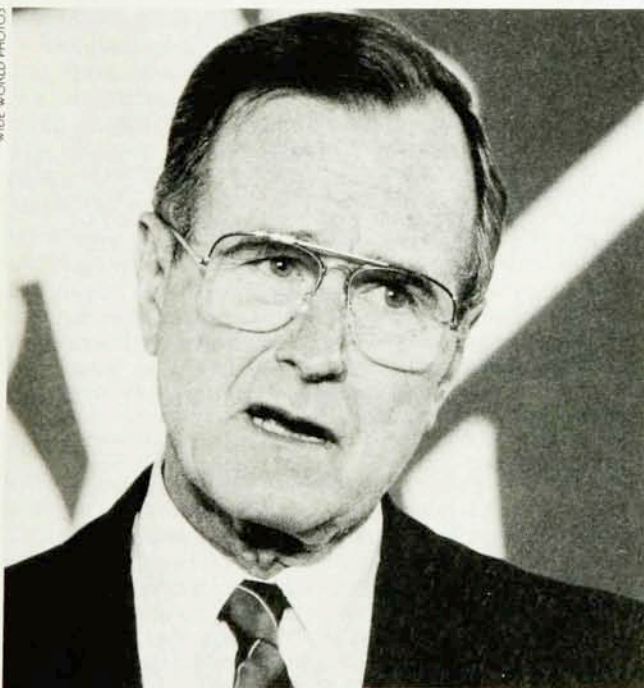
On arms control, Dukakis's views correspond with Reagan Administration policy and Bush's stand, endorsing the US-Soviet treaty prohibiting intermediate-range missiles and supporting current negotiations to reduce strategic nuclear warheads by half. In mid-September Dukakis put forward an idea on arms control that is described in an article in the current issue of *Foreign Affairs*, by one of his foreign policy advisers, Harvard professor Graham T. Allison Jr. Allison writes that the strategic arms talks are "not bold enough" and proposes eliminating all weapons "that are best suited for use in a first

strike," principally the Soviet land-based, multiple-warhead SS-18 missile.

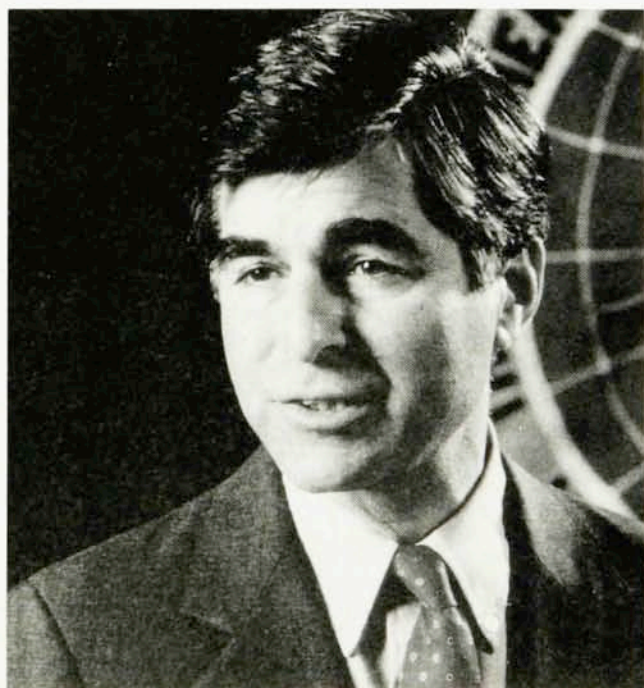
Bush and Dukakis are at odds over the Strategic Defense Initiative. The Vice President backs Reagan's vision of "Star Wars" and says that as President he would deploy the system "when it is ready." For his part, the Governor, who has been calling the program an expensive "fantasy," now says he favors proceeding with research, though at about one-sixth the current annual budget of nearly \$5 billion, and would consider testing and deploying the system if it turned out to be practical and necessary and if it didn't violate the 1972 Antiballistic Missile Treaty.

But just exactly how each would go about achieving all this without plunging the US more deeply into debt, without diverting scientific and technical talent from civilian R&D and without causing some enduring cultural changes has not been debated during the campaign.

Among the highest priorities of the



George Bush



Michael S. Dukakis

1988 Presidential campaign is the need for both candidates to explain their positions on such complicated issues as research budgets, scientific secrecy, arms control and environmental protection. None of these lend themselves to 30-second sound bites on television newscasts or lunch-time soliloquies about patriotic and family values.

To attempt to get each candidate to discuss the issues of concern to its readers, PHYSICS TODAY sent letters early in August inviting each to make himself available for a face-to-face interview on science research and policy topics at a time and location of his choice before the traditional Labor Day start of campaigning. Advisers and staff of both candidates re-

plied that direct access was not possible because the campaigns were "heating up" and increasing demands for interviews were being made, but that Bush and Dukakis would respond to written questions. Accordingly, as in three previous Presidential elections, the questions were formulated by the president of The American Physical Society, who is currently Val L. Fitch of Princeton University. This year a somewhat similar set of questions was drawn up by PHYSICS TODAY.

The Vice President's responses were received on 6 September. Governor Dukakis's statements arrived on 17 September. In both cases, the magazine did little more than transmit the remarks, somewhat like a

conveyor belt, from campaign headquarters to the reader. Under such circumstances, the editors had no opportunity to follow up with more specific questions or to challenge the candidates to answer in greater detail. In the event, the candidates and their advisers controlled the dialogue.

Below are the questions submitted to both candidates. Each man left some of the submitted questions unanswered: For Bush it was those about how he would deal with science advice in the White House, his research priorities and scientific secrecy; for Dukakis it was scientific priorities and secrecy issues. The responses of the candidates appear on pages 67-70.

—IRWIN GOODWIN

Questions for the Candidates

- America's postwar dominance in most fields of scientific research is being challenged by other countries, especially in fields where new high-tech products are likely to emerge. While the US still leads in solid-state physics, for instance, it is rapidly falling behind in making advanced semiconductors; in high-temperature superconductors, a development that won Nobel Prizes for two IBM physicists working in Zurich, other countries threaten to convert research results more quickly into commercial products. Furthermore, recent studies by the National Science Foundation suggest that government and industrial support for R&D is slowing in the US, while it is increasing in Japan, West Germany and France. How would your Administration ensure that the US retains its scientific and technological leadership as the key to our economic security?
- While the Reagan Administration has generally supported basic research quite well, the budgets for science in the last few years have been virtually flat (taking inflation into account). Many worthy projects have been dropped, deferred or decimated. It has been said, moreover, that R&D projects under consideration will cause the next President a massive \$100 billion headache. The list of such projects includes the space station, the Superconducting Super Collider, magnetic fusion machines, planetary exploration, AIDS research and human genome mapping. As large capital investments that are likely to come up in the next few years of tight budgets, such projects will demand that hard choices be made. At the same time, concern is increasing among university scientists that large projects will adversely affect the funding of individual grants and graduate fellowships. If this happens, it will be a case of robbing Peter to pay Paul. How would you go about assigning priorities to R&D programs in your Presidency?
- Many scientists argue that the White House science office has become isolated both from the President and from the scientific community. How would you structure the science advisory apparatus of the White House? Would you elevate the job of science adviser to Cabinet rank? Also, how would you go about obtaining sound, impartial advice on military R&D—on systems like the B-1B bomber, the MX missile, the proposed advanced hypersonic aircraft and so forth?
- Now that the INF Treaty is being carried out and relations with the Soviet Union are improving, what is next on your agenda for arms control? Will you seek further reductions in warheads, outlawing space-based nuclear weapons, reducing or eliminating strategic or long-range nuclear missiles? Related to this is the controversial Strategic Defense Initiative. What do you expect to do about the SDI program?
- In recent years the government has increasingly imposed restrictions on unclassified scientific communications on the grounds of national security. Now there are efforts to impose controls on "commercially valuable" information generated by the government. This seems to coincide with worries about transmitting research and technology data to our foreign competitors. What actions would your Administration take to ensure a responsible balance between the need for secrecy and the openness that is vital to the health of scientific research?
- In an increasingly interdependent world, should the US seek to conduct more collaborative R&D ventures with other nations, particularly in so-called megabuck programs? A few examples of possible joint undertakings are explorations of the planet Mars, building experimental magnetic fusion machines, constructing large astronomical telescopes and genome sequencing studies. Do you favor such joint projects?
- Eighteen years after passage of the Clean Air Act, millions of Americans still breathe unhealthy air and acid rain continues to pollute lakes and to kill forests in our country and other lands. What's more, some scientists, using computer modeling techniques, claim that the burning of hydrocarbon fuels by electric utilities and industrial plants, but mainly the emissions of cars, buses and trucks, will cause a "greenhouse effect" that might raise the Earth's temperature by from 1 to 7 °F. The implications of a global climate change brought on by our increasing use of coal and oil suggest that energy and environment are on a collision course. Have you given much thought to the rather frightening scenario of a generally warmer climate? What can the government do about reducing the amount of greenhouse gases that may be complicated by the actions or inactions of other countries?
- For years we have been inundated by reports on the dire state of America's education. We have committed what the National Commission on Excellence in Education described five years ago as "acts of unilateral disarmament." Despite the many actions taken at state and local levels, the situation becomes only marginally better—and in mathematics and sciences the student grades seem to get worse. "threatening our very future as a nation and a people." What ought to be the Federal government's role in improving our national literacy in math and science for the technological revolution of the 21st century and in training scientists, engineers and technicians for the essential civil and defense needs of the nation?

BUSH RESPONDS

US leadership in science and technology

In the last five and a half years we have created 17 million new jobs—and the vast majority of them are good, high-paying jobs. Unemployment is at its lowest level in 14 years, and we are going to keep ratcheting it down until every man and woman in America who wants a job has one.

The high-tech industry has been at the forefront of that rapid growth, providing a wide range of employment opportunities, from entry-level workers through senior engineers. I have visited electronics and defense centers throughout the country and I have spoken to the graduates of company training and education programs who have moved out of poverty and up the socio-economic ladder.

Yet, despite all this success, some are saying that the government should look elsewhere to answer the needs of our people. These critics ignore the importance of defense research to science and technology, manufacturing and trade—expanding the frontiers of our knowledge—and contributing to our prosperity.

Undermining America's aerospace and defense industry will come back to haunt us—not just in terms of our national security, but in terms of our economic security. The labor force of tomorrow depends on the technology that we produce today.

It's widely recognized that in electronics and defense work, American workers are the best in the world. I happen to believe that American workers are the best in the world, period. If we give them the tools to compete, if we give them the training and the education, they will not only compete, they will prevail.

The nation's R&D program

Science and technology are America's economic fountain of youth. They are what keeps us prosperous and vital. To stimulate our technological progress, we must adopt a program emphasizing innovation:

▷ We must commit to increasing our national investment in research and development. Both government and business must devote more resources to R&D.

▷ The Federal government should increase its research and development investment; we should make the R&D tax credit permanent.

▷ To encourage innovation, we must strengthen intellectual property protection both at home and abroad.

▷ We must constantly oppose any regulation that stifles competition, striving instead for innovative products and services. An illustrative example is the new biotechnology industry, which offers much promise in improved health care.

American business needs to get closer to the source of American inventiveness. It should have closer partnerships with government and university labs, so business can better commercialize scientific advances.

Arms control

The INF Treaty President Reagan signed in December was a major step forward in our relations with the Soviet Union. It is not the millennium. But it is something we can build on, and it is a victory of will and determination. The President first proposed the so-called "zero option" six years ago, when the Soviets had a monopoly on these intermediate-range missiles in Europe. The Soviet leaders said no to our offer—and so we countered their missiles with our missiles. Then they changed their mind.

continued on page 69

DUKAKIS RESPONDS

R&D for global competitiveness

Recent studies indicate that advances in science and technology account for one-third to one-half of all increases in our gross national product. Although the United States still leads the world in basic research, other nations have proven more adept at commercializing new technologies. If we are to take advantage of our nation's inventiveness, we must devise mechanisms for speeding the flow of ideas from the laboratory to the marketplace.

Investments in applied technology will strengthen our basic industries and create new ones. To help achieve this, I support Congressional action to create a national network of science and technology centers, under the National Science Foundation. We need such a network of centers of excellence in new and applied R&D that will help put America's inherent creativity and know-how to work....

Only ten years ago government funding of civilian and defense R&D was roughly in balance—about 50% for each. Today more than 70% of Federal support for R&D goes to our defense establishment. This imbalance, if not corrected, will... narrow our intellectual and scientific base....

To help sustain our leadership in high technology, I would provide government grants to universities to upgrade their research facilities—though such grants should be matched by funds from the states and the private sector. I would also support funding strategically important American industries that are facing intense foreign competition. Sematech might be a model for such programs.

Reducing the Federal deficit and building a competitive America go hand in hand. For we cannot hope to compete in the world economy if we are forced to pay ever-higher interest payments on our national debt and mortgage our future to foreign lenders.

We must significantly reduce the budget deficit, and we must do so in a steady and responsible manner....

In nine years as Governor of Massachusetts, I have submitted nine consecutive balanced budgets. I have learned that there are only four ways to reduce the deficit: Cut spending, improve economic performance, bring down interest rates and increase revenues. In order to clean up the fiscal mess in Washington, we will have to do all four.

Revitalizing research programs

To remain competitive economically we will need to do more than return to fiscal responsibility. We must also invest in a strong national economic development program that will create good jobs for all Americans. We must invest in good schools and good skills; in worker training and retraining; in needed public infrastructure like roads and highways and transit systems and clean air and clean water; in new and applied technology; and in regional development.

The Federal government has a major responsibility for helping to improve the effectiveness of our colleges and universities and our national laboratories if we are going to achieve the necessary breakthroughs in basic and applied research.

As an example of what my Administration would do in R&D, consider the nation's space program.... We must begin by addressing our basic aims in space: how to reinvigorate our space science program, how to maintain America's technological edge in the face of increasing foreign competition, how to meet our requirements for

continued on page 68

space transportation, and how to define the role of manned space activities. To help achieve this, I will reestablish the National Space Council, which was created by President Kennedy, with his Vice President, Lyndon B. Johnson, as its chairman. I will place my Vice President, Lloyd Bentsen, in charge.

Rather than spend billions of dollars for projects that serve narrow interests—such as the "Orient Express" space plane that will fly from New York to Tokyo in three hours—we should invest in a space program that will benefit our nation and humankind as a whole. We should emphasize research, the development of innovative technology and space science, to expand our knowledge of the Earth's resources and the world's oceans, improve communications and reveal the mysteries of the universe. We must develop a comprehensive, long-term plan to assure stable funding for important space science projects such as the Venus radar mapper, the Mars Observer, the Advanced X-Ray Astrophysics Facility and the Hubble Space Telescope.

Second, we must restore our space transportation capability. I support the recommendation of the Challenger commission to return the shuttle to service with a reduced flight schedule to help ensure higher safety standards, and to build a fourth orbiter, using proven technology. At the same time, the disruptions caused by the shuttle disaster and the failures of the Titan and Delta rockets make clear the need to diversify our nation's launch capability....

Third, I support the development, at a prudent pace, of a technologically sophisticated space science and engineering laboratory and NASA's concept of a large, permanently manned space station.

Fourth, we should encourage commercial uses of space....

Finally, I will ask the Soviet Union, and other space-faring nations, to join with the US in more cooperative efforts in space. While we must be careful to protect sensitive technologies in these cooperative programs, they offer an unparalleled opportunity for all nations to work together on projects which will benefit us all. We should renew the US-USSR Space Science Agreement, coordinate the 1989 Soviet mission to Phobos with the US Mars Observer flight, and invite the USSR to join with the US, Japan and the European Space Agency in the International Solar-Terrestrial Physics program. And we should explore with the Soviet Union and other nations the feasibility and practicality of joint space engineering activities that might pave the way to a joint manned mission to Mars.

I strongly oppose the Administration's militarization of space. Star Wars and antisatellite weapons not only make our nation less secure; they divert funds and attention from far more important space research efforts. As President, I will direct the Pentagon to focus its efforts on programs that will enhance our security, such as improved satellites for arms control verification and early warning of attack, communications, navigation and meteorology.

And I will challenge the Soviet Union to join with us in new agreements to protect our vital space activities and enhance our security. By negotiating a ban on testing antisatellite weapons—including lasers and electronic interference. By developing guidelines for space operations—such as "keep-out zones" that will reduce the danger of attacks on satellites. And by placing limits on military activities by humans in space.

Advice to the President

The President needs expert staff help with three kinds of scientific issues: keeping the nation's technical enterprise strong, making wise decisions about public issues that turn on complex and controversial debates about the technical facts, and carrying out the government's R&D programs efficiently and effectively.

These requirements call for an adviser who should know from personal experience as a scientist or engineer how scientific progress is made. To help the President manage a \$70 billion R&D enterprise calls for someone with experience in managing technical activities and whose stature within the scientific and technical community is unquestioned.

The best way the science-technology adviser can serve the President is to provide the most objective analysis of the scientific evidence surrounding important government decisions, and present these facts to the President without modifications by political considerations....

The science adviser should serve in two capacities: as Special Assistant to the President for Science and Technology (a White House senior staff position) and as director of the Office of Science and Technology Policy.

Arms control and SDI

The most important responsibility facing any President is to assure the security of our nation, to protect American lives, honor our treaty commitments and defend our democratic institutions and our precious freedoms. Our security is built on three pillars: strong and capable military forces, a thriving and vibrant economy, and a deep commitment to the values that have made America a leader throughout the world.

We know that if it is necessary to use force, it will almost certainly be our conventional forces that will be so tested....

Over the past eight years, the current Administration has spent nearly \$2 trillion for defense. Despite this enormous military expenditure, serious deficiencies remain in our conventional forces, as a result of the deeply misguided priorities of this Administration.

Now, the Administration wants to spend billions more on new nuclear weapons programs that will add to our deficit, but not to our security. They want to buy more MX missiles, and put them on rail cars, build a new, \$50 billion Midgetman missile, and spend nearly \$5 billion this year on Star Wars. I support continued research on strategic defenses at about the funding level in 1983—before the President announced SDI—as long as the research is consistent with the ABM treaty.

Environmental and energy issues

Some say we can have either a clean environment or a thriving economy, but not both. But I see our challenge very differently. We can't have sustainable economic development without careful and sensitive protection of our natural resources.

We must now, at last, begin to use our economic strength in harmony with the environment to restore and protect our natural resources for generations to come. As President, I will:

▷ Establish and enforce strict environmental standards for air and water quality and ensure that an adequately funded EPA vigorously enforces our environmental laws and makes the polluters pay.

▷ Work with the Congress and through the EPA to stop the acid rain pollution of North American skies and waters. I will establish national standards to reduce

emissions of sulfur dioxide and nitrogen oxide—the two major components of acid rain.

▷ I won't wait for a new statute. I will use the power Congress has already given the President to issue a finding that acid rain is an interstate problem. Under existing law, this finding will require states that are major contributors to the acid rain problem to find solutions within three years. The President has the power to act. I will act.

Today America has *no* energy policy. We can continue this way only at great peril. We need a national energy policy that protects our environment, promotes our national security and contributes to the economic growth and opportunity of every region of our country. We must decrease our vulnerability to interruptions in the supply of Persian Gulf and other foreign oil. We must use cleaner fuels, like natural gas, and better technologies, like clean coal. And we must promote alternatives to fossil fuels and significantly increase energy efficiency and conservation.

Once advertised as a source of electricity that would be "too cheap to meter," nuclear power has instead proven to be the most expensive way ever invented to boil water. As President, I will appoint Nuclear Regulatory Commissioners whose first priority will be to protect citizens, not the nuclear power industry. I will ensure that the nuclear waste disposal site selection process is carried out responsibly and intelligently. And until safe methods of waste treatment and disposal are devised, until sufficient waste facilities are sited and approved, until a new generation of reactor design and safety control is developed, I will oppose the construction of new commercial reactors.

Environmental problems do not respect national boundaries. Acid rain, global warming from the greenhouse effect, stratospheric ozone depletion, the destruction of tropical rain forests and the pollution of the oceans are problems which require cooperative, international solutions. As President I will immediately call for an international environmental and conservation summit to bring together world leaders to confront these urgent problems.

Education for the American dream

For me, there are three educational challenges facing America that must receive immediate, top-priority attention: the challenge of finding and retaining the best teachers for our students; the challenge of eliminating adult illiteracy; and the challenge of making sure that every student admitted to college has the financial support he or she needs to take advantage of that opportunity.

So, first, nothing is more important than making sure that we attract and retain the best teachers, and that we challenge and reward them well. More than half the teachers in America will retire before today's kindergarten students reach the tenth grade—and their replacements are nowhere in sight. We already have 35 000 teaching vacancies around the country and severe shortages of science, math and foreign language teachers. And fewer high school and college students these days are seriously interested in public school teaching.

As President, I will ask Congress to create a National Teaching Excellence Fund, with a first-year investment of a quarter of a billion dollars—just one-tenth of what the Reagan Administration wants to spend on Star Wars. Among its goals, that fund will:

▷ Provide college scholarships and loan forgiveness for young people willing to make a commitment to teaching after they get their degrees

▷ Launch a new National Teachers Corps, a domestic Peace Corps for teaching that can inspire, galvanize and harness the power and potential of a new generation of

teachers directly out of our liberal arts colleges and universities

▷ Work with the states to create centers of teaching and learning where veteran teachers can take sabbaticals, do research in their fields, share ideas, and refresh and reinvigorate their minds and their spirits

▷ Support a national network of retirees with needed skills, particularly in math and the sciences, to return to the classroom to provide specialized instruction.

In my Administration, the Secretary of Education will work with states to combat illiteracy by examining existing programs, increasing both the quality and quantity of current services—including professionalizing literacy instruction and improving the accountability and tracking of results. In all of these efforts, we will work in close partnership with the business community, labor and institutions of higher education. The Federal government should provide seed grants—to be matched by the private sector—to improve existing programs, help create new computer-based learning technologies, and build workplace literacy programs.

A generation ago, Archibald MacLeish wrote that "there are those who say that the liberation of humanity, the freedom of man and mind, is nothing but a dream. They are right. It is the American dream." The key to that dream is educational opportunity for all Americans.

BUSH

continued from page 67

Just as important as our strength was our steadiness—our refusal to be stampeded into unwise concessions by our desire for peace. The President went to Moscow this spring and had a successful summit. We must continue to maintain that same resolve. While we should be willing to take bold steps for peace, we must not do so under artificial deadlines.

I believe the INF Treaty will be looked upon someday as a watershed agreement—the first to actually reduce—not just limit, but reduce—the number of nuclear weapons in the world; one that achieves a balance through asymmetrical reductions—1600 of their warheads to 400 of ours; one that breaks new ground on verification and puts us on a new track toward a more stable and enduring deterrence. I am delighted the Senate gave the treaty its full support.

What is significant is not just that we are eliminating a small percentage of our nuclear arsenal, but that we are reversing the patterns of the past—away from more and more weapons and toward greater stability and safety.

Strategic Defense Initiative

Successful research on SDI can lead to an effective defensive shield, one that lifts from the shoulders of mankind the fear of nuclear annihilation. It is both moral and logical to look for a solution that is better than mutually assured destruction.

The SDI has strong moral underpinnings... A deterrent strategy based on strategic defenses—coupled with deep reductions in offensive forces—could offer us the most stable and secure environment of all. Isn't it better, as we move forward in the nuclear age, to put weapons at risk, not people? This is the moral underpinning of our program.

I am confident we can find a better way than mutual assured destruction, with all its admitted shortcomings. I am committed to the deployment of SDI, as soon as feasible, and will determine the exact architecture of the system in my first term, as the technologies are tested and

proven. As President, I will not leave America defenseless against ballistic missiles.

Space research and exploration

I am committed to reestablishing America as the world's leader in space. Americans are explorers—we need to push back the frontier of our knowledge. Continued space exploration is vital to the nation's security and economic growth as well.

▷ The new technologies resulting from space experiments have produced dynamic improvements in fields such as electronics and medicine.

▷ Space exploration provides our children, the next generation of scientists and engineers, with a sense of vision to encourage their imaginations and energies.

These are three specific aspects to my space program:

▷ The Federal government should get out of the business of being a freight service for routine commercial payloads. I want to encourage the development of—not compete with—private commercial space development.

▷ I support construction of a replacement space shuttle and a heavy-lift launch capability that will provide us with flexible, reliable access to space, and I've strongly supported the development of a space station.

▷ I support "Mission to the Planet Earth"—which is a project designed to establish platforms in space to observe climatic changes on our planet. The information gained through this project will be of great value to farmers, fishermen, weathermen, scientists, all of us.

Environmental issues

I will take a global perspective on the environment. I will confront the problems of global warming, ozone depletion, tropical deforestation, species extinction and the contamination of our oceans—I will make it safe to go to the shore again.

We must address this complex problem at the international level. The United States will take a leadership role by setting an example and securing the cooperation of other countries. I will convene an international summit on global warming where I will push the use of alternate sources of energy. Cooperation with the Soviet Union and China is particularly essential because of their large deposits of coal.

Education of all Americans

All our hopes for our children will mean little if we don't make sure that the education they're given is outstanding. If we provide special attention to those with special needs, then we can wipe out illiteracy the way we wiped out polio.

Quality education is good policy. In the years ahead, education can be our most powerful economic program, our most important trade program, our most effective urban program, our best program for producing jobs and bringing people out of poverty. The best investment we can make is in our children.

We need to spend more on education. Providing excellent education is an investment in America's future—and it is one of the most basic roles of government.

Investments in education must be a responsibility of state and local governments who can recognize and respond to the different needs of students. The Federal role must be to provide grants to state governments for new programs which enhance the standards of instruction and to improve the curriculum at the elementary and secondary levels.

In the years ahead, virtually everyone in the work place will need to understand technology. It is education's role to prepare us for this. To help further our technological future:

▷ We should strive for the goal of computer literacy for high school students.

▷ The Federal government should consider helping states set up schools that would give our most gifted and talented students the chance to learn as much science and math as their abilities will allow. Here's a chance to find exceptional kids who otherwise would not have the opportunity to develop fully their abilities because their parents can't afford to give them that opportunity.

▷ To improve the science and math skills of all our students, we need to have the best science and math teachers available.

We should consider using these schools of excellence to help high school science and math teachers across the state improve and upgrade their skills.

Our high schools must graduate students who understand enough science, math and technology to perform well in the jobs of the future.

23 SOCIETIES BOOST IDEA OF SCIENCE SITTING AT PRESIDENT'S CABINET TABLE

"Looking ahead 20 years from now, the most important question facing the next President is how to deal with science," says Representative David R. Obey, a Wisconsin Democrat who is an influential member of the House appropriations committee. Obviously agreeing with Obey, leaders of 23 science and engineering societies, representing a combined total of 750 000 members, believe the next President needs to do more than his predecessors in making sure that expertise in research and development is readily at hand. Just so, on 25 August they sent a jointly written letter to the Democratic and Republican candidates for President, urging the appointment of a top-

notch science adviser soon after one of them enters the Oval Office on 20 January. By naming the adviser early, the letter argues, the adviser would be able to lend a voice in selecting officials dealing with science and technology issues at the highest levels of government.

Whether it is dealing with the destruction of the ozone layer, preventing the onset of the "greenhouse effect," or restoring the competitiveness of American industry, the society presidents assert, "the most urgent problems confronting the US... depend on the effective utilization of the nation's science and technology resources." To be sure, they observe, "Our nation's hopes for a more se-

cure, healthy, humane and prosperous society rest on continued advances in science and its applications."

According to the society presidents, national leadership in science and technology "must come from the White House. We therefore urge that, as you seek the office of President, you devote careful thought to the White House advisory structure. We believe that this structure must be strengthened and that the person selected to be the principal science and technology adviser should have direct access to the President. That person should be a distinguished scientist or engineer who would enjoy not only the confidence of the Presi-

dent but the respect and trust of the science and technology community. In the absence of that trust, the science adviser is isolated and ineffective. . . . A hiatus in filling the position . . . at the start of a new Administration could prove costly to the nation."

During a news conference at Washington's National Press Club, three of the society presidents made a strong case for returning to the good old days of the President's Science Advisory Committee in the 1950s and 1960s. As they saw it, PSAC was the paradigm of Presidential science advice. As such, noted Val L. Fitch (Princeton), president of The American Physical Society, it held the attention of Eisenhower and Kennedy on matters affecting nuclear weapons and space exploration. Nixon dismantled PSAC in 1973 and also sacked his science adviser, Edward David Jr., at the same time, after both had disagreed with some of the President's special interests, including the the Antiballistic Missile Treaty and the Supersonic Transport airplane.

While PSAC was primarily concerned with national security matters, it also dealt with such issues as airplane hijackings to Cuba and toxic pesticides on cranberries. Now, said Fitch, who was a member of PSAC in its last years, the issues that most vex Presidents are even more complex and crosscutting, demanding a wider ranging representation of experts than those on PSAC.

The other two society presidents at the press conference, Howard Schachman (University of California at Berkeley) of the Federation of American Societies for Experimental Biology and Russell Drew (Viking Instruments Corp) of the Institute of Electrical and Electronics Engineers, admitted under questioning by reporters that no amount of cheerleading or boosterism for a high-level science adviser could make a President listen to the counsel provided, let alone accept it. What's more, said Drew, the letter was not intended as simply moralizing on how to run the next Administration.

Fitch observed that without an authoritative scientific component in the White House, the government often had to rely on outside advice. While there is nothing inherently wrong with getting insights from such sources, Presidents usually want to know the political, economic and social implications of the various scientific options. To illustrate his point, Fitch referred to last year's APS study on directed-energy weapons, which helped convince Congress to

reduce the President's budget request for the Strategic Defense Initiative and influenced the Pentagon to redirect its research program. Undertaken by the APS on its own, the study was released to the public reluctantly after members of Congress and the press demanded it. The government, said Fitch, "should not have to rely on a professional society" for directing any of its programs. Somewhat related to this, Drew claimed that Congress had been forced to do the Administration's job in pushing such legislation as the Omnibus Trade and Competitiveness Act, which, among its provisions, renames the National Bureau of Standards as the National Institute of Standards and Technology and gives it added responsibilities for setting computer systems and software standards, developing communications security procedures and providing regional technology outreach programs.

Signers of the letter insist it was written as a commitment to good government, not as a confession of self-interest. Indeed, calls for a more coherent way of providing science advice to the President have come from many sources in this Presidential election year (see *PHYSICS TODAY*, August, page 52). One of the most recent came two weeks after the letter from the science and engineering societies. A 51-page report by the non-governmental Council on Competitiveness, issued on 7 September, also complains that the Federal government's current procedures for determining science and technology priorities and coordinating policies across agencies "are insufficient."

As it now stands, says the report, responsibility for R&D is dispersed among 12 executive agencies, each concerned only with its own special mission, while in Congress the non-defense budget is divided among nine of 13 different appropriations subcommittees. "The one organization that provided an overview of Federal research and other activities related to economic performance—the White House Office of Science and Technology Policy—has no line functions and a small budget, with staff mostly on temporary loan from other agencies."

Another sticking point, adds the report, is that "no consensus" exists "on the scope, mission and relevance of the Federal laboratories to the needs of the country over the next 20 years." While those laboratories operate on an annual budget of about \$20 billion, equal to almost one-third of the government's R&D expenditures and roughly one-sixth of the nation's entire total, "technology

needs of industry are not among their major priorities."

The report also criticizes the government for not implementing promising science and technology initiatives because of policies that it terms "piecemeal, *ad hoc*, and inconsistent." Examples of this problem are given: One is the R&D tax credit, enacted by the 97th Congress and undercut by the 100th; another is directed to the desktops of bureaucrats who are unwilling or unable, says the council, to deal with innovative new programs. "Throughout the government," argues the report, "there is far too little coordination within the Federal bureaucracy and among the Federal agencies, the states and the private sector."

What does the council recommend, then? The next President should elevate his science adviser to assistant to the President for Science and Technology—a prominent position carrying Cabinet rank, allowing for active membership on such key inter-agency policy groups as the National Security Council and the Economic Policy Council and, most important, providing access to the Oval Office. The council's characterization of the job is similar to one proposed by Frank Press, president of the National Academy of Sciences and science adviser to President Carter. Press described the post in a *PHYSICS TODAY* interview (April 1987, page 47) after he cast doubt on a previous concept proposed by the council's predecessor, the President's Commission on Industrial Competitiveness, which had recommended a Department of Science.

The Commission had issued its report, *Global Competition: The New Reality*, in 1986, before it was killed. It was reincarnated last year as the Council of Competitiveness, with the same chairman, John A. Young, president and chief executive officer of Hewlett-Packard Co. The council's vice chairmen are Paul E. Gray, president of MIT; Ruben F. Mettler, chairman of TRW Inc; and Howard D. Samuel, president of the AFL-CIO Industrial Union Department. Though the Presidential candidates have not reacted to either the letter of the scientific societies or the council's new report, *Picking Up the Pace: The Commercial Challenge to American Innovation*, the importance of the message and the makeup of the council suggests that the next Administration may heed the advice. Its members include the heads of just about every significant R&D company in the country and most major research universities.

—IRWIN GOODWIN ■