

# CONNECTION

NEW ENGLAND'S JOURNAL  
OF HIGHER EDUCATION AND ECONOMIC DEVELOPMENT  
VOLUME VI, NUMBER 1

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THINKING *Environment*

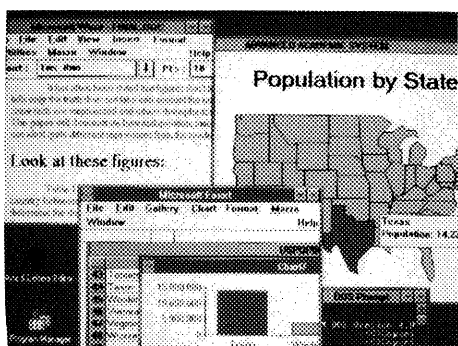


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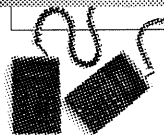
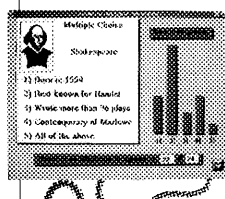
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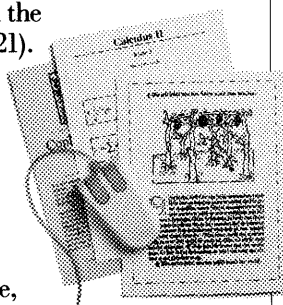
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NEW ENGLAND'S JOURNAL  
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*Cover by Timothy Harney.*



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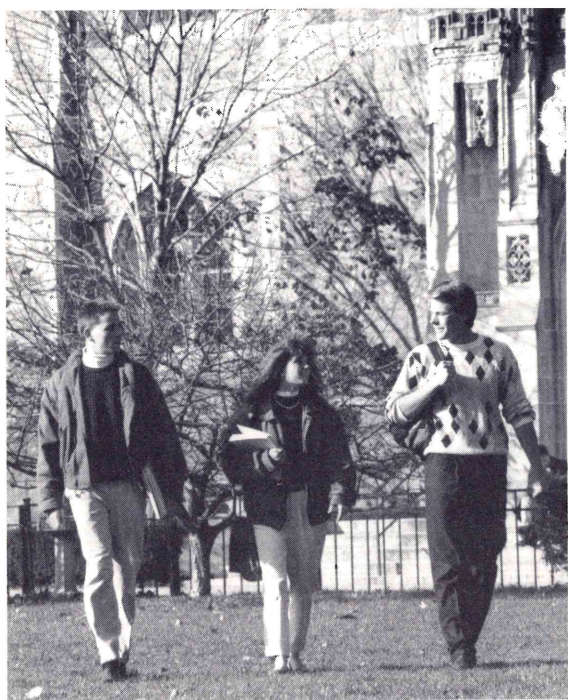
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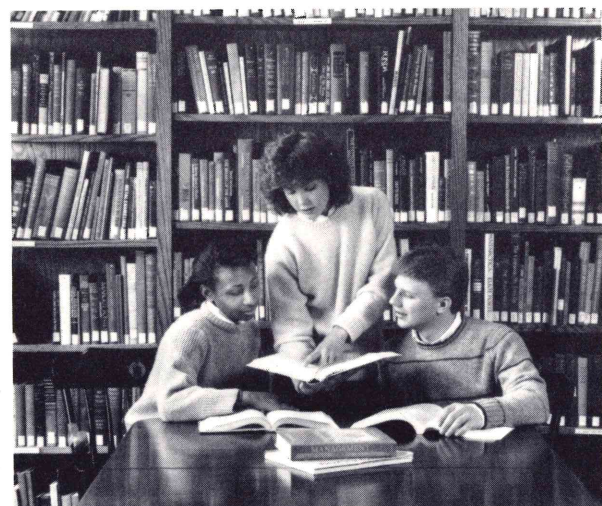
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# CONNECTION

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## EDITOR'S MEMO

With this issue, CONNECTION begins its sixth year exploring links between higher education and New England's economy, recounting the successes of shoulder-to-shoulder collaboration among the region's educators, business leaders and policy-makers — and prodding them to do more.

The "Thinking Environment" section of this issue tells a story of collaboration if ever there were one. It seems a growing number of New England companies are proving you can turn a pigsty into a silk purse. These "envirotech" companies are thriving in this corner of the United States for two reasons: New England's tough environmental regulations demand innovation. And the region's unparalleled concentration of colleges and universities provides it.

The rise of this environmental technology is good news for the recession-wracked New England economy and the sickly planet. But it should not inspire overconfidence about the condition of either, nor diminish the work left to do.

Richard Barringer, director of the University of Southern Maine's Edmund S. Muskie Institute of Public Affairs notes: "Science and engineering and technology are not the whole answer to [environmental] problems. There are whole sets of policymaking and management considerations that have to be addressed at the same time."

On all fronts — science, policymaking and management — the tasks are considerable. For starters, today's students are choosing to pursue science and engineering fields in ever-decreasing numbers. Who can blame them? Prestige and money are lacking. And to further complicate matters, the American public tends to take its advice on environmental issues from well-known entertainers, whether scientists agree or not.

As for policy leadership, the environment — like education — gets plenty of attention during elections, but short shrift when budget battles begin. The filth of Boston Harbor helped elect President Bush. But when the Persian Gulf War threatened U.S. oil supplies, what was the White House response? Look for oil in Alaska's fragile Arctic National Wildlife Refuge. Meanwhile, recent reports indicate that Vice President Dan Quayle, in his capacity as chairman of the Council on Competitiveness, is leading an effort to water down last year's stringent clean air legislation. The "New World Order" — made popular while oil fires in Kuwait threatened global climate change and the United States stood alone with its go-slow approach on global warming — apparently does not include a major new environmental commitment.

Many businesses, on the other hand, are indeed cleaning up their act. They had better. In one national poll, 30 percent of consumers said they had boycotted a company because of its environmental record. And the prospect of passing on to consumers the cost of environmental cleanup is dimming as prosecutors seek prison terms, rather than fines, for the worst polluters. Still, few businesses are engaged in environmental efforts that go beyond the mandates of federal and state regulations. And the overall message to consumers remains mixed as illustrated by Exxon's latest jingle: "Turn the key ... Feel free."

To be sure, business innovation will be pushed to a new level as society moves beyond "end of the pipe" pollution-control strategies and emphasizes pollution *prevention*. Creating clean production processes to avoid pollution from the start will require wholesale changes in the way companies work — and increase the need for partnership among business, government and higher education.

CONNECTION in its five years of publication has served as the place where New England higher education comes together with business and government to build an agenda. We are grateful to the distinguished environmental scholars, entrepreneurs, public officeholders and authors who have used the pages of this issue to offer perspectives on the environmental issues facing the region. If we don't address these issues, there won't be any agenda. □

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*John O. Harney is editor of CONNECTION.*



## Diversity: A Retreat?

Was the U.S. Department of Education's controversial ruling barring "race-exclusive" scholarships — then permitting those funded by private, non-college sources — a benign case of miscommunication between the White House and the department? Reginald Wilson, a senior scholar with the American Council on Education, is among a growing number of observers who don't think so.

"It doesn't take a high IQ to know that the past two administrations have not been great friends of civil rights," says Wilson, who believes the ruling announced by a mid-level department official in December 1990 fits neatly with President Bush's October veto of civil rights legislation and recent court cases knocking down civil rights protections.

Affected scholarships — those based exclusively on race — represent less than 3 percent of all scholarship money in the United States, according to Wilson. But the dispute has raised the hackles of college officials who are trying to increase cultural diversity on campus.

In March, former Tennessee Governor and University of Tennessee President Lamar Alexander walked into the education secretary's job with sparkling credentials and a plan to let colleges continue their current scholarship policies, while the department launches a six-month investigation into the rationale for such policies.

But even as the scholarship issue simmered, the new secretary became embroiled in a new civil rights controversy. Alexander warned the Middle States Association of Colleges and Schools — one of the nation's six regional accrediting agencies — not to delay accreditation of Baruch College in New York City on the basis of the college's poor minority hiring and enrollment record.

A key congressional aide says the department is simply asking probing questions about how accrediting agencies set standards for cultural diversity.

But Wilson is not so sure. "If you're in New York City — where there are dozens of colleges in Manhattan alone — how is it that you cannot find an ade-

quate number of minority staff?" he asks, noting that Baruch appeared willing to work toward improving its hiring record before Alexander's warning.

## Recession-proof?

Despite the recession, individuals and organizations gave more than \$1 billion to New England colleges and universities in 1990, up 9 percent from 1989, according to new data from the Council for Aid to Education in New York City.

Nationally, giving to colleges and universities reached a record \$9.8 billion, up 10 percent from a year earlier. (When inflation in higher-education goods and services is factored in, the national gain falls to 4 percent.) The 1990 U.S. increase marks the second year of rising voluntary support after a 3.5-percent drop in 1988, which was attributed to the 1987 stock market crash and tax law changes.

Harvard University led all U.S. institutions with \$213 million in total contributions for 1990. Yale University ranked fifth nationally with \$130 million in total giving. The Massachusetts Institute of Technology — which led the nation in corporate support — ranked ninth in overall contributions with \$118 million or more than \$12,300 per student.

Among New England's leading gainers: The University of Southern Maine captured \$1.6 million in gifts in 1990, up 189 percent from \$562,000 in 1989. Gordon-Conwell Theological Seminary in Massachusetts received \$8.7 million, up 122 percent from \$3.9 million in 1989. Lesley College in Massachusetts took in \$1.5 million, up 106 percent from \$709,000 in 1989.

## Education EZ

As Congress considers reauthorization of the 1965 Higher Education Act, the chairman of the Senate Labor and Human Resources Committee is calling for a simpler financial-aid application process. "It should not be harder to get student aid than it is to pay your taxes or get a mortgage, but the fact is, it is much harder," Massachusetts Sen.

Edward Kennedy told educators and students during recent reauthorization hearings at the Wentworth Institute of Technology.

The financial-aid form currently used by most students contains four pages of questions and eight pages of what the committee's chief education aide Terry Hartle describes as "IRS-style" instructions. To make matters worse, students and their families must wrestle with the perplexing form every year they seek aid, whether their financial situation changes or not. Some students find the process so overwhelming, they decide against going to college, according to Kennedy.

The senator wants to: cut the form down to two pages of questions, plus clearer instructions; give automatic eligibility to students whose families receive Aid to Families with Dependent Children or benefits from other means-tested programs; and streamline the application process for students who have previously received aid and have not experienced changes in their financial situation.

"If we can create a 1040EZ form to simplify the payment of federal income taxes," quipped the senator, "we can do the same for federal student aid."

## Reed's Raise

A freshman congressman may not wield much clout during reauthorization of the Higher Education Act, but first-term Rhode Island Democrat John Reed found his own way of beefing up student aid. During his campaign, Reed opposed the pay raise that the House of Representatives awarded itself a year before. In March, he gave the extra salary to a newly formed Reed Student Grant Program, which will provide college scholarships to high-school students in his 2nd District.

## Mass. Exodus

University of Massachusetts President Joseph D. Duffey's appointment as president of American University in Washington, D.C., provides more evidence of a Massachusetts "brain drain" that higher-ed officials say began two years



ago, when former Chancellor Franklyn G. Jenifer resigned to become president of Howard University.

Since Jenifer's departure, the list of public higher-education presidents and administrators leaving Massachusetts for greener quadrangles has grown almost as quickly as funding for state colleges and universities has shrunk.

The roster includes Evan Dobbelle, president of Middlesex Community College; Philip Day, president of Cape Cod Community College; and Norma Rees, vice chancellor for academic policy and planning with the Board of Regents of Higher Education. Jenifer's successor, Randolph W. Bromery, resigned from his post as chancellor in protest of a proposed \$100 million cut in state higher-education funding, but returned to teaching at UMass-Amherst.

UMass-Boston Chancellor Sherry Penney (who was also a finalist for the American University presidency) and Roxbury Community College President Walter C. Howard are also reportedly seeking new posts.

Presidents and administrators are not the only public college employees contemplating job changes. An informal poll last fall revealed that nine of 10 junior faculty members at UMass-Amherst were in the market for new jobs.

Between 1988 and 1989, 35 of the university's professors found new posts at other institutions.

### Ivy Economics

A new Yale University study showing the university pumps more than \$250 million into the greater New Haven economy each year could go a long way in diffusing town-gown tensions in the seventh-poorest city in the United States.

While most of Yale's operating money — including tuition, grants and gifts — comes from outside the New Haven area, the bulk of it is spent in greater New Haven on salaries, purchases, contracts and payments to local government, according to the study of

the university's impact on New Haven and eight surrounding towns from July 1988 to June 1989.

Yale employees earned more than 7 percent of all personal income in the city of New Haven, and the university spent nearly \$100 million on goods and services in Greater New Haven during the one-year period, according to the study. In addition, since 1987, a Yale initiative has invested millions of university dollars in New Haven projects, ranging from affordable housing to a high-tech start-up fund.

On the more controversial point of Yale's major "tax-exempt" presence in New Haven, the study also offers some comfort to city officials: Under a Connecticut program in which cities receive state payments in lieu of taxes, New Haven received \$6.1 million on Yale property; the 1991 payment is expected to exceed \$9 million. Besides a collection of miscellaneous tax payments, Yale this year will pay nearly \$1.2 million to New Haven for fire department service.

In Providence, meanwhile, Brown University President Vartan Gregorian has reached an agreement with the city to develop and implement "The Providence Plan," a major initiative to address drug abuse, poor education, unemployment, lack of affordable housing and other problems that contribute to poverty in the Rhode Island capital.

Gregorian also announced that Brown

would donate to the Providence Public Library tens of thousands of dollars in fees — and interest — that the institution was improperly charged by the city for local fire alarm boxes.

### Glasgow's Goodbye

Connecticut Higher Education Commissioner Norma Foreman Glasgow will step down next fall after 10 years as chief executive of the state's higher-education system. During Glasgow's tenure, operating funds for Connecticut's public colleges and universities nearly doubled from \$209 million to \$397 million; enrollment grew from 98,427 to 108,708; and annual bond authorizations for campus facilities shot up from \$48 million to \$166 million. Financial-aid programs for Connecticut students at public and independent institutions grew by 140 percent.

Glasgow's successor, however, will confront a worsening state budget crisis that is already taking a toll on higher education. Gov. Lowell Weicker's recommended budget for 1991-92 would cut current services funding by more than 13 percent for most state higher-education institutions and about 11 percent for the state's technical colleges. The Board of Governors for Higher Education has voted for double-digit tuition increases, and about 200 programs that grant low numbers of degrees may be discontinued or changed.

High-tech layoffs ...  
Real-estate bust...  
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Are New England's  
colleges and  
universities next?

As New England's recession deepens, a financial vise is closing on the region's public and independent colleges and universities — and their students. See the Summer 1991 issue of **CONNECTION** for a comprehensive look at the precarious state of higher education.

To subscribe to **CONNECTION** for 25% off the cover price, use the card in this issue or call (617) 357-9620.



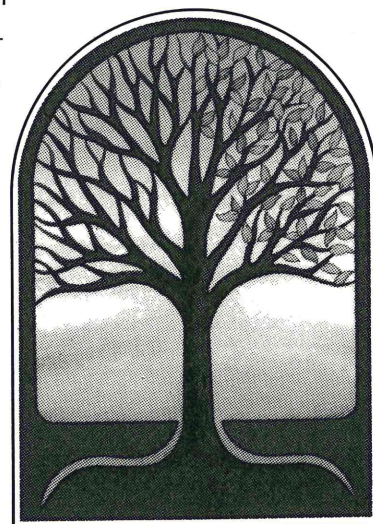
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## Why New England Must Track the Higher Education Act

JOHN C. HOY

In their rhetoric, business and government leaders rarely miss an opportunity to link educational excellence to American competitiveness. Yet educational resources and standards continue to decline. Now as the U.S. Congress considers reauthorization of the Higher Education Act, corporate leaders and lawmakers have a mutual opportunity to match rhetoric with action.

The deliberations will focus sharply on the array of federal student-aid programs created under the landmark 1965 law. The stakes are especially high for New England. While the region's economic future depends upon brainpower, New Englanders face inequities in student-aid programs as well as a host of other factors that have conspired to undercut educational access and excellence.

New England colleges and universities enroll 6 percent of U.S. undergraduates, but in 1990 received only 3 percent of Pell Grants awarded by the federal government to the nation's neediest students.

From 1985 to 1990, total Pell Grant dollars awarded in the United States rose 57 percent. But in New England, Pell Grant dollars increased only 11 percent. Nationally, 3.5 million students received Pell Grants in 1990, up 18 percent from 1985. In New England, 105,762 students received grants, down 8.4 percent from 1985.

The region's comparatively higher personal incomes and home values in the 1980s — and therefore greater "expected family contributions" — rendered more and more New Englanders ineligible for Pell Grants. But higher incomes and inflated home values offered little real relief to students and families trying to pay for college, because tuition at public and independent colleges rose faster and higher in New England than in any other region of the country.

Now, in the face of a severe recession, income growth in New England is slowing down, but tuition continues to rise.

At some public institutions, tuition and fees will have doubled during the period 1988 to 1992.

The unfortunate solution for many New England students has been debt. Borrowing under federal student-loan programs declined 1 percent nationally between 1989 and 1990, but jumped 21 percent in New England. The number of New Englanders taking on federal Parent Loans to Undergraduate Students rose 105 percent from 1988 to 1990; the number with Supplementary Loans to Students shot up 317 percent. A Bush administration proposal to significantly reduce Pell Grants to students from families with incomes of \$20,000 to \$25,000 — cutting awards by 40 percent in some cases — could further encourage loans, or worse, discourage students from even pursuing higher education.

**Well-educated young people remain New England's primary insurance against long-term damage to the basic structure of the regional economy.**

As Congress ponders the imbalance between grants and loans for New England students, the region's business leaders could serve their own self-interest by reminding lawmakers of some of the other factors that threaten their future labor supply by throwing insurmountable obstacles before New England students. Among those factors:

**Rising Tuitions.** New England colleges and universities charge higher tuitions on average than those in other regions. While the region's *independent* institutions now appear ready to limit tuition and fee hikes to 10 percent or less for 1991-92 — still as much as twice the current rate of inflation — the pressure on *public* institutions to raise tuition and fees significantly is intense and will likely result in increases as high as 20 percent at some institutions.

**Deepening Recession.** Many New England students and their families, as well as institutions in all sectors, are experiencing severe economic hardship. The region's economic downturn is reflected by growing unemployment — projected to exceed 10 percent; the highest-in-the-nation cost of living — about 115 percent

of the U.S. average; a dramatic increase in business failures and personal bankruptcies; the nation's worst credit crunch accompanied by an unresolved banking crisis; declining corporate profits; declining philanthropy; and the slowest projected rate of per-capita income growth among all regions through 1994.

**Demographic Change.** The 1990 U.S. Census reveals that New England's minority-group population grew dramatically during the past decade. New England's Hispanic population nearly doubled to 568,240 in 1990; the region's Asian-American and Pacific Islander population nearly tripled to 231,656; and the African-American population grew by one-third to 627,547. While New England campuses have modestly increased enrollment of minority students in recent years, the number of degrees awarded to minorities remains inadequate.

It is clear that the region's colleges and universities must step up efforts to create a more hospitable climate for students of diverse backgrounds. At the same time, reauthorization must reaffirm a federal commitment to minority participation in higher education and make sufficient financial aid available to assure that all qualified low- and middle-income students can afford a college education.

**Chronic Underfunding.** In the 1980s, per-capita income grew faster and higher in New England than in any other region of the country. But as per-capita income — and therefore per-capita tax revenues — increased, state support for higher education and scholarship programs did not keep pace. This lag occurred despite the fact that the region's 1980s prosperity was largely attributed to its educated workforce and knowledge-based economy.

Well-educated young people remain New England's primary insurance against long-term damage to the basic structure of the regional economy. It's up to the region's corporate and higher-education leaders as well as students to sharply target that message in Washington. □

*John C. Hoy is president of NEBHE and publisher of CONNECTION.*





# Clean Money

JOHN O. HARNEY

**V**inyl chloride causes liver cancer. When the Occupational Health and Safety Administration realized that in 1973, it dropped the allowable level of vinyl chloride in the workplace from 500 parts per million to 50 parts, then one part per million. There was just one problem: The fixed monitors used to measure the substance began to look like dinosaurs; they could barely detect vinyl chloride at such a low level and certainly would not be able to isolate a potentially deadly pin-hole-sized leak. Under those conditions, John Driscoll, a consulting engineer, invented a portable instrument to measure vinyl chloride. In time, he invented a range of other high-tech

New England

confronts

environmental

problems and sees

an opportunity

250 employees, its products are used around the world, and its sales last year topped \$25 million.

While Driscoll was developing technology to measure vinyl chloride, Paul Sanders was inventing a filter to separate oil and water. The company he founded — Groundwater Technology Inc. of Norwood, Mass. — now is one of the top five environmental firms in the world, with more than 1,700 employees in 62 offices around the globe. Groundwater Technology specializes in cleaning up leaking underground storage tanks. It's an enormously important job. In the United States

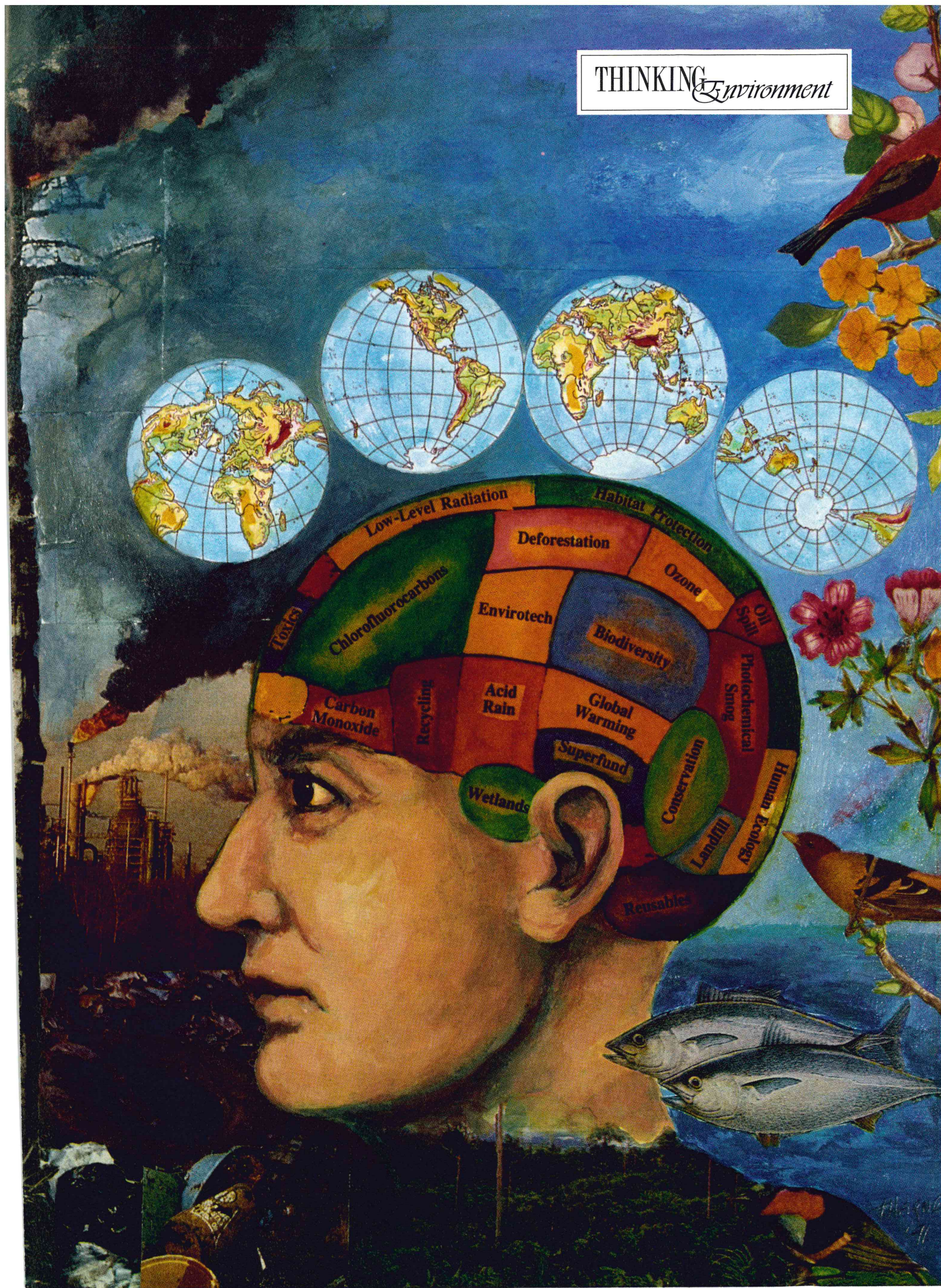
instruments to monitor hydrocarbons, pesticides and heavy metals, not only in the air, but also in water, soil and food. Today, Driscoll's Newton, Mass., company called HNU Systems has

alone, 400,000 underground tanks are leaking petroleum or hazardous chemicals, according to the U.S. Environmental Protection Agency (EPA). Since gravity works, the contents of leaky tanks eventually find their way into groundwater — sometimes, drinking water.

These may seem like just a few more examples of scientific minds building the right product at the right time and blah, blah, blah. But they symbolize more than that.

For decades, predictions of the destruction of the planet — and the interim rise in cancer cases, lost species and a host of other *costs of doing business* — tended to fall on deaf ears. No more. Environmental protection is now unabashedly packaged as an economic issue — and ears are perking up, especially in New England, where tough environmental laws, a concentration of colleges and universities and a tradition of technological innovation may mean a competitive edge in the race to clean up both at home and abroad.







The "envirotech" industry — some use the term "ecotech" — is thriving in recession-battered New England. Too amorphous for a standard industrial classification code, the industry encompasses a melange of laboratories, manufacturers and consultants who direct their energies toward cleaning up pollution or developing products that are friendly to the environment.

In Massachusetts alone, nearly 1,500 envirotech outfits account for 30,000 jobs, and the industry is growing by as much as 30 percent a year, according to the newly formed Environmental Business Council, which Driscoll helped establish. The council began by focusing on Massachusetts, but plans to extend its scope throughout New England.

#### Filthy markets

The future of envirotech is as bright as the future of the earth is murky. The United States spent \$115 billion to clean up pollution in 1990 and the tab

could grow to \$185 billion by the year 2000, according to the EPA.

The dirty truth goes well beyond U.S. borders. When the Iron Curtain was lifted, out puffed soot. Decades of heavy industrialization, dependence on brown coal and little pollution control have ruined the Eastern European environment. There are places in Poland where water is so polluted, it is treated on its way *into* factories to prevent corrosion of the machinery inside. In Czechoslovakia, five regulators are overseeing the cleanup of more than 11,000 hazardous-waste sites. Though the former East Bloc countries don't have much money to buy Western technology — nor the regulatory structures to begin cleanup — agencies such as the World Bank have earmarked international aid for environmental projects. Western European governments also are pitching in.

#### CLEAN WATER

University of New Hampshire research could save millions of dollars for 31 Granite State communities trying to comply with new Environmental Protection Agency drinking water regulations.

Complying with the rules could require towns to drill new wells or build expensive treatment plants. But two UNH civil engineers have devised a filtration system, using a revised version of a typical swimming pool filter and earth composed of the skeletal remains of tiny single-cell plants called diatoms, to eliminate the sediment, parasites and viruses whose presence triggered the more stringent EPA regulations. A system computer regulates water treatment and evaluation, with occasional intervention by a technician.

After refining their system, housed in a trailer on campus, the UNH engineers will test their work in Contoocook, one of the towns subject to the new water regulations.

Eastern Europe is by no means the extent of the world market for New England's environmental expertise. A Taiwanese delegation recently toured Massachusetts waste-disposal facilities to view the latest technology at work. The Japanese are among the foreign customers that together account for more than 40 percent of HNU's business. And in the aftermath of the environmentally disastrous Persian Gulf War, Kuwait and other Middle Eastern countries are seeking urgent help from New England companies such as Metcalf & Eddy, an engineering and consulting firm with headquarters in Wakefield, Mass. "The world market is clearly evolving into a major market for American environmental organizations," says Metcalf & Eddy associate Tom Tilas. "There are areas where the air pollution is so thick you can cut it with a knife."

But cleaning up America's — and the world's — mess is just the beginning. The EPA and some of its international counterparts are gradually shifting away from "end of the pipe" pollution-control strategies and toward pollution *prevention* through materials substitution, recycling and redesign of products and production processes. It's far more effective than cleaning up. When the aluminum industry reduced the amount of material that goes into making a soda can, less bauxite had to be mined from fragile environments and, can for can, less energy had to be used in shipping and manufacturing.

Julie Belaga, the EPA regional administrator for New England, is urging the region's businesses to stop pollution at the source. "The mindset shouldn't be, 'Well, we're going to comply with the law,'" she says. "It should be 'How do we avoid polluting in the first place?'"

Pollution prevention also will push innovators even further to develop, say, cars that don't emit exhaust. And, like cleanup, it will require vigilance. U.S. environmentalists are considering adopting a variation of Germany's "blue angel" labeling scheme, which identifies products that meet agreed-upon environmental standards, partly to protect the environment and partly to protect consumers against the torrent of false environmental claims being made in the absence of such a system. Example: Supposedly degradable Hefty trash bags that degrade only in sunlight — not much help since most of the bags wind up buried in landfills.

Add to those challenges larger environmental problems like acid rain, depletion of the ozone layer, global warming, deforestation and extinction of species. There's a lot of work to be done, a lot of ingenuity needed.

#### Spawned by regulation

It is no coincidence that the majority of New England envirotech companies — like the majority of environmental laws — are less than 20 years old. Environmental regulation is the midwife to envirotech.

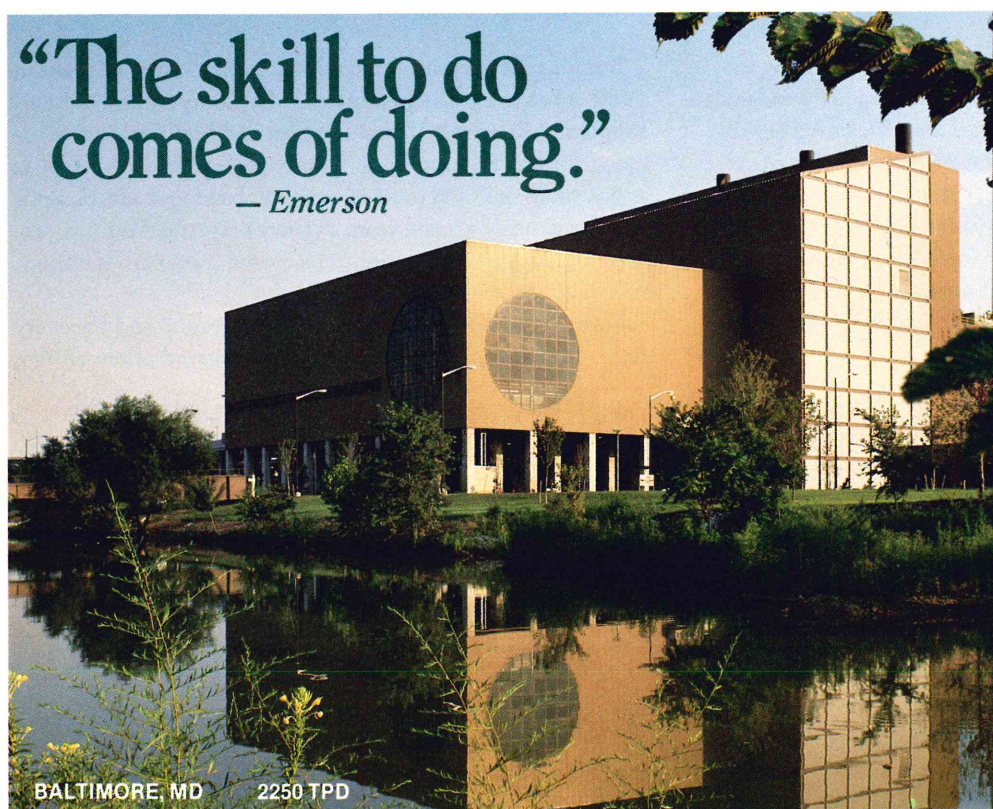
The environmental sentiment of the 1960s set the stage for a

**Members of New England's congressional delegation ranked addressing "environmental problems" as the region's No. 1 priority in a 1990 CONNECTION survey.**



# "The skill to do comes of doing."

— Emerson



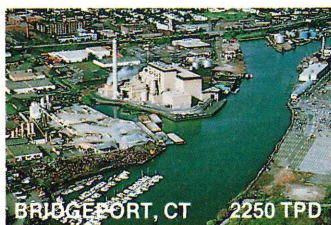
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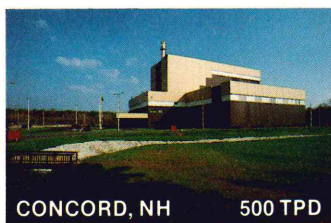
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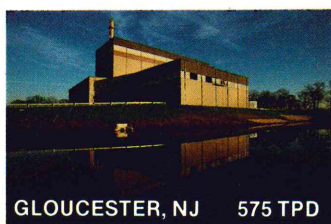
WESTCHESTER, NY 2250 TPD



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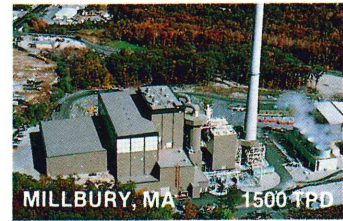
PINELLAS, FL 3000 TPD



N. ANDOVER, MA 1500 TPD



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flurry of federal environmental laws in the 1970s, including creation of the EPA. The Clean Air Act (1970) set national standards for concentrations of air pollutants. The Clean Water Act (1972) controlled sources of industrial and municipal pollution of surface water. The Safe Drinking Water Act (1974) limited the amount of contaminants in drinking water. The Resource Conservation and Recovery Act (1976) introduced regulation of waste management. The Toxic Substances Control Act (1977) empowered the EPA to ban production of certain harmful chemicals.

But for a lot of cleanup specialists, the best law of all came in 1980. That year, Congress passed the Comprehensive Environmental Response Compensation and Liability Act, commonly known as "Superfund." Under the law, the EPA responds to hazardous spills and orders cleanup of abandoned sites on a priority basis, using revenue from a variety of special taxes and, perhaps more importantly, money recovered from parties responsible for contamination.

Superfund — and the Resource Conservation and Recovery Act — differ from the other laws in that instead of prescribing

## The New England States: *Comparatively Green*

**T**he six New England states all rank in the top 10 of the Institute for Southern Studies' 1990 *Green Index: A State-by-State Report Card on the Nation's Environment*.

The North Carolina-based nonprofit research institute ranked states based on 35 indicators, such as enforcement of environmental laws, environmental spending per capita and number of factories that emit hazardous waste.

The institute concedes, however, that the high overall rankings can be deceiving. After calculating the rankings, the researchers looked at about 70 more indicators ranging from tons of fertilizer used to oil spills in state waters. Among the findings:

□ Despite Vermont's greenest-in-the-nation ranking, the state also led all others in per-capita Superfund and other hazardous-waste sites requiring cleanup.

□ Connecticut posted the lowest occupational death rate of all states and the third-lowest pesticide use, but the highest percentage of residents

who breathe air that doesn't meet federal standards for carbon monoxide.

□ Maine was deemed to have the best policies for protecting drinking water, but the most acidic rain.

□ While Massachusetts boasts the second-best drinking water policies and second-lowest occupational deaths of any state, the Bay State is near the bottom in clean air and spending to curb air pollution.

□ New Hampshire ranks second among states in management of hazardous waste, but second-to-last in meeting sewage needs.

□ Rhode Island ranks second in control of energy consumption and third-lowest in growth of carbon emissions over a 20-year period, but scores poorly on cancer cases, sewage investment and ozone levels.

New England states also rank high in pro-environment congressional votes and state initiatives in 45 environmental areas, according to the institute.

### THE 10 GREENEST STATES\*

1. VERMONT
2. MASSACHUSETTS
3. MINNESOTA
4. RHODE ISLAND
5. CONNECTICUT
6. WISCONSIN
7. HAWAII
8. NEW HAMPSHIRE
9. OREGON
10. MAINE

\*Based on 35 indicators measuring poisons, public health, worker health, politics and policies.

Source: Institute for Southern Studies, 1990 *Green Index: A State-by-State Report Card on the Nation's Environment*

### THE 10 GREENEST CONGRESSIONAL DELEGATIONS\*

1. MASSACHUSETTS
2. VERMONT
3. NEW JERSEY
4. RHODE ISLAND
5. MAINE
6. CONNECTICUT
7. WISCONSIN
8. DELAWARE
9. NEW YORK
10. MARYLAND

\*Based on an analysis of League of Conservation Voters ratings for 1985-1989.

Source: Institute for Southern Studies, 1990 *Green Index: A State-by-State Report Card on the Nation's Environment*

### THE 10 GREENEST STATEHOUSES\*

1. CALIFORNIA
2. WISCONSIN
3. OREGON
4. CONNECTICUT
5. NEW JERSEY
6. MINNESOTA
7. NEW YORK
8. MASSACHUSETTS
9. MAINE
10. FLORIDA

\*Based on laws passed in 45 areas, including recycling, energy efficiency, automobile emissions tests, workplace safety, hazardous-waste disposal and regulation of pesticides.

Source: Institute for Southern Studies, 1990 *Green Index: A State-by-State Report Card on the Nation's Environment*



solutions, they hold industry liable for managing cleanup. "That liability fear is what's driving the growth of environmental business. It's also driving technologies that make production processes cleaner," says Ralph Earle, a senior consultant with Arthur D. Little, the Cambridge, Mass., management consulting firm, and former assistant secretary of environmental affairs in Massachusetts.

More than 32,000 potentially hazardous waste sites have been identified under the Superfund program; more than 1,000 are listed on the government's National Priorities List. The latter are places like the Sudbury, Mass., site where the army routinely burned components of poison gas until 1981. The priority sites alone will cost Superfund more than \$27 billion, and responsible parties will throw in billions more. Each site will take years to clean up and encourage new technological solutions such as "bioremediation" — the use of bacteria to consume wastes.

**"As man proceeds toward his announced goal of the conquest of nature, he has written a depressing record of destruction, directed not only against the earth he inhabits but against the life that shares it with him."**

— Rachel Carson,  
*Silent Spring*, 1962

"Consultant firms are mushrooming, helping industry comply with the laws."

Meanwhile, on environmental issues such as air quality and land use, the New England states have set standards that, in many cases, exceed those of the federal government. In Massachusetts this year, lawmakers have considered a sliding-scale auto sales tax based on fuel efficiency and a ban on new cars equipped with air conditioners that use ozone-depleting chlorofluorocarbons. Already, Connecticut, Maine and Massachusetts have some of the toughest recycling laws in the country, and all six New England states are expected to adopt stringent California standards on auto tailpipe emissions by 1995. Because New England's economy is built on small businesses — and most federal regulations are aimed at big polluters — the states have also stepped in to regulate smaller hazardous-waste producers.

Besides untold savings in the health of humans and other species, the tough state regulations have bolstered New England's envirotech industry. "It turns out that those jurisdictions that regulate most severely are enjoying economic benefits of extreme magnitude," says Richard Barringer, director of the Edmund S. Muskie Institute of Public Affairs at the University of Southern Maine and Maine's former conservation commissioner. "The envirotech industry in New England has a dramatic

Following passage of Superfund, a let-the-next-generation-clean-up attitude prevailed in Washington. But last year, Congress reasserted itself in the environmental arena with passage of stringent amendments to the Clean Air Act. The amendments require that manufacturers reduce toxic emissions; refineries curb cancer-causing fumes; carmakers reduce tailpipe emissions; utilities reduce emissions of acid-rain-causing sulfur dioxide; and cities reduce urban smog. Says Belaga,

competitive advantage by virtue of the fact that this region leads in certain environmental regulations and development of technologies to respond to them."

#### Pollution everywhere

The EPA estimates that 60,000 of the 10 million chemical compounds known to man are used in U.S. commerce, most of them introduced before laws were enacted to regulate them. Renewable sources account for only about one tenth of U.S. energy. Only about a fifth of the nation's 6,000 municipal landfills have systems to prevent contamination of water supplies. And the list of Superfund priority sites is expected to grow by about 100 hot spots a year.

New England cleanup firms have plenty of work on their own turf. In a region where tourism, recreation and quality of life are major cultural — and economic — assets, mountain vistas have been blurred by a sulfate haze, courtesy

of prevailing winds that carry acid-rain-causing substances from the Midwest. Fewer than half of Massachusetts rivers and streams meet minimum water quality standards for swimming and fishing. Nine Maine counties regularly exceed safe ozone levels in the summer.

In most New England cities, storm sewers empty into wastewater sewers. After heavy rain, outflows exceed the capacity of treatment plants and go untreated into the nearest body of water. A concentration of substances from cadmium to zinc make historic Salem Harbor a veritable chemistry lab — and one of the dirtiest harbors in America. The muck isn't confined to the immediate coastline. More than once, Gloucester, Mass. fisherman have pulled up barrels of toxic waste with their catch; some crew members have required hospitalization upon returning to shore.

#### MAJOR INTEREST

**M**ore Brown University seniors graduated last May with majors in environmental studies than in chemistry, geology and physics combined. In 1990, Brown graduated 18 environmental studies majors; next May, that number is expected to nearly double.

Employment prospects are good. "We have had no trouble finding prospective employers for our graduates," says Harold Ward, director of Brown's Center for Environmental Studies. "In fact we could have placed them several times over."

A recent \$2 million grant from the Ittleson Foundation will fund various training and research programs at the center and expand its role as a national clearinghouse for environmental studies programs.





Many of the region's metal-finishing industries use chlorofluorocarbons. Even high-tech is not the "clean" industry some have suggested. Among other things, solvents used by high-tech companies could contaminate the groundwater that New Englanders rely on heavily for drinking water. The list of problems goes on.

But whether the trouble spot is Jay, Maine, or Kuwait City, New England environmental companies will face growing competition from foreign companies. German firms were responsible for the majority of the air-pollution control equipment in the United States during the 1980s. A Canadian company, meanwhile, is building Europe's first aluminum-can recycling plant. Again, regulatory traditions may determine competitiveness. "The United States leads the world in a relatively narrow set of environmental regulations," says Barringer. "In those areas where it does not lead, it is rapidly losing competitive advantage to other nations."

Indeed, while the United States has forged tough environmental regulations, it has been tight with money to implement them. Limited government spending on the environment is one reason it has taken longer than expected for U.S.

companies to bring new environmental technologies to market, according to Mead Wyman, a venture capitalist with Hambrecht & Quist. "We're all on board philosophically, but we haven't put our pocketbooks where our mouth is," he says.

#### Higher-ed link

Regulations aside, New England's single most important advantage in environmental technology may be its unparalleled concentration of colleges and universities. It's an area where the old charges about academia's slow response to changing economic needs does not seem to hold up. The Williams College Center for Environmental Studies is two years older than the EPA. Today, several institutions such as Brown and Tufts universities operate nationally known environmental centers for research, training and public policy. About 75 New England colleges and universities offer degrees or certificates in environmental fields. (See Environmental Degree Programs and Concentrations at New England Colleges and Universities, p. 33.)

For more than a decade, universities have played a key role in enabling New England state agencies to execute ambitious environmental policies. Through a collection of university-state partnerships, state environmental agencies

get technical help at relatively low cost; students get an in-the-trenches view of real environmental problems.

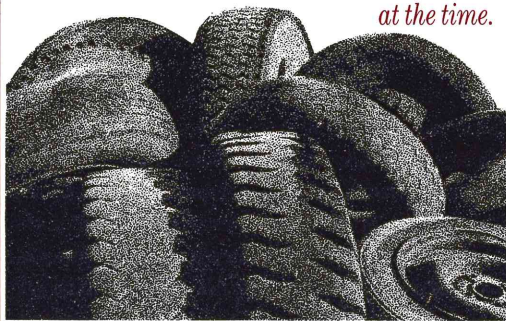
Higher education's major challenge now is to provide a steady supply of graduates with the skills to reverse environmental degradation and prevent further damage. While envirotech leaders say a downturn in the New England economy has made it relatively easy to find qualified workers today, they worry about the future supply of technical experts such as chemical engineers, geologists, hydrogeologists, civil engineers and mechanical engineers. And they should. The number of graduate students majoring in environmental sciences at U.S. doctorate-granting institutions has dropped steadily since 1984. The number of full-time science and engineering students at New England colleges and universities is also declining.

"The rise in environmentalism correlates with trying to conserve, trying to recycle, watching whales and so on," says Gregory Horn, a professor in Wesleyan University's Department of Earth Sciences. "I don't think there's any correlation between real environmental science and environmentalism."

To complicate matters, virtually every new environmental law creates a demand for new skills. Engineers trained to work toward compliance with the Clean Water Act, for example, do not have skills that are transferable to assessing global climate change.

**"Our disposable society is just beginning to understand that the way we get rid of our refuse can affect our quality of life today and tomorrow. ... The environment is no longer just an issue for environmental activists and the wine, brie and granola set."**

*—Massachusetts Attorney General L. Scott Harshbarger, in a 1989 speech before a national group of district attorneys. Harshbarger was the Middlesex County DA at the time.*



#### DEGRADING IN LOWELL

Scientists at the University of Lowell's Polymer Degradation Research Consortium are using blends of natural polymers to develop degradable plastics that could cut the nation's growing mountains of trash down to size. Each year, America generates 160 million tons of municipal solid waste, 80 percent of which ends up in landfills.

Members of ULowell's one-year old research consortium include ICI Americas, Polysar, Monsanto, the U.S. Army research facility in Natick, Mass., and the Massachusetts Centers of Excellence. Members contribute \$20,000 in annual dues plus services and materials. In exchange, they get rights to patented technology developed by the consortium, use of university facilities to test their own materials and a role in directing research priorities.

Meanwhile, ULowell's Toxic Use Reduction Institute is working with industry to reduce use of toxic chemicals in the workplace. The institute was established last fall in response to the Toxic Use Reduction Act, a 1989 Massachusetts law that seeks to halve the amount of chemicals state businesses use by 1994.



And while the EPA is a major source of research funds at some New England institutions, critics say the agency's research has been focused too narrowly on immediate regulatory needs.

"R&D has been an abysmal performer at EPA," laments Alan Borner, founder of the Durham, N.H.-based Environmental Hazards Management Institute, a nonprofit educational group. "For 20 years now, we've taken an approach to environmental problems that throws resources at the current problem in the *New York Times*. When that problem 'disappears,' they're thrown at something else. There is no multimedia focus."

The EPA recently has begun taking a more systematic look at which problems it should target with its scarce resources. An agency report found some of the most serious risks to human health, welfare and ecology are posed by problems that the EPA and Congress have not targeted for aggressive action. If the report's message is heeded, the United States may need more expertise in the high-human-risk areas of air pollution, worker exposure to chemicals, indoor air pollutants and contaminated drinking water, and less in relatively lower-risk areas such as hazardous-waste cleanup.

### Interdisciplinary approach

Adding to the challenge for higher education is the growing realization that science alone will not solve environmental problems; what's needed, scholars and envirotech officials say, is an interdisciplinary approach.

"Institutions of higher education have looked at the environment as perhaps an engineering problem or a toxicological problem or a chemistry problem," warns Borner. "If students have the scientific skills, they may be oblivious to the implications of business management, cost-effectiveness and human relations." One way to change that, Borner says, is to expand internships with state environmental agencies and cleanup operations.

Environmental *studies* programs launched by several New England colleges and universities are meant to broaden that narrow outlook. In a similar spirit, College of the Atlantic in Maine offers one degree program: a bachelor's in "human ecology." The goal is to give students an understanding of ecological sciences and a grasp of sorely needed human relations skills.

As the EPA changes its priorities, the blend between hard and soft sciences could become even more crucial. "The only way to avoid sticking technologies on the end of the pipe is to redesign the whole manufacturing process," says Barringer. "Science and engineering and technology are not the whole answer to these problems. There are whole sets of policymaking and management considerations that have to be addressed at the same time."

Envirotech companies aren't the only ones looking for that blend. If it is the job of this generation to reinstate man's relationship with the environment — and many believe it is — well-trained public policymakers will be in high demand. For while policymakers can claim some major successes — the EPA ban on leaded gasoline is largely responsible for a 96-percent drop in lead emissions since 1970 — environmental policy is rich with complexity, irony and occasional bumbling.

For example, while the federal government passes more and more laws to protect the environment, it has cut funding to comply with the mandates. "You've got these very stringent federal man-

dates on how clean drinking water ought to be or how clean sewage ought to be, but no federal money. And now there's very little state money, so that begins to fall on ratepayers, particularly in older cities with decaying infrastructure," says David Luberoff, a research analyst at the Taubman Center for State and Local Government at Harvard University's John F. Kennedy School of Government.

In addition, some federal regulations have stymied technological innovation by designating the "best available technology" to fight pollution — and stubbornly defending it. If the best available technology detects 10 parts per million for a certain pollutant, there's no incentive to develop technology that detects five parts per million.

Luberoff says some policy innovation is reflected in the recent amendments to the Clean Air Act in the form of "tradable permits," an idea championed by economists from Harvard and Colby College. Under that system, the EPA sets a total amount of allowable emissions for a particular pollutant and allows companies to buy or sell discharge permits, based on how cost-effective it is for a given plant to reduce emissions. (It is a telling, if disturbing, symbol of environmental economic potential that a small industry of brokers is thriving by buying companies the right to pollute.)

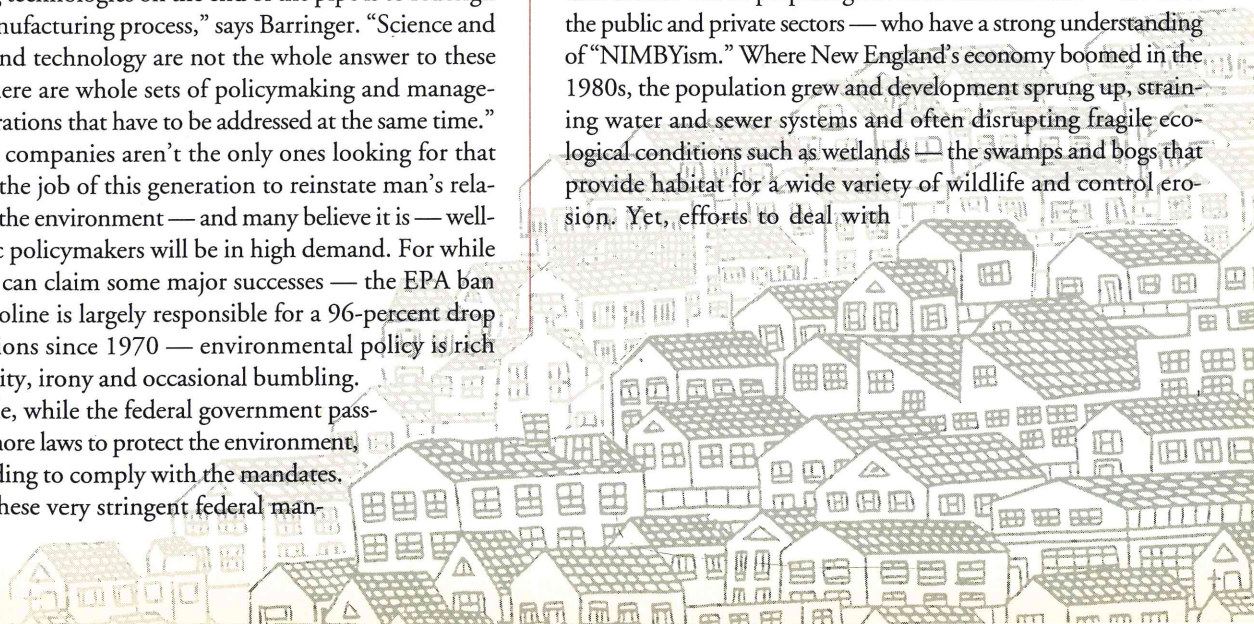
Not surprisingly, the public agencies, with their relatively low pay scales, have a special problem keeping talented policymakers. Look at the resume of a major corporation's environmental officer and "EPA" is bound to show up. Says Belaga, "We train some very talented people in this agency, and they're really marketable out in the private sector."

### Not in my backyard

On the policy front, one key task for New England colleges and universities will be preparing environmental leaders — for both the public and private sectors — who have a strong understanding of "NIMBYism." Where New England's economy boomed in the 1980s, the population grew and development sprung up, straining water and sewer systems and often disrupting fragile ecological conditions such as wetlands — the swamps and bogs that provide habitat for a wide variety of wildlife and control erosion. Yet, efforts to deal with

### ASHES TO?

The University of Connecticut is conducting the most comprehensive investigation into ash recycling of any university in the United States. The burning question for scientists at UConn's Environmental Research Institute: What can be done with ash residue from municipal waste-to-energy incinerators? One possibility: Use the cinders in road asphalt and concrete.







**"In my view, we have perhaps  
10 years to turn around  
some of the most vital  
[environmental] problems  
that are facing us  
or we will be crossing big,  
important thresholds —  
irreversible thresholds —  
that will leave  
the world permanently  
impoverished."**

*— Denis Hayes, executive director of the  
first Earth Day,  
in a March 1990 address  
at the Cambridge Forum*

growth — plans for new waste facilities and sewage-treatment plants, for example — tended to meet with a refrain of *not in my backyard*.

NIMBYism carries a cost. Because of Massachusetts' inability to site a landfill for debris from the court-ordered \$6.1 billion cleanup of Boston Harbor, a federal judge ordered a moratorium on sewer hookups for most developments throughout

Greater Boston. The ban effectively halted construction — and some badly needed real-estate transactions — from the harbor out to Interstate 495. Similarly, none of the New England states has made much headway in complying with a 1980 federal law requiring states to provide facilities for disposing of low-level radioactive waste. The stalemates are the result of a combination of population density and citizen sophistication. "Neighborhoods understand how to fight these things," says Tilas of Metcalf & Eddy. "And where can you locate anything in New England where somebody's not going to be impacted by it?"

Besides providing graduates who understand acid

tongues as well as acid rain, higher education is offering a technical solution to NIMBYism. In an effort to find a suitable site for a new landfill in Rhode Island, Peter August and his staff at the Environmental Data Center at the University of Rhode Island are using "geographic information systems" that manipulate reams of data to produce maps showing the precise location of resources and pollution. As the number of possible landfill sites is narrowed down, August concedes, there will be a call to arms. But the maps produced by the center's geographic information system could offer an objective defense of the sites chosen — few wetlands, no rare species, no groundwater, no important historical sites, appropriate geology. Says August, "The maps and supporting data can diffuse the claim that a site has been chosen for reasons of politics."

#### The task for educators

The interweaving of environmental, social and economic goals creates a daunting array of challenges for educators beyond producing X-number of scientists, lawyers and public managers. For example: Why do national studies show that minorities are disproportionately likely to live near hazardous-waste sites, but underrepresented in environmental groups? Where does the public turn to find out which environmental issues should consume their political capital?

Maybe most important, how do we articulate the value of a clean environment? Businesses complained vehemently about the \$25 billion price of compliance with recent amendments to the Clean Air Act. And while economists might determine the payoff by balancing the cost of compliance against income generated by the envirotech industry in creating and installing pollution-control technology, it's not that simple. Dirty air and dirty water have a cost, too. "The traditional argument that you are adding to production costs by requiring pollution-control technology is founded upon an accounting scheme that is quite narrow in conception," says Barringer. "It's a question of assigning values to resources, and society has already determined that it wants to value clean air and clean water." In any case, adds Barringer, "We know there are 30,000 [envirotech jobs] in Massachusetts and it would be very hard to demonstrate that there have been 30,000 jobs lost as a direct result of environmental regulation." □

#### DOWN TO EARTH

The New England Land-Grant Universities Council of Presidents has developed a regional soil science certificate program, geared to working adults with bachelor's degrees in scientific fields not related to soil science.

Expertise in soil science is important in land-use and land-management decisions such as wetland identification and assessment of sites for sewage disposal. Under the cooperative program administered by the University of Massachusetts at Amherst, students take courses at any of the six land grants in subjects ranging from soil chemistry and microbiology to land-use management and conservation, and receive a certificate after completing 15 semester hours.

#### CLEAN CANALS

What's a Venetian to do? The Queen of the Adriatic's canals are murky; its priceless works of art and ancient buildings are threatened by acid fog. The answer, it seems, will come from Worcester Polytechnic Institute. For two years, WPI students have been traveling to the Italian city to help local officials cope with pollution from the industrialized island of Murano, sewage in the canals and the threat to ancient buildings posed by the pounding of motorboat wakes. Their work takes on added importance as Italy tries to come in line with environmental standards set by the European Economic Community.

*John O. Harney is editor of CONNECTION.*



# HELP WANTED: FIXING ENVIRONMENTAL INFRASTRUCTURE

DAVID LUBEROFF

New England's state and local governments need help. Amid a recession that is already straining budgets, they must also comply with new federal environmental regulations that impose stringent standards without providing money to build, maintain or operate new facilities.

Local colleges and universities will play an important role in addressing these problems. Besides being the locus for innovative thinking on how to address these problems in cost-effective ways, colleges and universities must educate citizens who are able to think carefully about environmental issues. Higher education, moreover, must find new ways to train the policymakers and builders who will design, construct and manage new environmental programs and facilities.

The challenges these new leaders must address are formidable. In the early 1970s, the United States passed a host of new laws designed to clean up our air, water and land. While those measures have certainly helped to improve our environment, most fell far short of their goals. Some — such as transportation-control measures necessary to comply with the Clean Air Act, would have forced people to make changes in their driving habits that they were ultimately unwilling to make. Others fell by the wayside as the country grappled with the oil price shocks and "stagflation" of the mid-1970s; the few new environmental laws of the time, such as the 1977 amendments to the Clean Air Act — stepped back from draconian measures envisioned in earlier bills.

Still other environmental initiatives, such as efforts to deal with acid rain and solid-waste disposal, were swept aside by the anti-government tide that brought Ronald Reagan to Washington. Massive budget deficits in the Reagan years also led to large cuts in existing programs such as federal grants for wastewater treatment.

In the mid-1980s, however, the environmental movement emerged as a powerful political force. As a result, in the late 1980s, Congress passed sweeping new legislation tightening standards for water treatment, wastewater treatment, disposal of solid waste and restoration of clean air.

The cost of implementing these new laws and finally complying with older ones could be enormous. By the end of the decade, according to a 1990 study by the U.S. Environmental Protection Agency (EPA), all levels of government combined will have to spend an additional \$15.6 billion a year (not taking inflation into account) merely to maintain current levels of environmental quality in water, wastewater and solid waste. Unless the newer laws are repealed or ignored, the costs of compliance

will rise an additional \$5.3 billion, the study adds.

The bill for these improvements will fall heavily on some New England states. At current rates of spending, between 1993 and 2000, Massachusetts will face a \$3 billion-plus gap between its water and wastewater spending needs and its available resources, according to a recent study by Apogee Research, a consulting firm.

The Bay State is not alone: Connecticut's shortfall will be \$2.2 billion; Maine's \$1.1 billion; New Hampshire's \$863 million; and Rhode Island's \$397 million. Vermont is in better shape with a projected shortfall of \$70 million, but the state will have to spread the cost over a much smaller population than will its larger neighbors.

Since most environmental programs are funded directly by local users, residents will see these costs in their property taxes and utility bills. On average, household payments for environmental services are expected to increase 50 percent by the year 2000, according to the EPA study. The increases will be even greater in small towns that do not have enough people to spread out the large, fixed costs of capital-intensive facilities such as sewage treatment plants.

Reports of such rate hikes are already common.

The Massachusetts Water Resources Authority, the agency undertaking the court-ordered cleanup of Boston Harbor, has estimated that water and sewer bills in the Boston area could rise by as much as 500 percent before that project is completed. Other older cities, such as Warwick, R.I., also face huge rate increases to replace or substantially alter their combined sewer overflow systems that dump a mixture of raw sewage and rainwater into the ocean during storms.

Communities throughout New England are coping with solid-waste disposal costs that have risen by a few hundred percent, as unsafe landfills have closed and new facilities have been stalled amid concerns about their environmental impact.

To be sure, cost estimates are very tricky business, and some of these figures could represent pricetags for massively overbuilt projects. The fundamental reality remains: If New England and the United States are going to get the kind of environmental quality people have demanded, it is going to cost some serious

## ENVIRONMENTAL LABOR

### OPPORTUNITIES

Ceimic Corporation, the country's fastest growing environmental testing laboratory, offers exciting career opportunities for both experienced environmental professionals and entry-level candidates. Ceimic's new laboratory on five oceanside acres in an Environmental Park in Narragansett, RI. Ceimic provides quality services to the United States Environmental Protection Agency and to the nation's leading engineering, consulting firms. Our unparalleled growth has created numerous opportunities at varied levels and shifts, all with advancement potential.

#### EXPERIENCED

**GC Supervisor** - 2-5 years experience with EPA protocols and demonstrated GC expertise.

**GC/MS Operations** - 1-3 years experience.

#### ENTRY-LEVEL

**BS Chemistry** for entry-level position.

**MS and PhD** - A Chemists for GFAA, GC and GC/MS Anal. Environmental Media

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money. In this era of budget deficits and taxpayer revolts, finding ways to raise and spend money efficiently while still protecting the environment is going to be one of the major challenges facing state and local policymakers.

### New generation of leaders

New England's educational institutions have the opportunity to contribute to this effort. Research institutions may find more efficient ways to treat water, sewage and solid waste. Economists, political scientists and students of public policy can help policymakers design programs that will minimize the demand for expensive new facilities.

For example, a number of economists from New England educational institutions, notably Rob Stavins of Harvard University's Kennedy School of Government and Tom Tietenberg of Colby College, have touted the idea of tradeable permits as a way to make environmental programs more cost-effective.

Under such a system, the government sets a total amount of allowable emissions for a particular pollutant in a specific region and establishes a finite set of discharge permits, which together equal the total allowable amount for that pollutant. Companies can buy or sell the permits. Facilities that find it cost-effective to reduce pollution will sell excess permits to those that cannot reduce emissions inexpensively. The industry as a whole achieves the governmentally mandated cleanup goals at the lowest possible cost, while society receives the same amount of "clean" that it sought.

This is not wishful thinking: Tradeable permit systems have been used in limited forms for almost a decade and were a key element of the 1990 amendments to the Clean Air Act, particularly sections that aim to reduce acid-rain emissions.

Such new policies, however, are easily misunderstood. It is critically important, therefore, that liberal arts institutions give students the basic tools they need to understand the often emotional debates over environmental policy. Unless we can learn

to think critically about the tradeoffs in such policies, debates over environmental issues will continue to whipsaw wildly between the opposite rhetorical poles of environmental protection and economic growth.

Finally, and perhaps most importantly, New England's educational institutions have to train the next generation of policymakers and builders. In some technical areas, this mission will be critical: Schools must be prepared to train a new generation of engineers to replace a large group of engineers trained after World War II that will retire in the next decade. Ironically, this demand for engineers is coming at a time when enrollment in engineering schools is declining dramatically. Somehow these institutions must find a way to infuse the new generation of engineers with a sense of mission. The schools must also give engineering students the skills in political science and economics they will need to understand and influence debate over environmental policy.

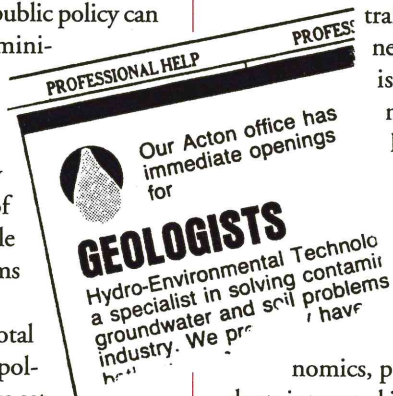
Similarly, programs in public policy, economics, political science and planning need to give students interested in environmental policy the technical skills they need to understand relevant scientific issues.

Correctly done, this marriage could produce substantial payoffs. One such model is New York state's Rural Self-Help Program. Initially conceived by innovative political appointees, the program has taken technical experts from the state's environmental bureaucracy and given them training and support to help small communities design cost-effective water and wastewater treatment systems. It has tried to change the role of state bureaucrats from office-bound workers who merely review engineering plans to community organizers. The program, for example, has rediscovered low-technology methods, such as slow-sand filters, for treating sewage and drinking water.

Many of these systems are relatively simple to build, which means small towns can construct large segments of the systems with local volunteers or surplus men and women from public works departments instead of hiring private engineering firms and contractors to build high-tech systems previously required by the state. As a result of the program, dozens of small towns have cut the cost of badly needed facilities by about half.

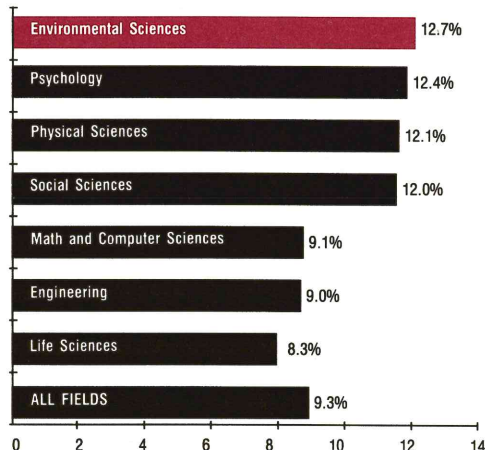
If New England is to achieve the level of environmental quality that its residents and businesses demand without wasting badly needed resources, we must find ways to train a new generation of environmental leaders who can replicate such experiments on a larger scale. These leaders must have substantive knowledge of environmental technology and sophisticated understanding of how local communities function, how environmental infrastructure is financed and how large bureaucracies operate. □

*David Luberoff is a research analyst specializing in infrastructure policy at the A. Alfred Taubman Center for State and Local Government at Harvard University's Kennedy School of Government.*



With just over 5 percent of U.S. population, New England receives more than its share of academic R&D funds — especially in the environmental sciences.

New England's Share of R & D Expenditures at All U.S. Colleges and Universities by Field



Source: National Science Foundation, Academic Science/Engineering: R&D Funds, FY 1988.



"**E**nvirotech" is a recently coined buzzword for the growing environmental/energy industry. The field itself, however, is older than many people think. Harry Truman was president when the Los Angeles Air Pollution Control District was formed to deal with the severe photochemical smog plaguing the Los Angeles basin. (Though smog is still a problem, one might ask whether Los Angeles would even be livable today if it had not enforced strict standards many years ago.)

Nearly a half-century later, an increasing number of New England companies are identifying themselves with envirotech. Last summer, the Massachusetts Office of International Trade published a directory of about 200 envirotech companies in Massachusetts. The Environmental Business Council, formed last fall, now has identified nearly 1,500 Bay State envirotech companies,

To understand  
worldwide demand  
for envirotech products  
and services, stand on  
a street corner in  
Budapest and try to  
keep from coughing  
when the light changes.

many of them small firms with fewer than 50 employees.

It appears that more than 30,000 people are employed in envirotech in Massachusetts alone. Assuming the Bay State is home to two-thirds of New England's environmental companies, the six-state region may host nearly 2,500 such companies, accounting for more than 40,000 New England jobs.

One striking aspect of this industry is that it is still growing by 25 percent to 30 percent annually despite soft economic times. A chief reason: Environmental products and services are in high demand on the export market.

To understand this demand, one need only stand on a street corner in Budapest and try to keep from coughing when the light changes. Most of that city's automobiles were built in what was the East Bloc, often running on dirty two-cycle engines with no pollution controls.

## Regulation-driven

The environmental field is regulation-driven. Because the United States leads in environmental regulations, U.S. environmental companies have an edge in world markets.

The United States began regulating the environment in earnest in the early 1970s. A study completed in 1970 for the newly formed U.S. Environmental Protection Agency (EPA) concluded that 41 percent of Americans were drinking "inferior" water. This study provided a catalyst for the 1972 Clean Water Act, which set water-quality standards for all bodies of surface water, required sewage treatment and limited industrial effluents.

In 1976, stories started appearing in the media about statistically significant health problems such as miscarriages and cancer in the Love Canal area near Buffalo, N.Y. It was found that chemical companies had dumped barrels of hazardous waste there during the 1940s. The land was filled in and subsequently used for housing. Twenty years later, the barrels corroded and the waste permeated soil, groundwater and homes. As a result of the publicity surrounding the Love Canal disaster and similarly polluted sites discovered throughout the country, Congress passed the Comprehensive Environmental Response Compensation and Liability Act, now known as Superfund, which governs cleanup of hazardous-waste sites.

Most federal regulation and enforcement in the 1970s and 1980s focused on "clean water" and tighter automobile emission standards. After many unsuccessful attempts, Congress last year passed amendments to the Clean Air Act, indicating a new emphasis on clean air.

The states also have passed environmental laws and regulations with varying intensity. Massachusetts and Connecticut, for example, are among the handful of states that have passed their own hazardous-waste laws for commercial real estate.

Not surprisingly, two of the states with the strictest local environmental standards — California and Mas-

sachusetts — are hotbeds of emerging environmental companies. Witness Taiwan's decision to send representatives to Massachusetts as part of its "Buy American" program, which this year specifically targets environmental products and services.

Heavy regulation, however, is not the only reason New England is poised to lead the country in envirotech. Envirotech firms will find in New England an already-solid export base; the region accounts for about 6 percent of U.S. exports of all products. Plus, the region's concentration of colleges and universi-



*Can envirotech pull New England out of recession? Cleanup workers use an HNU hydrocarbon monitor to survey a hazardous-waste site.*

*Photo courtesy of Ecology and Environment Inc.*



ties is a key element in the growth of any emerging industry. Note that New England is home to many high-tech and biotechnology start-ups and success stories.

#### Environmental education and jobs

New England's colleges and universities will play a critical role in providing manpower for envirotech.

In January and February 1991, about 70 environmental/energy jobs were advertised in the Boston area each week. Assuming that only about 50 percent of jobs are filled through advertising and that only 70 percent of Massachusetts jobs are advertised in Boston, it appears that about 200 environmental/energy jobs are open each week in Massachusetts alone. Even if 25 percent of those are replacement jobs, that leaves 150 new jobs a week or

7,800 a year. That indicates a job growth rate of 26 percent — about the growth rate of the industry. In the six-state region, envirotech job growth could reach 12,000 per year.

But as the nature of environmental work has changed, so has the way colleges and universities train people for environmental jobs. Before the EPA's creation in 1970, the National Air Pollution Control Administration (NAPCA) was the chief government agency dealing with pollution. NAPCA was part of the Public Health Service, and the traditional place for an "air pollution" education was in a school of public health, where industrial hygienists and aerosol physicists were trained.

While four New England institutions — Boston University, Harvard University, the University of Massachusetts at Amherst and Yale — have schools of public health, environmental study

opportunities today are far more widespread. About 75 New England colleges and universities now offer degrees in environmental fields.

Disciplines that are relevant to the environmental/energy field include: chemistry, chemical engineering, biology, geology, physics, civil engineering, HVAC engineering, sanitary engineering, planning, industrial hygiene, health physics, law and even auditing.

The current job distribution in the envirotech industry is one-third manufacturing and two-thirds service-related. (See table.)

In the manufacturing sector, envirotech job classifications are very similar to those of high-tech firms: skilled and semi-skilled assemblers, electronic engineers, etc. In the service sector, envirotech companies need people skilled in areas such as remediation of sites, disposal of hazardous waste or sludge, construction and operation of water treatment plants, HVAC, energy management and design and operation of pollution-control facilities.

#### Recession-buster?

One frequently asked question is whether the envirotech industry can serve as the engine that pulls New England out of recession.

The answer: Not alone.

### ENVIRONMENTAL/ENERGY PRODUCTS AND SERVICES

#### Environmental products

- monitoring instrumentation (air, water, soil)
- water cleanup equipment (ultrafiltration, reverse osmosis)
- solvent/oil/coolant recovery systems from air, water, soil
- on-site cleanup (incinerators, scrubbers)
- pumps for water treatment plants

#### Environmental services

- laboratory testing
- site remediation (water, soil)/(organics-inorganics)
- asbestos abatement
- hazardous-waste collection and disposal
- planning
- site surveys
- air/water pollution control system design
- legal
- financial
- solid-waste management and disposal
- recycling processes
- environmental training
- engineering services

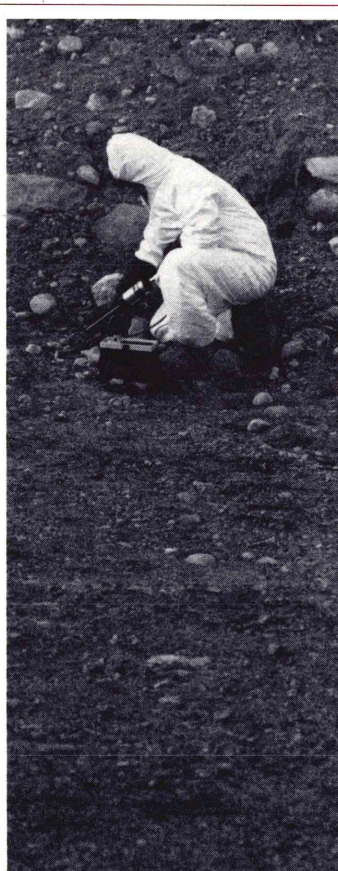
#### Energy products

- power plant controls
- instrumentation (pressure, temperature, etc.)
- photovoltaic cells
- cogeneration
- resource recovery plants
- HVAC control systems

#### Energy services

- energy reduction in buildings/plants
- improvement in process efficiency
- plant construction
- conservation
- energy management systems
- engineering services
- training

Source: HNU Systems





The growth of envirotech will help stem the recessionary tide and provide jobs for many of the region's highly qualified college graduates. But the projected addition of 4,000 envirotech man-

### Envirotech's economic role can be bolstered through regional efforts.

ufacturing jobs and 8,000 envirotech service jobs in New England is quite small compared with the total number of jobs lost in 1990 in the region's manufacturing and service sectors. To pull out of recession and get back on track, we need help from the real-

estate market, construction, banking, high tech, software, biotech and many other traditional businesses in the region. No one business sector can do it all. Envirotech's economic role, however, can be bolstered through regional efforts. Given the present state of diminishing resources — both natural and economic — representatives of the envirotech industry are urging regional development of a large export market to drive this technology. Regional cooperation can boost envirotech's growth rate, help our balance of payments and, if we

focus on energy conservation, lessen our dependence on foreign oil.

There are many things we can do better as a region than as individual states, including developing export markets; forging closer cooperation among universities and envirotech companies; coordinating environmental regulations (after all, one state's emissions quickly become another state's problem); and developing regional hazardous-waste disposal sites or incinerators.

We have precedent for this kind of regional action in, for example, the New England River Basins Commission and the New England Board of Higher Education.

In Massachusetts, the Environmental Business Council is working with state environmental affairs officials to develop a list of environmental resources in business and academia. A similar effort undertaken on a regionwide basis could mark the beginning of regional cooperation in this vital industry. □

John Driscoll is founder and president of HNU Systems, a Newton, Mass., manufacturer of instruments for monitoring hydrocarbons, pesticides and heavy metals in air, water, soil and food.

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## REMEMBERING THE FIRST EARTH DAY

### A U.S. senator sees progress and warns of challenges

JOHN H. CHAFEE

**T**wenty-one years ago, while serving as secretary of the navy, I was asked to deliver an address at the University of Rhode Island commemorating the first Earth Day. I recently reviewed a newspaper report of the event and was struck by how the things I said about protecting and preserving our environment have added urgency in the 1990s. Some excerpts from that speech as reported in the *Providence Journal* are worth repeating:

*"If we are really serious about cleaning up our streams and air, we must be prepared to forego some of the independence that we pride ourselves upon. For instance, abolishing air pollution is incompatible with a homeowner's right to burn his leaves on a quiet fall afternoon."*

*"Discovering alternatives [to pollution] and putting them into effect is going to cost money, and anyone who thinks we can clean up the environment without substantial expenditures by government, by industry and directly by the individual, is woefully mistaken. The question we must ask ourselves is do we really care?"*

The *Journal* article went on to say, "Mr. Chafee made it clear that he is optimistic [about] the chances of achieving what he called the delicate balance between man's materialism and his desire for a decent environment."

Two decades later, I am still optimistic. We have made substantial progress since the first Earth Day, when 20 million Americans rallied under the banner of environmentalism. We have phased out leaded gasoline and seen the blood lead levels in chil-

dren drop dramatically. We have revived many of our unsightly and polluted rivers to the point where they are now fishable and swimmable. Most hazardous waste — once dumped into open pits where it threatened groundwater — is now strictly regulated and disposed of in an environmentally sound manner.

Last year's landmark amendments to the Clean Air Act should significantly improve the quality of the air we breathe. Legislation requiring double-hulled ships will greatly diminish the threat of oil pollution.

But the challenges remain formidable. The greenhouse effect, overpopulation, unhealthy levels of air pollution, extinction of countless species and a severe shortage of capacity for solid waste are all problems that command our attention.

Fortunately, support for environmental initiatives has grown steadily over the past two decades to the point where, according to recent polls, 80 percent of Americans say they would support more strenuous environmental efforts regardless of cost. Whereas the first Earth Day was promoted by large numbers of college students and academicians and a small number of politicians, today's movement has broad, deeply rooted support from a large cross section of Americans. I receive a flood of letters from

Support for environmental initiatives has grown to the point where 80 percent of Americans say they would support more strenuous environmental efforts regardless of cost.





**We must regard  
our planet not so much as  
something we inherited  
from our parents,  
but as a delicate ecosystem  
we borrow from  
our children.**

Reilly of the World Wildlife Fund-Conservation Foundation,  
as the head of the U.S. Environmental Protection Agency (EPA).

parents, industrial workers, students, fishermen and others who are concerned about the degradation of our environment and committed to cleaning it up.

This widespread support for environmental causes has not gone unnoticed by those holding public office. In the U.S. Senate today, environmental bills commonly receive an overwhelming majority of votes. And the prominence of environmental issues in the 1988 presidential campaign led to the appointment of a bona fide environmentalist, Bill

The first Earth Day had a measurable impact on the political landscape, and helped pave the way for passage of the Clean Air Act, the Clean Water Act and the Endangered Species Act, as well as the creation of the EPA. But what do we hope to accomplish in this, the Environmental Decade?

I believe our goal should be nothing less than the adoption of a global environmental ethic. With a man in the White House who has vowed to become the "environmental president" and a Congress increasingly sympathetic to environmental causes, we have an opportunity to lead the world in setting policies that protect our basic ecological capital.

We must set an example by considering the environmental consequences of our economic policies. For example, our policies toward fossil fuel consumption can no longer be considered independent of the urgent need to reverse the greenhouse effect. Reorienting business — and indeed nations — to consider the environmental implications of economic growth should be a major challenge for U.S. foreign policy in the coming decade.

"Think Globally, Act Locally" is an appropriate slogan for the '90s. President Bush recently observed that in millions of everyday decisions, we are determining the fate of the earth. This is a very poignant observation. We must instill in our popula-

DANIEL S. GREGORY

## PROMOTING ENVIRONMENTAL BUSINESS:

### *The Massachusetts Approach*

**T**he development of the envirotech industry in Massachusetts can be attributed to several factors. First, the state has a history of environmental preservation and technological innovation. Second, Massachusetts colleges and universities produce the students who can carry on this tradition. Third, the growth of the high-tech and biotech sectors of the Massachusetts economy during the early 1980s created a sound foundation for the emergence of the envirotech industry. The confluence of these factors has created the largest industry of its kind in the nation.

There are an estimated 1,500 environmental ser-

vice, consulting, manufacturing and project construction companies located in Massachusetts. These firms provide goods and services not only to local and national markets, but also to international markets. Massachusetts companies are playing a vital role in Europe, including the former Eastern Bloc countries, and Asia.

The outlook for this industry is extremely positive. As environmental awareness grows, so does the demand for our companies' knowledge and experience.

My goal is to ensure the continuation of strong growth rates in this industry and enhance the business climate in which Massachusetts envirotech companies operate.

It is my philosophy — and that of the administration I serve — to

increase the level of cooperation between the public and private sectors to enhance economic growth. No government should tell a business how to operate, but business can tell government how to create a better climate for business development.

The Weld-Cellucci administration regards the envirotech industry as a key component of the state's business community. The state is helping the industry in two major ways:

□ The Massachusetts Office of Business Development provides general assistance to companies wishing to do business in Massachusetts. The office guides companies through the myriad state regulatory agencies, provides opportunities for networking with other businesses and can help arrange financing



tion, especially the younger generation, an understanding that everyday decisions such as taking public transportation instead of driving, or washing dishes in a basin instead of with water running, or purchasing easily recyclable products have a direct impact on our life-sustaining ecosystem.

In Congress, we are confronting difficult and complex issues. In this session, we are revising laws governing the management of solid waste and the protection of our water and endangered species. And we are making sure that as we build and repair our highways and infrastructure, we do so in a manner that protects the environment.

We all must begin to treat the earth with care and concern and regard our planet not so much as something we inherited from our parents, but as a delicate ecosystem we borrow from our children. Only by developing this sense of environmental stewardship can we ensure the future health of our planet. □

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*John H. Chafee is a U.S. senator from Rhode Island and a ranking Republican member of the Senate Environment and Public Works Committee.*

through the state's quasi-public finance agencies.

□ The Massachusetts Office of International Trade and Investment helps envirotech companies find new markets in Europe and Asia. One of Gov. William Weld's first orders of business was to meet with representatives of nine German environmental companies who traveled to Massachusetts at the invitation of the Office of International Trade. As a result of that meeting, a number of contracts have been signed between Massachusetts companies and their German counterparts.

In addition, the state's Executive Office of Economic Affairs and Executive Office of Environmental Affairs are conducting a survey of environmental and energy companies in Mas-

sachusetts. The results will provide an accurate profile of the envirotech industry, as well as recommendations on how the public and private sectors can work together to support development of this industry. The two secretariats are also working together to coordinate regulatory permitting to ensure the preservation of our environment without hindering economic development.

As Massachusetts develops and markets its knowledge-based industries, the envirotech industry will play a leading role. The state is poised to seize the business opportunities that the Green Decade of the 1990s will present. □

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*Daniel S. Gregory is the Massachusetts Secretary of Economic Affairs.*

## ECOLOGICAL TECHNOLOGY CALLS FOR A NEW MIX

A burgeoning industry banks on corporate research support, campus restructuring and investors who take a long view

DAN DIMANCESCU

New England is uniquely poised to leverage an enormous long-term opportunity.

The opportunity falls under the heading of a new industrial sector: ecotech. It encompasses all the technical disciplines, products and services needed to clean up the environment and conceive products that are ecologically "clean." A perfect example is a successful research effort at the Massachusetts Institute of Technology to get bacteria to produce "plastic polymers" that are completely biodegradable and involve no crude oil as a raw material. These polymers could be used to manufacture high-volume and short-usage products such as cups, plates and other disposables.

The embedded intellectual disciplines for an ecotech industrial base are strongly rooted in New England, from the hard materials sciences, to electronics, to biotech, to energy. Needed now is a concerted effort to accelerate their evolution.

### Overseas competition?

What should concern us is that others already have a running start on this industry. One piece of good news is that the "others" do not yet include Japan. The bad news is that the German government provides substantial subsidies to industrial firms prepared to develop and market ecologically clean products. According to one estimate, about 4,000 ecotech firms have research links to Germany's technical universities. By the same account, almost 10 percent of the German national budget is invested in clean technology subsidies, compared with about 0.8 percent in the United States and 0.6 percent in Japan.

France, in contrast, has lagged seriously behind Germany in taking the ecotech opportunity seriously. Only after the sudden domino-like fall of Eastern European communism revealed ecological devastation did the French take the issue to heart. Invited to address several hundred French executives and government officials in June 1990, I proposed that France target a new industrial sector that I coined then as "ecotech." This, I believed, could turn the ecological movement from what was perceived as a leftist political threat into a positive economic growth opportunity.

Is ecotech worth the bother?  
Morally, of course.  
We cannot afford to continue to unleash continued damage on the environment at geometric rates.



To encourage this new industry, I proposed that a new technological institute — planned for western France — consider the ecotech theme as a core for its academic and research agenda. I suggested that research be conditional on industry participation, and that all projects be multidisciplinary and team-based, since the inherently holistic character of ecotech cuts across specialized fields. Because French higher education, like ours, tends to emphasize specialization, the development of more effective teamwork is an important byproduct. The concept now sits in the hands of the French government. I've been told it could come alive this summer.

Those recommendations could have been made in New England with one important difference: The severity of the ecological dilemma is already understood by most people here. In Massachusetts, moreover, the beginnings of an industrial ecotech lobby are visible. Indeed, the recent founding there of the Environmental Business Council is perfectly timed and positioned to leverage the ecotech opportunity.

Is ecotech worth the bother? Morally, of course. We cannot afford to continue to unleash continued damage on the environment at geometric rates.

Is it a practical option? Yes. The economic opportunity is large indeed. Ecological cleanup costs worldwide are measured in trillions of dollars. Eastern Europe, as one example, is in a crisis state. Romania — with no controls on heavy metal and other emissions from factories — now estimates that 80 percent of its drinking water sources are industrially polluted. In the Americas, cities like Los Angeles and Mexico City have reached health limits on the most serious air-inversion days. To let these problems get worse is to deliberately threaten human lives.

#### Clean products

Beyond cleanup, there is a large opportunity to create clean products at their origin as well as clean infrastructure. MIT's polymers are one example. The leaching of sewage in artificial swamps is another. The new technology is the "swamp." Unlike an incinerator used for the same purpose, the swamp creates no toxic by-product.

What this means — and what is understood more and more by the electorate — is that such products and methods eliminate large, secondary social and economic cleanup costs. Many people are prepared, as a result, to pay more for clean products whether they come in the form of packaged foods, cars with fully recyclable components or computers that do not emit radiation. They understand that more money up front may mean far less later.

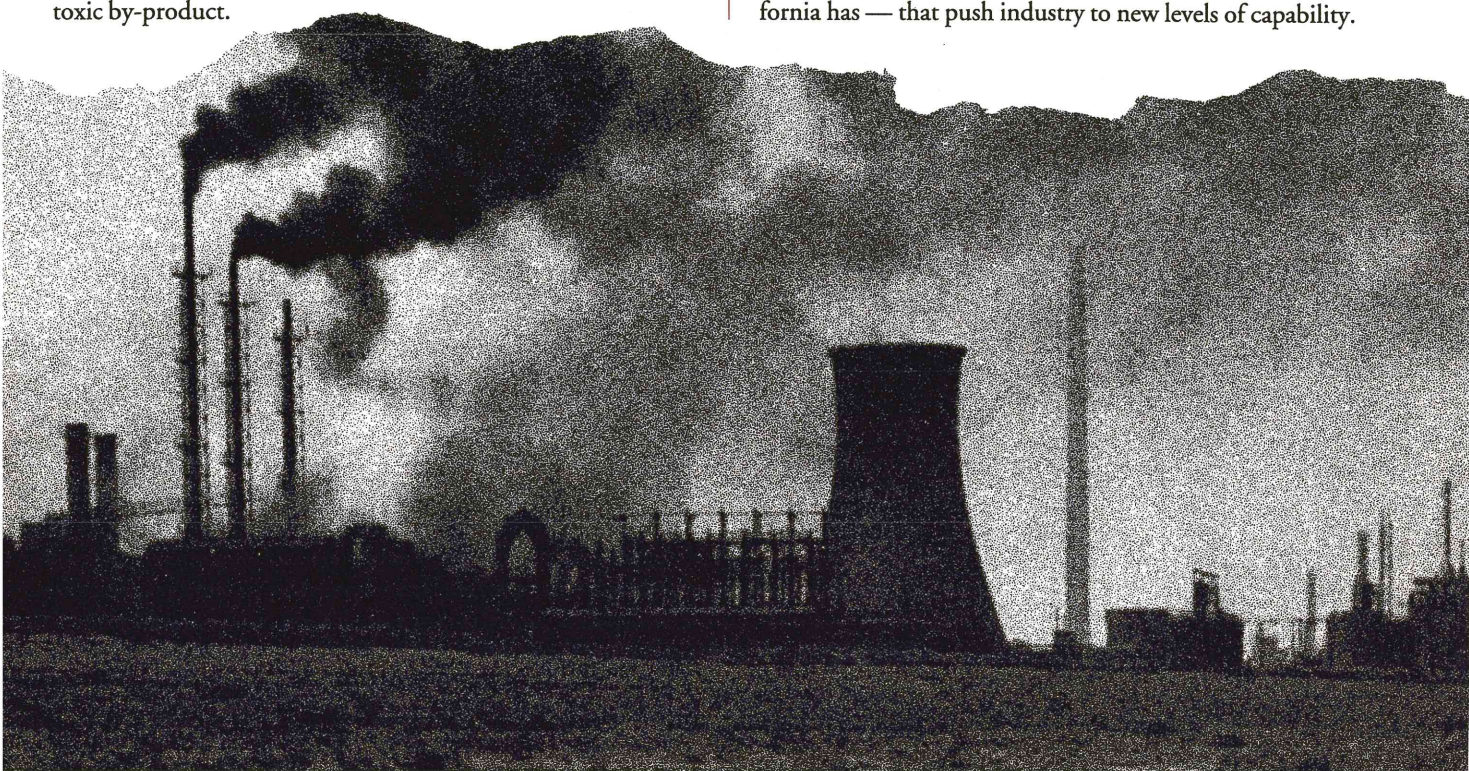
How does ecotech get sparked? In part, it has been already by stricter pollution-control laws, of which California's are pacesetters for the nation. It has been spearheaded, too, by a groundswell of interest originated by the so-called '60s movement. The search for a life unfettered by damaging technological by-products — once the domain of "hippies" or greens — is now becoming desirable to large portions of the middle class. The trip to the garbage dump is no longer what it was. The dollars add up for every bag thrown in, and property taxes soon reflect it. Even companies are on board. The creation of the Environmental Business Council confirms that. It legitimizes the ecotech opportunity as economically and politically acceptable.

**Almost 10 percent of the German national budget is invested in clean technology subsidies, compared with about 0.8 percent in the United States.**

#### Building ecotech

What next? For New England, the foundation exists for an ecotech industry: academic resources and laboratories, large established firms and fledgling ones, as well as a growing demand for clean products and services.

Public leadership can recognize the opportunity and give it public visibility. Procurement by public agencies, states and towns can be used to accelerate the building of an industrial ecotech supplier base. States can enact laws — much as California has — that push industry to new levels of capability.





Universities can be challenged to redefine or reorient research projects and curricula to reflect the interdisciplinary and holistic nature of the ecotech opportunity. In doing so, institutions will have to restructure their vertically linked departments into horizontally linked ones. This is no easy task. The Leadership in Manufacturing program at MIT, for example, reflects the need to cut across disciplinary boundaries, but has yet to win the battle of vertical departments. In addition, universities will have to consider revising reward systems for scholars who are normally channeled into narrow disciplines as a basis for publication and promotion.

New England's governors have the opportunity to build a bipartisan coalition around an agenda of cleaner air, water and foods — and in so doing, create a tangible opportunity to affect the economy.

The New England Miracle — the real one that is now hitting hard times — was formed by three dominant industrial sectors catalyzed during the 1950s and 1960s: defense, health care and computer electronics. Two more emerged as strategically important during the 1970s and 1980s: software and biotechnology. The nickname "AI-Alley" for Kendall Square in Cambridge, Mass., is fitting. It could also be called "Biotech Row." An unprecedented concentration of software and biotech firms are accumulated in the few square blocks that lie in MIT's shadow. The reason all these industries blossomed here was the underlying foundation of world-class academic institutions, risk-taking money lenders and generous federal research support.

A different mix is ready to burgeon. More aggressive corporate support will have to replace declining federal dollars. At universities, cross-disciplinary research methods will have to replace

the old vertically managed, narrow disciplines. And the venture capitalist or money lender will have to abandon the quick return and big-hit view of entrepreneurship in favor of the longer view and more, smaller hits.

During the 1990s, the ecotech sector is poised for take-off. One way to start it on its way in New England is with the world's first major ecological technology trade show. Call it Ecotech I. It would place Boston — and New England — at the bull's-eye of a global opportunity. It could be cosponsored by New England's leading research universities, the new Environmental Business Council and the six states. It could be distributed in multiple sites anchored at one of the universities or at the Trade Center. Funds — already authorized by the states for purposes akin to this — could be used to establish a year-round laboratory, where researchers from industry and other sectors could test concepts, tools and techniques developed elsewhere. Its focus could range from a specific industrial need, such as toxic by-products of the electronics manufacturing process, to a subject as broad as clean water.

The pieces of an ecotech industrial base are in place. The next step is up to the governors. They can give the initiative immediate visibility and credibility. □

*Dan Dimancescu is a consultant and co-author of several books, including Global Stakes and New Alliance.*

**Ecological  
cleanup costs  
worldwide are  
measured  
in trillions  
of dollars.**

## R&D EXPENDITURES IN ENVIRONMENTAL SCIENCES AT NEW ENGLAND COLLEGES AND UNIVERSITIES: 1988

(Institutions ranked among top 100 in the United States)

Institutions	Environmental Science Expenditure*	National Rank
Woods Hole Oceanographic Institution	\$47,100,000	3rd
University of Rhode Island	15,048,000	15th
Massachusetts Institute of Technology	11,716,000	22nd
University of New Hampshire	6,847,000	35th
Harvard University	6,073,000	41st
University of Massachusetts	5,715,000	43rd
University of Connecticut	4,574,000	49th
Brown University	4,118,000	56th
Tufts University	2,941,000	65th
Yale University	2,241,000	76th
University of Maine	1,630,000	88th
Wentworth Institute of Technology	1,457,000	93rd
Total for New England institutions among top 100:	\$109,460,000	
Total for all New England institutions:	\$110,665,000	

\* Rounded to nearest 1,000

Source: National Science Foundation, *Academic Science/Engineering: R&D Funds*, FY 1988.



# ENVIRONMENTAL EDUCATION: *A Look at the Landscape*

WILLIAM R. MOOMAW

Society's newfound concern for the environment has made itself felt on college campuses in terms of both increased student activism and added attention in the classroom. Indeed, though colleges and universities are generally conservative when it comes to introducing new curricula, many were ready with environmental courses and programs well in advance of rising student interest.

Undergraduate environmental studies programs now have a tradition going back more than 20 years in New England. As environmental interest rose on campuses during the 1960s, faculty and administration at several colleges and universities responded with a range of academic and research programs reflecting the unique strengths of each institution. New graduate programs were created and traditional courses in engineering, natural resources and public health were modified to address environmental problems. Degrees in environmental health appeared, while courses in sanitary engineering became courses in "environmental engineering" and courses in forestry became

courses in "environmental management."

Today, the variety of environmental programs in New England is as great as the variety of educational institutions. Undergraduate liberal arts programs typically offer a combination of traditional disciplinary courses in the sciences, social sciences and humanities, coordinated by special interdisciplinary offerings —

courses like "The Individual, Nature and Society" and "Man and the Biosphere."

Graduates of these programs now occupy positions as environmental writers and educators, corporate environmental officers, government officials and leaders of public interest organizations. With additional graduate education, others have gone into environmental science, engineering, medicine, law and other professions.

Obviously not all students who major or concentrate in environmental studies become professionals in the field. In fact, most of the undergraduate programs are not designed to turn out environmental specialists. Students are often required to major in a conventional disciplinary specialty, and the environmental studies program attempts to teach them how to work together with other disciplinary specialists to understand environmental prob-

lems not only scientifically, but economically, socially, politically and philosophically.

It might well be argued that environmental studies provides the ultimate liberal arts education by combining science with the study of politics, economics, history and philosophy. Furthermore, given declining national interest in the sciences, environmental studies may be a magnet to draw more students into science and engineering generally.

In addition, institutions have begun to realize that all college graduates, whatever their specialty, should have a grasp of environmental issues. Tufts University's Dean of Environmental Programs Anthony Cortese and President Jean Mayer have set a goal that within five years, all Tufts graduates will be environmentally literate. Toward that goal, dozens of Tufts faculty members already have participated in programs to help them incorporate environmental issues into their courses.

**When environmental programs were introduced, many critics viewed them as a fad.**

## Individual approaches

While sharing common goals, institutions have developed their own approaches to environmental education based on their strengths. Williams College, which in 1968 became one of the first colleges to establish an environmental academic program, uses its nearby 2,400-acre experimental forest to develop research and teaching programs in the sciences. Faculty interests in environmental law and land-use help shape Williams' social science offerings.

While the University of Vermont builds upon its expertise in natural resources, the environmental center at Brown University takes advantage of its urban setting to provide a major laboratory for urban environmental issues such as solid waste.

Dartmouth College addresses acid rain and resource issues, while Bowdoin College and College of the Atlantic have developed special marine expertise based on their locations near the coast.

Graduate programs and environmental research have also grown in recent years. Tufts University complements its undergraduate programs with specialized graduate offerings: hazardous-materials management in engineering; urban and environmental policy in arts and sciences; and international concentrations at the Fletcher School of International Law and Diplomacy. Tufts' Center for Environmental Management carries out and supports research on corporate environmental practices, environmental monitoring, technology development and policy. New programs in environmental health are being developed at the university's medical school.

The University of Massachusetts, building upon its natural



**Given declining national interest in the sciences, environmental studies may be a magnet to draw more students into science and engineering generally.**



resource programs, has established itself as a leader in the field of integrated pest management.

#### Key research

As we have begun to recognize that many of the most critical environmental problems are regional, even global, a number of institutions have responded with important research programs. Harvard University has a major concentration of researchers working on global atmospheric problems. The Massachusetts Institute of Technology is carrying out studies on technology and the environment and on water quality. Yale University, with the country's oldest school of forestry, has shifted its graduate programs heavily into the environmental field. A few law schools

now offer environmental law courses and publish environmental law journals and one — Vermont Law School — operates an environmental law center.

The University of New Hampshire has created a major new center to study global and regional environmental problems. The University of Rhode Island and the Woods Hole Oceanographic Institute are major national centers for studying the marine environment.

When environmental programs were introduced, many critics viewed them as a passing fad. But the programs have proven to be vigorous, enduring and indeed significant components of college and university curricula. Students and faculty who are interested in gaining knowledge and applying it to real issues

RICK E. MELBERTH

## NATURAL LAWS

### A New England Law School Makes a Case for Environmental Knowledge

**E**nvironmental laws are changing faster than law schools can keep pace. Decisions on corporate mergers and acquisitions are influenced by the acquisition target's pollution record — and possible liability. Land development projects face numerous environmental regulations, ranging from adequate sewage and water capacity to habitat protection and aesthetic considerations. In short, business planning activities now involve environmental risk calculations well beyond concerns that dominated past decision processes.

Law schools have responded to this challenge by offering "environmental law" courses, ranging from broad survey courses to specialized substantive studies in areas such as water law and toxic torts. Some schools also offer post-law

degrees in, for example, natural resource law, ocean and coastal law, and land-use management and control law.

Few law schools, however, offer interdisciplinary or joint degree programs in law and environmental studies, in which students follow a usual law school program while pursuing graduate programs in the environmental field. Vermont Law School's research indicates that only six schools nationwide — including Vermont Law School and Yale University School of Law — offer joint degree programs with strictly environmental or natural resource-based graduate components.

These institutions are preparing a generation of professionals with the vision to set broad environmental goals and the technical, managerial and legal skills to work toward them.

Environmental lawyers need a basic understanding of the ecological concepts that govern relationships among living organisms; knowledge of the legal mechanisms by which environmental goals and standards are interpreted and enforced; understanding of the political and institutional mechanisms that shape environmental policy; and appreciation of the moral and ethical issues posed by environmental policy choices.

Legal education, meanwhile, must become more interdisciplinary as we learn more about the scientific, economic, legal, political and ethical dimensions of environmental problems. For example, solid-waste management, global warming and groundwater contamination are more complex problems than we first imagined, demanding from lawyers a blend of technical and legal expertise as well as an ethical perspective.

To date, however, policymakers have not taken a sufficiently interdisciplinary approach. As a result, the laws, programs and strategies designed to provide environmental protection

have been uncoordinated and inconsistent. States not only develop their own environmental policies, but are often given the responsibility for administering federal regulations. These complex and fragmented responses have achieved successes, but they may not be appropriate for a range of new and larger environmental problems like global warming and species diversity.

Instead, our responses need to be more integrated, coordinated and consistent with the goals of environmental quality at national and international levels. The challenge then is to educate students with the values and skills to integrate essential information and make sound environmental policy choices.

Those choices reflect our understanding that human activities dramatically alter the natural community. As our capacity to affect natural systems grows, we must acknowledge our obligation to the future. □

*Rick E. Melberth is associate director of the Vermont Law School Environmental Law Center.*



and problems are drawn to environmental studies. Faculty working on environmental problems often find themselves called upon by industry, government and the public to translate their knowledge into policy options or technical solutions. Many students find the immediate applicability of their studies to be highly motivating, to say nothing of the career options available to them. All seem to find the interdisciplinary aspect of environmental studies to be intellectually stimulating.

After weathering a downturn in interest during the 1980s, environmental programs are now in demand; on many campuses, more students are enrolled in these programs than in such

traditional concentrations as premedical studies. Moreover, there is a growing expectation that higher education will provide graduates and the knowledge base to address the many environmental challenges we face. With the environmental agenda long and unfinished, few today are suggesting environmental studies is just a fad. □

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*William R. Moomaw is the director of the Center for Environmental Management at Tufts University.*

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## SAVING THE EARTH, SAVING MONEY

MADELEINE MC GARRITY

**T**he burgeoning environmental field presents just the kind of dilemma the New England Regional Student Program (RSP) is designed to solve: If the region is to foster a world-class envirotech industry — and clean up its own environment — it will need well-educated professionals and cutting-edge technology. That is, New England will call on the specialized strengths of its colleges and universities for new ideas, new programs.

Yet many New Englanders are questioning whether they can afford higher education — nationally, college costs rose at twice the rate of financial aid during the 1980s — and if they can, they may not find the environmental programs they need, at least not at public institutions in their home state. The reason is public higher-education systems in New England are caught in a fiscal squeeze that has them cutting, rather than adding, programs.

The RSP addresses both problems. The program — administered by the New England Board of Higher Education — enables New England residents to pay significantly reduced tuition at out-of-state public colleges and universities within the New England region, if they pursue certain academic programs that are not offered by their home state's public institutions.

Under the RSP, New Englanders who attend out-of-state public colleges and universities pay *in-state* tuition, plus a surcharge. During academic year 1990-91, RSP participants — many of them preparing for high-demand environmental fields — saved an average of \$2,719 on tuition bills.

### New Hampshire Doctorates

Dozens of majors related to the environment — ranging from associate's to doctoral degree programs — are offered at reduced tuition through the RSP.

Consider, for example, the Maine resident who was one of eight students enrolled in the University of New Hampshire's new doctoral program in natural resources. Tuition savings through RSP: more than \$4,500 this year.

The UNH program involves faculty members drawn from

several departments, colleges and institutes across the campus. Besides the core areas in natural resource management, students can study a wide range of environmental and ecological fields. Concentrations are offered in hydrology and water resource management, ecosystems and global biogeochemistry, terrestrial ecosystems studies, forest resource management or natural resources and public policy.

UNH's renowned Institute for the Study of Earth, Oceans and Space — a major recipient of funds from the National Science Foundation and National Aeronautics and Space Administration — plays a key role in the program. The Institute sponsors work by students on several aspects of regional and global environmental analysis, including causes and effects of global warming and acid rain.

### Tri-campus degree in Maine

RSP participants also are eligible for a tri-campus bachelor's degree program in environmental studies offered by the University of Maine System's campuses at Fort Kent, Machias and Presque Isle. With access to each campus's unique resources, students are offered an innovative, individualized approach to understanding and solving environmental problems.

Students pursuing the bachelor's degree may opt to spend one or two semesters at the other two campuses, which offer different concentrations.

UMaine at Fort Kent stresses environmental issues affecting rural areas and wildlands, offering concentrations in wildlife preservation, forestry, soil conservation, and air and water pollution.

The Machias campus focuses on the study of organisms in their natural environment and on interactions between people and the natural environment. Concentrations include: avian ecology, environmental education, environmental policy, marine ecosystems and terrestrial ecosystems. Students can also design their own concentration. UMaine at Presque Isle takes a more scientific and biological approach, offering concentrations in geo-

**For a Maine resident  
enrolled in the University  
of New Hampshire's  
new doctoral program  
in natural resources,  
RSP tuition savings  
topped \$4,500.**

*continued on page 34.*



# ENVIRONMENTAL DEGREE PROGRAMS AND CONCENTRATIONS AT NEW ENGLAND COLLEGES AND UNIVERSITIES

	ENVIRONMENTAL SCIENCE	ENVIRONMENTAL ENGINEERING	ENVIRONMENTAL STUDIES	ENVIRONMENTAL HEALTH	ENVIRONMENTAL TECHNOLOGY	ENVIRONMENTAL EDUCATION	HUMAN ECOLOGY		ENVIRONMENTAL SCIENCE	ENVIRONMENTAL ENGINEERING	ENVIRONMENTAL STUDIES	ENVIRONMENTAL HEALTH	ENVIRONMENTAL TECHNOLOGY	ENVIRONMENTAL EDUCATION	HUMAN ECOLOGY
Antioch New England Graduate School					M	M		Plymouth State College	B					M	
Bennington College		B						Roger Williams College	B						
Bentley College		B,M						Saint Joseph's College	B						
Berkshire Community College	A							Saint Michael's College	B						
Boston College	B							Salem State College	B						
Boston University	B		M	M,D		M		Simon's Rock of Bard College			B				
Bowdoin College	B							Southeastern Massachusetts University		B					
Bridgewater State College	B					B		Southern Connecticut State University	B			B			
Brown University		B,M						Southern Maine Technical College					A		
Central Connecticut State University					B			Southern Vermont College			A,B				
Clark University		B,M,D		M				Springfield College				B			
College of the Atlantic						B		Springfield Technical							
Connecticut College						B		Community College					A		
Curry College	B							Sterling College						A	
Dartmouth College		B						Suffolk University	B						
Eastern Connecticut State University	B							Tufts University		B,M,D	B	M,D			
Fitchburg State College	B							Unity College	B						
Franklin Pierce College	B							University of Connecticut		D					
Goddard College	B,M							University of Hartford		B					
Gordon College	B							University of Lowell	B	B,M	M,D		M		
Hampshire College	B							University of Maine		M					
Harvard University		B,M,D		M,D				University of Maine/Fort Kent				B			
Holyoke Community College	A							University of Maine/Machias				B			
Johnson State College	B		B					University of Maine/Presque Isle				B			
Keene State College			B					University of Massachusetts/Amherst	B	B,M,D		B,M,D			
Lyndon State College	B							University of Massachusetts/Boston	D						
Marlboro College	B							University of New England	B						
Massachusetts Institute of Technology	B,M,D	B,M,D						University of New Hampshire		B,M				B,D	
Mattattuck Community College	A							University of New Haven		A,B	A,B,M				
Merrimack College	B							University of Rhode Island		B,M,D				B	
Middlebury College			B					University of Vermont		B,M	B		M		
Middlesex Community College (Conn.)	A							Vermont Law School			M				
Mount Ida College						A		Waterbury State Technical College					A		
New England College			B					Wesleyan University	B						
New Hampshire Technical College/Berlin						A		Western Connecticut State University	B						
Northeastern University		B,M,D						Williams College				B			
Northern Essex Community College						A		Worcester Polytechnic Institute	B	B,M					
Norwich University		B						Yale University		B	D	M,D			

## KEY:

A = associate's  
B = bachelor's  
M = master's  
D = doctorate

Source: NEBHE analysis  
March 1991.

## ABOUT THE CATEGORIES:

**Environmental Science**  
includes the following:  
environmental science,  
environmental biology,  
environmental chemistry,  
environmental earth  
science, environmental  
geosciences.

**Environmental Engineering**  
is usually  
a concentration  
or major within  
civil engineering.

**Environmental Studies**  
is usually interdisciplinary,  
including study of  
socioeconomic factors,  
policy and science.  
It can be a concentration  
within another major,  
such as natural sciences.

**Environmental Management**  
includes rural  
resources management  
and resource management.

**Human Ecology**  
generally deals with  
the relationships between  
humans and their natural,  
social and technological  
environments.



ecology and science.

The RSP tuition savings this year for one Connecticut student enrolled in the UMaine program: more than \$1,770.

Environmental degree programs are in demand. As *The Chronicle of Higher Education* noted last December, "More and more college students are choosing academic majors that meet their concerns about their communities and the environment." Where previously students would channel these concerns into voluntarism, such as organizing campus-wide recycling, many are now pursuing their interest by majoring in programs that will equip them with the skills and knowledge needed to help solve environmental problems upon graduation.

Employment options abound for graduates of the environmental majors. Graduates may go to work for state and federal environmental protection agencies, pollution-control industries, state and national conservation groups and environmental education organizations.

The 1991-92 *Apple Book*, the RSP catalog, lists more than 800 undergraduate, graduate, certificate and degree programs available at reduced tuition to New England residents. The *Apple Book* is available in guidance offices at all New England secondary schools, as well as in public libraries, college admissions offices and career-planning centers throughout the region. □

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*Madeleine Mc Garrity is director of NEBHE's Regional Student Program.*

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## GREEN PARTNERS

Environmental issues give academics and public officials a common cause, but roadblocks remain

CHARLES H. W. FOSTER

A century and a half after Harvard University's Louis Agassiz provided scientific advice to help restore Atlantic salmon and other anadromous fish to New England waters, rising environmental concerns and dwindling financial resources have set the stage for a new round of university-state partnerships on issues ranging from clean air to land use.

The collaboration — though itself fraught with challenges — promises benefits to all involved. For the state agency, environmental partnerships with higher education offer infusions of talent to help meet statutory responsibilities. The agency can enhance its credibility and do good work at lower cost — attributes that are likely to sell well with governors' budget offices and state legislatures at a time of mounting competition for scarce public dollars.

For higher education, the challenge of environmental problems not only fulfills the intellectual curiosity of academics, but may attract funds for project and student support. And work on state agency-supported activities represents a real-world educational experience for students and a possible entree into jobs after graduation.

For the general public, there is the pleasant prospect of two important communities joining forces to address important social issues in cost-effective ways.

### Collaboration

An environmental partnership is more than a contract to engage in research or perform academic services. It represents a wholehearted commitment to address jointly one or more areas of environmental concern over time.

Yet, like any form of collaboration, environmental partnerships have faced obstacles. Cooperation in science and technology, based on hard data, has been easier than in more subjective policy formulation. Specific actions such as technical advice on an oil spill have been more successful than, say, the assessment of environmental impacts, which require the kind of multidisciplinary collaboration that is lacking at many universities. And because academics are encouraged to act entrepreneurially — and state agencies are most comfortable contracting for particular services — working arrangements between individual academics and specific agency administrators far outnumber standing agreements for cooperation on an institutional basis.

Moreover, research has been emphasized over other forms of assistance because it is the currency most accepted in academic circles and the activity most amenable to agency contracting. Other types of collaboration have occurred much more sporadically. They include: joint appointments, personnel exchanges, mid-career training, project courses and internships for students, service on advisory boards and thesis committees, coauthorship of publications and cosponsorship of roundtables, conferences and workshops.

For every assertion that academics tend to wash their hands of involvement in difficult policy decisions, there is a counter-accusation that state policymakers really do not want anyone else sharing their decision-making powers.



### Distinct communities

The primary difficulty with environmental partnerships may be a lack of recognition that academia and state government represent two distinct communities — even cultures — with distinct attitudes about each other.

For example, outright contempt for state government is encountered on many campuses. This is fortified by the lack of flexibility researchers tend to have under state contracting procedures and by the minimal rewards and low esteem accorded state service — as opposed to federal or even community service — under university promotional procedures.

State agency professionals, in turn, have been known to scorn academics as unworldly eggheads. The seeming independence of faculty members and their relatively higher pay scales fan the flames of discontent. For every assertion that academics tend to wash their hands of involvement in difficult policy decisions, there is a counter-accusation that agency policymakers really don't want anyone else sharing their decision-making powers. Universities, state officials say, are inherently risk-averse. On the other hand, when faculty members do take positions, agency critics are quick to accuse them of being uninformed and opinionated.

Exacerbating these problems is the ephemeral nature of the academic and governmental enterprises. Universities are built around students who come and go, but departmental and university administrators also are short-lived. Similarly, the life cycle of agency activities revolves around the two- or four-year span of the current political administration. While the institutions themselves may endure, the commitment of those who set policy, guide programs and approve cooperative arrangements requires constant renewal. In the absence of something better, it is small wonder that the practice of "ad-hocery" has come to characterize much of university-state relations today.

### Cooperation underway

Nonetheless, it appears that much genuine cooperation on environmental matters is underway. Through one flagship cooperative venture, the University of Massachusetts at Amherst's Environmental Institute has been "brokering" research and advisory services — such as coordinated data and technical review of projects — to the state's Executive Office of Environmental Affairs since 1971.

Of equal promise is Maine's University System/State Partnership Program, launched in 1987 by joint action of the governor and the chancellor of the University of Maine System.

In Massachusetts, the arrangement with the cabinet office enables five component environmental departments to work with the university. A university faculty member, dividing his time between Amherst and Boston, is readily available to help locate the university resources best suited to a problem identified by an agency administrator. Under the Maine program, five agency commissioners and five campus presidents have constituted the initial partnership policy group.

### Among other promising joint ventures:

□ At the internationally designated, 10 million-acre Champlain-Adirondack Biosphere Reserve in Vermont and New York, five governmental agencies, five universities and five citizen orga-

nizations form a steering committee that encourages joint resource planning and management.

□ In Connecticut, a consortium of academic and governmental specialists — with citizen input — is advancing a comprehensive environmental program for Long Island Sound. In this case, a committee of public and private university presidents is actively engaged in allocating funds for studies and research.

□ At Odion State Park in New Hampshire, the state Division of Parks, the University of New Hampshire and private groups have entered into a unique education "compact" aimed at heightening public awareness of environmental issues.

□ In Rhode Island, Brown University's Center for Environmental Studies has furnished faculty-student environmental apprenticeship teams to work with the state Department of Environmental Management on recycling and solid-waste reduction programs. That program has been recognized by the United Nations.

Last October, the prospect of an expanded set of university-state environmental partnerships brought together some 30 academic and agency representatives for a two-day working conference at the New England Center in Durham, N.H. After much discussion and debate, the conferees unanimously concluded that university-state environmental partnerships should be encouraged. Several useful steps were identified.

First, state and academic administrators should provide a supportive environment for partnership ventures of all types and sizes wherever warranted. Rather than dictate from on high, the arrangements should emphasize the development of basic linkages and bridge-building capacities to provide the flexibility needed to meet individual circumstances. What would expedite collaboration, the academics and policymakers observed, would be a series of case studies to make available to interested parties the substance and the potential transferability of actual partnership experiences to date.

Second, procedural impediments to effective university-state partnerships should be examined and remedied. A potential model offered was the Intergovernmental Personnel Act of 1970, the instrument that so successfully moves federal agency personnel and academics in and out of each other's domain. A similar instrument to facilitate the movement of environmental and other specialists at both intrastate and *interstate* levels is long overdue. As it stands now, it is so procedurally difficult for one state — or institution — to share its strengths with another that collaboration is discouraged. In overcoming impediments to partnerships, New England might well end up pioneering a model act for the whole country.

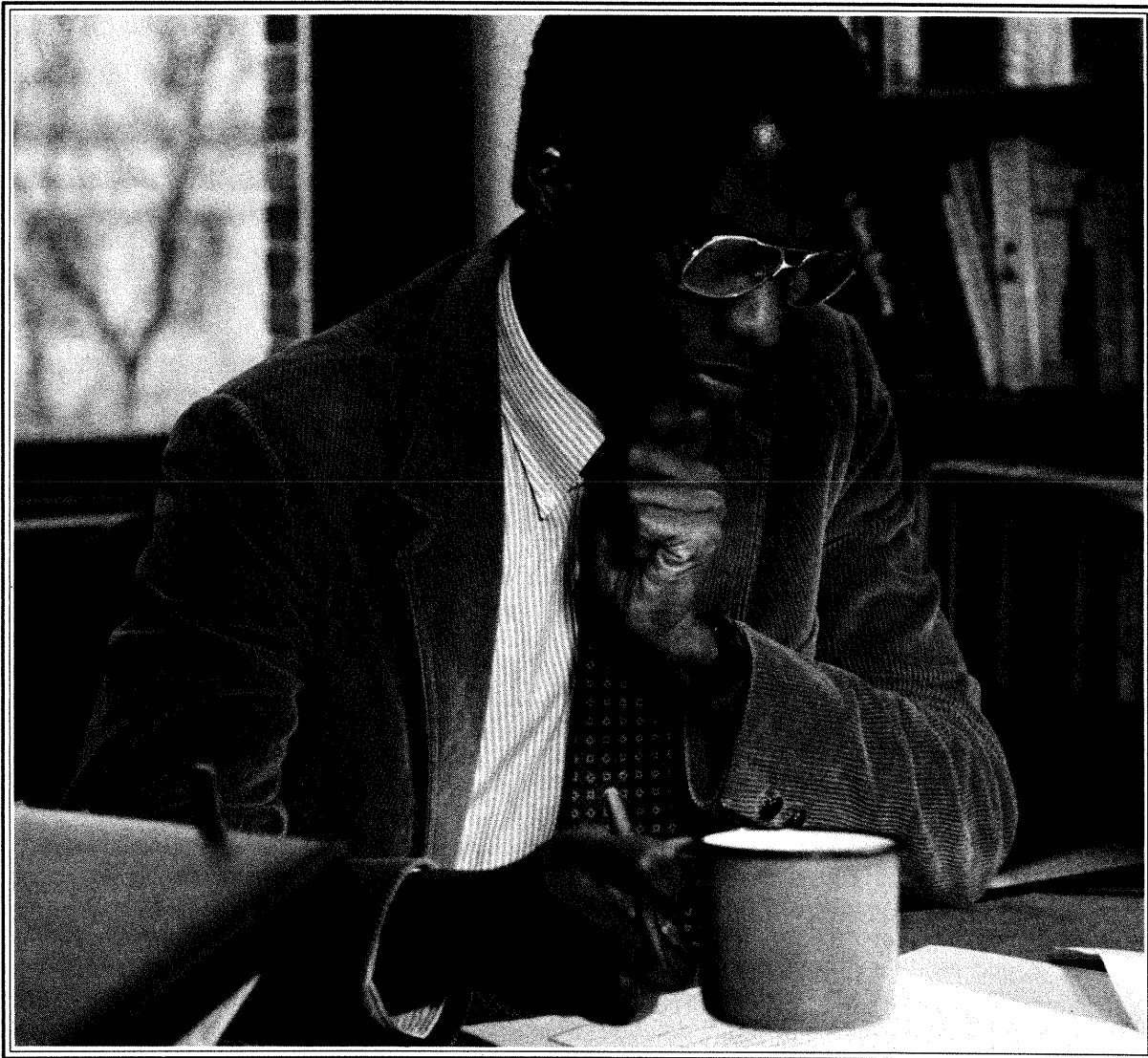
Finally, if university-state environmental partnerships are to

**The Intergovernmental Personnel Act of 1970, which moves federal agency personnel and academics in and out of each other's domain is a potential model for state and regional environmental partnerships.**

*continued on page 38.*



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# IN BOSTON, TOO FEW MINDS IN THE SEWER

How we made “the most expensive public policy mistake” in the history of New England

PAUL F. LEVY

**M**ore than 2 million people live in Boston and the 42 other communities served by the Massachusetts Water Resources Authority (MWRA) sewer system — a system built 100 years ago to stop the spread of cholera and other diseases in the growing metropolitan area. This one example of public works probably has had as great an impact as any single project on the region’s ability to expand and prosper. Yet a survey taken three years ago showed that three out of four people had no idea where “it” went when they flushed their toilets. Most people could tell you that it went down, but after that, the system was a mystery. The slogan clearly was “out of sight, out of mind.”

## FOSTER

*continued from page 35.*

flourish, active leadership and concerted efforts will be needed on their behalf. At the state level, the New England Governors’ Conference is ideally positioned to help. The new crop of governors now in office should prove receptive to the partnership idea, and their Committee on the Environment, consisting of the cabinet-level environmental officers of each state, could provide advice and recommendations.

On the academic side, the matter of New England-wide leadership is more problematic, because higher education has been as much, or more, the province of private institutions as land grants or other public universities. My choice here would be the New England Board of Higher Education, an entity best known for research on higher education and the economy, but also empowered by compact to enter into contractual agreements or arrangements with any agency or educational institution to provide services.

Helping build university-state environmental partnerships and facilitating the flow of environmental specialists across institutional and state lines would seem to be an appropriate and timely use of NEBHE’s powers and traditions and a further manifestation of its commitment to fostering cooperation throughout the region. These program initiatives should be high on NEBHE’s list of priorities for the 1990s. □

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This lack of public understanding of the most basic of public services led to the debacle that an official at the U.S. Environmental Protection Agency called “the most expensive public policy mistake” in the history of New England. Very simply, 2 million people had no idea that their human waste was entering Boston Harbor with rudimentary treatment, causing the degradation of a valuable commercial and aesthetic resource.

The solution ultimately forced on the public was a federal court order to clean up the harbor by building a multibillion dollar sewage treatment plant. The schedule required by the court — to finish the project by 1999 — compresses what should have been 25 years worth of construction into a decade. This, in turn, will cause water and sewer charges in the metropolitan area to triple by the end of the century.

“What went wrong” is the question I am often asked when explaining the Boston Harbor cleanup project to civic groups and professional associations. The next most common question is: “Whose fault was it?” The answer to the latter question provides the answer to the former. It was all of our faults.

The most basic reason for a society to engage in environmental protection is to preserve its own health and well-being. The designers of the sewer system in the 1890s understood that, as did the public of that day. Although there were complaints about the high cost of the metropolitan sewer system in that era, there was also a general understanding of the need to carry out the project to eliminate disease and make Boston an attractive place to live and conduct business.

For some reason, following the great era of civil engineering projects in the late 1800s and early 1900s, we allowed the basic infrastructure of our society to retreat from the public consciousness. The amnesia about these systems and their relationship to the natural and built environment persisted well beyond World War II.

While the environmental causes of the 1970s centered on issues like throwaway bottles and trash — things that people could see in the street — we forgot about the things *under* the street that made our metropolitan areas survivable. Politicians were not keen on supporting “invisible” projects like improvements to water and sewer systems. For example, the Commonwealth of Massachusetts invested only \$11 million per year in the metropolitan water and sewer system during the period from 1965 to 1985. At that rate, it would take 200 years to replace the current system, not accounting for any expansion.

Meanwhile, the population grew, and the harbor became more and more polluted. Beach closings became more frequent after rainstorms, when the combined sewer system operated as it had been designed: It overflowed and discharged raw sewage into the rivers and along the beaches. But the public at large did not see these symptoms of neglect. Only a few hardy souls braved the Dorchester beaches. Most others went north or south of the city to swim and fish. Why? Because public access to the waterfront in the metropolitan area was severely limited by private

Children are fascinated — in a way adults might have been in the 1890s — with the answers to questions like: “Where does my drinking water come from?”



property, roads and other development. The one view that could have given us an early warning was blocked by our other ventures. In short, we lost touch with our environment.

Boston is where Boston is because of the harbor and access to three major rivers leading to the harbor. But as Boston grew, Bostonians lost their connection to the sea and the rivers. They looked inland and became dependent on railroads and highways. The sea became a less important mode of transportation. Meanwhile, fisheries and other water-based commerce declined, and the economy shifted to land-based occupations.

Would the harbor have become polluted if it had been more accessible and more used? The message from other places is mixed, but some evidence from cities like Seattle that look toward their waterfronts suggests that constant public attention and use tend to keep the body politic interested in keeping a local body of water from getting too dirty, or at least make people more committed to getting it cleaned up in a reasonably expeditious way.

The Commonwealth of Massachusetts has, over the past few years, taken a number of important steps to ensure that coastal areas are developed in a way consistent with their higher uses. The City of Boston also has demanded and received concessions from shoreline developers to ensure public access to the waterfront. In the future, these measures may serve to keep public attention on this remarkable resource and may therefore help protect it.

In addition, the MWRA, in cooperation with many teachers and school administrators, has tackled the environmental education problem at the most effective levels. Curricula for the third and fourth grades, junior high and high school have been developed and are in use in hundreds of classrooms throughout eastern Massachusetts. Teachers have integrated important, locally relevant environmental concepts into their science, math,



▲ *Dirty water:* Boston's skyline rises over one of the dirtiest harbors in the United States.



◀ *The treatment:* Deer Island is the principal construction site for the Boston Harbor cleanup project.

*(Photos courtesy of the Massachusetts Water Resources Authority.)*

social studies and language arts lesson plans.

Children are fascinated — in a way adults might have been in the 1890s — with the answers to questions like: “Where does my drinking water come from? Where does it go when I flush the toilet? Where do those manholes in the street lead? How can we make sure the harbor gets clean and stays that way?”

With a little attention and some luck, maybe they will learn the answers and remember the lessons better than their parents and grandparents. □

*Paul F. Levy is the executive director of the Massachusetts Water Resources Authority.*

## REDRAWING THE CAMPUS MAP: *Interdisciplinary Studies*

RICHARD J. BORDEN

**T**he campus map is a handy guide for showing the way around a college or university. It also tells us something about the “shape” of what we know. But while the architectural landscape of a university is a solid testimony to the history and successes of higher education, it also portrays a longstanding segregation of knowledge. The green separating, say, the history department from the sciences building might as well be a wall on some campuses.

The arguments for departmental specialization are many: It allows disciplined and rigorous study, brings order to a complex curriculum, provides personal and professional identity, gives focus to research and advances knowledge. But as economist Gunnar Myrdal once said, “In reality, there are no economic, sociological or psychological problems ... but simply problems, and ... as a rule, they are complex.”

This is especially true of “environmental” problems. Most

environmental problems involve a multitude of interacting forces. They are not merely problems “in” the environment. They contain all manner of human issues as well. They are, therefore, “interdisciplinary” problems, and in many ways our traditional education structures pose serious impediments to interdisciplinary work. Universities offer a universe of perspectives, but seldom provide a forum or incentives for integrating these perspectives into useful methods for solving the complex problems, of which humans are a part.

### A new structure

College of the Atlantic is different. It was founded in 1969 as a private college with an educational mission focused on social and environmental problem-solving. Organized around a non-departmentalized, interdisciplinary faculty, the college offers a single degree: the bachelor of arts in human ecology. While the



The American educational community has been the most stubborn in which to introduce an ecological perspective.

Since COA began, the idea of human ecology has grown elsewhere. But unlike most ideas that start in one place and spread,

term "human ecology" has been a source of ongoing discussion and refinement over the years, it is generally understood as the study of the complex relationships between humans and their natural, social and technological environments. The degree program has offered students a unifying perspective for combining the ecological sciences and human studies and provided a practical framework for individualized and problem-centered studies. With their interdisciplinary training, COA graduates have taken jobs in environmental, business and community services or moved on to a wide variety of advanced studies.

human ecology has sprung up spontaneously in a hundred different educational settings around the world. Wherever human ecology has emerged, it has stimulated educators, researchers and professionals to work together on complex issues of interdisciplinary decision-making, planning and problem-solving.

#### International interest

In recent years, a loose international and interdisciplinary network of interest in human ecology has begun to coalesce. This summer, the Royal Swedish Academy is sponsoring a week-long international conference to bring together representatives of these various programs. Three major Swedish universities offer human ecology studies, as do universities throughout Western Europe.

Many Eastern and Central European educational institutions also are creating new structures to deal with rapidly changing conditions. During a recent trip to Moscow, I saw keen interest

## PREPARING ENVIRONMENTAL LEADERS

MITCHELL THOMASHOW

Imagine a typical day in the life of a prominent environmental professional. The morning is spent analyzing the scientific data necessary to evaluate a piece of state legislation. The afternoon is devoted to a seemingly intractable administrative problem — the latest budget cuts facing the agency. In the evening, it's off to a public forum where engineers, politicians and local residents will discuss a controversial wastewater treatment plant. And that's just Monday's agenda. Tuesday will bring another set of challenges.

The complex schedule presents educators with a challenge, too: how to plan environmental programs, curriculum and courses to give students the attributes they need to succeed in this professional context.

Indeed, the attributes themselves are complex. Environmental professionals are inherently interdisciplinary; they must understand that ecological issues don't respect traditional disciplinary boundaries. They must be scholars as well as practitioners, understanding that the skills and discipline of theory and research must have real applications to help solve urgent ecological problems. They must develop new frames of reference, new languages and new processes because many of the problems themselves are new. They must understand the diversity and complexity of organizational life and social and political behavior. And they need the patience, skill and foresight to integrate their environmental values with their professional identities.

Put simply, environmental professionals must be prepared and skilled in three domains: content, process and reflection.

*Content* refers to the facts and data needed to solve a problem. In a field as wide-ranging as environmental studies, there will always be a debate about the most important content knowl-

edge. And depending on an individual's career plans, the right formula may be somewhat idiosyncratic. But any content mix should be reasonably interdisciplinary and include healthy doses of environmental science, field ecology and environmental policy. Essential content skills include the ability to manipulate complex data, find appropriate information and engage in complex problem-solving.

*Process* refers to how one learns and interacts with other people. Process skills such as group problem-solving, organizational analysis and presentation techniques are essential for environmental leaders. Often, an individual will have outstanding content knowledge, but will be an ineffective practitioner because he or she is incapable of appropriately communicating that knowledge. Similarly, process skills are useless without the rigor and discipline of credible content knowledge. We have all met professionals who are good in one domain or another. But the individual who excels in both domains is most likely to exercise leadership.

*Reflection* refers to the ability to integrate core values about nature with professional practice. This is the inner guide that maps one's path through complicated moral questions. To sustain the moral basis of environmental work, professionals must be able to translate their inner thoughts and feelings into a meaningful and coherent philosophy. This is part of a lifelong learning process, but it should be emphasized and nourished in professional training programs. Content and process are empty without adequate reflection.

#### Visionary quality

As the environmental professions expand and mature, considerable attention will be placed on the so-called training requirements of environmental problem-solvers. The various scientific, technical and managerial criteria and perspectives will inevitably dominate the boundaries of training.

Yet environmentalism has always projected a visionary quality. It is a values-oriented movement. It persistently raises serious questions about how we live. Indeed, environmentalism poses the preeminent paradigmatic challenge to economic growth,



in human ecology expressed by many people involved in future planning, including the chairman of the All-Union Committee on People's Education — the Soviet equivalent of the U.S. secretary of education.

In Japan — which has both high economic and high environmental standards — human ecology is offered at several universities. Throughout the developing world — from Latin America to Africa to the Philippines — similar initiatives are being shaped by the special needs of those countries.

The list of places where human ecology is gaining a foothold goes on. The point is that a worldwide reorganization in higher education is occurring. In many different contexts, professional lines are being redrawn and new interdisciplinary skills are being emphasized. Yet in this country, there is still a reluctance to break through the walls that define our own institutions. Indeed, the American educational community has been the most stubborn in which to introduce an ecological perspective.

resource development, the human relationship with nature and material consumption. This is the basis of its controversial image and the source of its internal schisms and divisions.

Without disparaging the importance of strong technical and managerial know-how, it is essential to stress the ethical, philosophical and psychological aspects of environmentalism. To borrow a phrase from the "helping professions," environmentalists must be reflective practitioners. They must understand the values that drive their actions. They must see the broader context of their work. And they must have a philosophical view of their profession. These qualities are critical to the development of any environmental professional, yet they are often lost in the maelstrom of skills-oriented, fast-paced training.

**Without disparaging the importance of strong technical and managerial know-how, it is essential to emphasize the ethical, philosophical and psychological aspects of environmentalism.**

The environmental profession may now attract individuals because it is, in some cases, lucrative, or perhaps even fashionable, and most certainly pressing. The risk is that the task-oriented, time-bounded pressure of immediate solutions challenges the virtues of reflective process. The values of environmentalism are easily undermined by the legitimate demands of professional life. Under these circumstances, an environmental professional must be able to articulate and project his core values about nature — his environmental identity. By doing so, his reasons for becoming an environmentalist should remain clear in the face of difficult situations. His participation in the profession will have an introspective, dynamic and visionary perspective.

This reflection is needed wherever environmental problems emerge; it has global applicability. Last December, while in Moscow to set up environmental exchange programs between Antioch New England Graduate School and Soviet schools, I met with rectors, vice rectors, faculty and students from six dif-

"Sooner or later," noted H.G. Wells, "human ecology, under some name or other, will win its way to academic recognition and to its proper place in general education." That was in 1934.

Whether this new perspective is called human ecology is not the issue. What's important is that knowledge has been growing in many areas in advance of our ability to use it effectively. The problems of the future require new opportunities for learning to integrate and apply this wealth of knowledge. In this regard, a campus map is an impressive reminder of the strengths of higher education — and an outline of future challenges. □

*Richard J. Borden is academic dean at College of the Atlantic and director of international programs for the Society of Human Ecology.*



*Helping the Soviets clean up:*

*Mitchell Thomashow, co-chair of Antioch New England Graduate School's environmental studies department (left) with interpreter Tanya Fonina (center) and College of the Atlantic Academic Dean Richard Borden (right) standing in front of Moscow State University.*

*Photo by Cynthia Borden-Chisolm.*

ferent institutions. Although the people I spoke with understood and believed in the importance of technical solutions, they also universally agreed that what they called the "humanistic approach" to environmental issues was sadly lacking in the Soviet Union. They were referring to the understanding of values and the importance of reflection, which has been a major gap in Soviet education. A basis of Antioch New England's exchange program will be the implementation of innovative educational methodologies that encourage process and reflection.

Environmental leadership requires unique and innovative approaches to learning. It is the task of higher education in the years ahead to break down its traditional disciplinary barriers and to investigate approaches to training that take into account the special nature of ecological problems. By emphasizing the interrelationship of content, process and reflection and by modeling the very ideas we care about through the structure of our programs, we can develop the cadre of environmental leaders that will be crucial for the 21st century New England landscape. □

*Mitchell Thomashow is co-chair of the environmental studies department at Antioch New England Graduate School.*



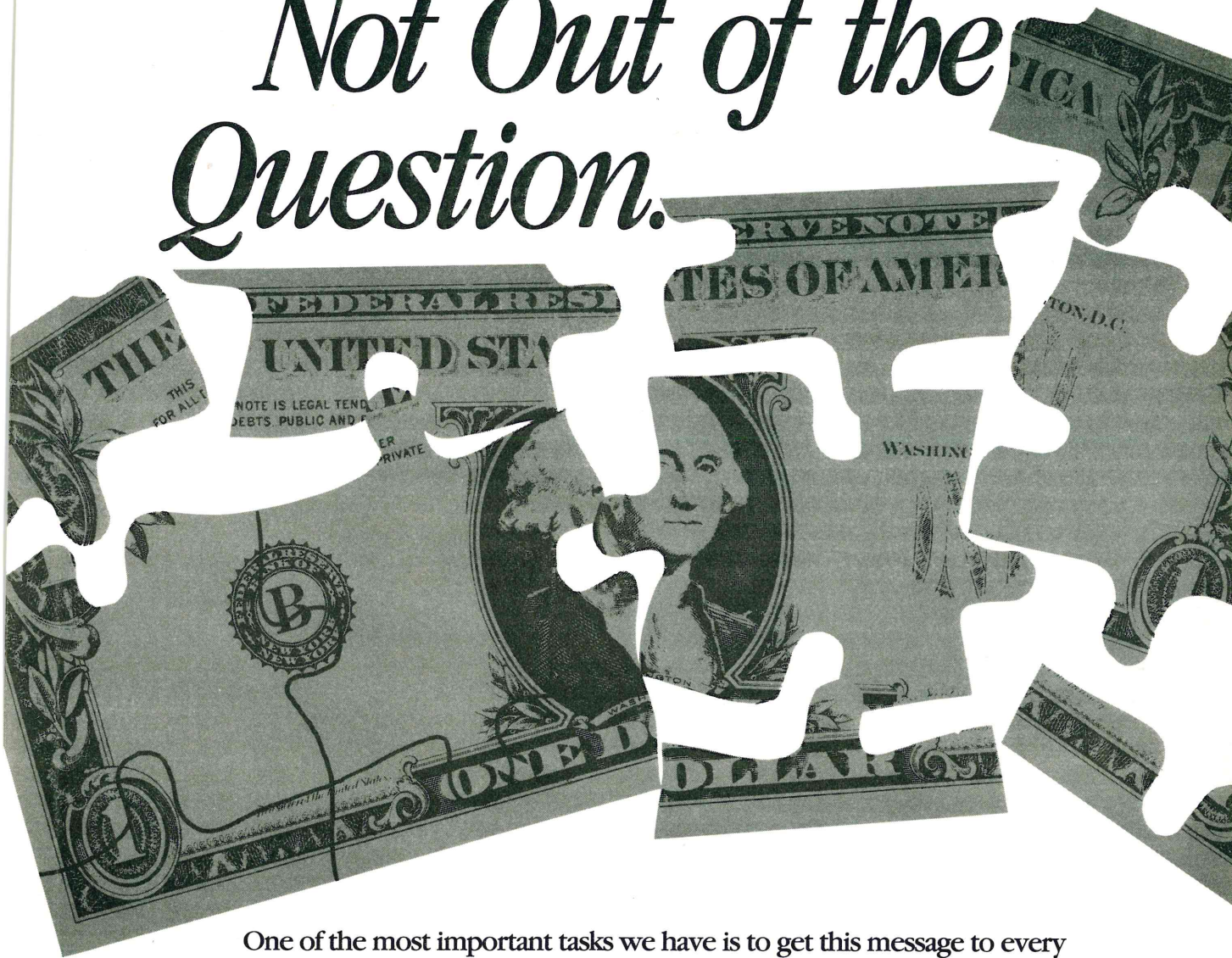
- ❑ Average monthly income of Blacks with bachelor's degrees, 1987: \$1,596
- ❑ Average monthly income of Whites with associate's degrees, 1987: \$1,654
- ❑ Percentage of Massachusetts 9th- to 12th-grade Black students who dropped out of school in 1989: 9
- ❑ Percentage of Massachusetts 9th- to 12th-grade Hispanic students who dropped out: 14
- ❑ Percentage of Massachusetts 9th- to 12th-grade White students who did: 4
- ❑ Number of new biomedical jobs that will be created in metropolitan Boston by 1995: 20,000
- ❑ Number that will require a bachelor's or master's degree: 15,070
- ❑ Chance that a 1990 Boston high-school student will graduate from a four-year college: 1 in 15
- ❑ Massachusetts' national rank in state tax funds for higher education per \$1,000 in personal income, fiscal 1991: 49th
- ❑ New Hampshire's national rank: 50th
- ❑ Number of U.S. high-school seniors who play football: 265,000
- ❑ Number who receive scholarships to play in college: 8,000
- ❑ Number of U.S. colleges and universities where need-based scholarships average \$8,000 or more: 36
- ❑ Number that are in New England: 15
- ❑ Number of U.S. colleges and universities where *non-need-based* scholarships average \$8,000 or more: 23
- ❑ Number that are in New England: 7
- ❑ Number of students per computer at Brown University: 19.9
- ❑ At Nichols College in Massachusetts: 1
- ❑ Increase in value of U.S. manufactured exports from 1989 to 1990: 8.6%
- ❑ Increase in value of Maine's manufactured exports: 24%
- ❑ Increase in value of New Hampshire's manufactured exports: 0.7%
- ❑ Value of U.S. manufactured exports shipped per worker in 1990: \$16,601
- ❑ Value of Vermont manufactured exports shipped per worker: \$22,745
- ❑ Number of bachelor's degrees conferred in the United States, 1988: 993,362
- ❑ Number of those conferred in business and management: 243,344
- ❑ In education: 91,013
- ❑ Annual spending on alcoholic beverages by U.S. college students: \$4.2 billion
- ❑ President Bush's proposed fiscal 1992 budget for AIDS research: \$1.2 billion
- ❑ Of doctorates awarded by U.S. institutions, percentage that went to U.S. citizens, 1989: 74
- ❑ Percentage of engineering doctorates that went to U.S. citizens: 45
- ❑ Number of current U.S. Supreme Court justices who attended Harvard Law School: 4
- ❑ Harvard Law School's rank among U.S. law schools in number of alumni who have served on the Supreme Court: 1

**Sources:**

1,2 U.S. Bureau of the Census; 3,4,5 Massachusetts Board of Education; 6,7,8 EDIC/Boston; 9,10 Center for Higher Education, Illinois State University; 11,12 The College Board; 13,14,15,16,17,18 *Peterson's National College Databank*; 19,20,21,22,23 New England Economic Project; 24,25,26 U.S. Department of Education; 27 U.S. Department of Health and Human Services; 28,29,30 American Council on Education; 31,32 Harvard Law School



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# A New Measure of Success in Business

WILLIAM P. HAAS

**C**olleges with business programs can measure their success by the number of graduates who become millionaires or presidents of Fortune 500 companies, or who become CPAs, MBAs, Ph.D.s, CEOs or anything else in the alphabet soup of credentials. But there is another much more demanding measure: Does the college educate future business leaders who will measure their own success in terms of meeting global human needs?

of organizational structures, not as leadership which challenges or bypasses given structures. It is one thing to lead a particular business organization, but quite another to be the driving force in the business community, however large or small. Leading an organization from the top down is very different from transforming an organization from within or without at any level. In other words, the meaning of business leadership depends upon what you mean by business and how far and

wide you expand the vision of the leader.

We should prepare students for leadership in the *world's* business, encompassing the economic and political conditions of all people and recognizing the diversity of cultural, ethnic, religious and secular values that govern their lives. The ways wealth is created, acquired and distributed are surely our business; it should also be our business to look at

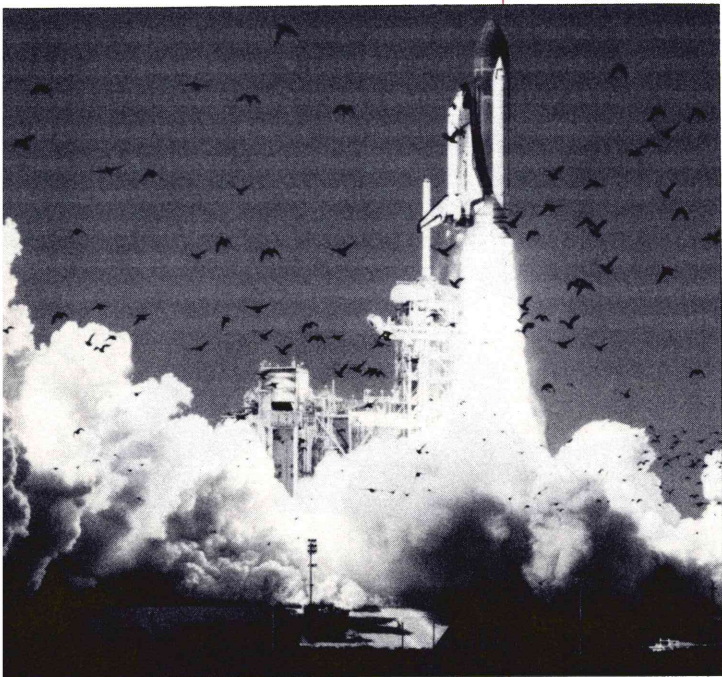
the ways wealth relates to poverty, human degradation, starvation, violence and other human woes. It would be naive to claim that wealth is the principal or only cause of these conditions. But it would be equally naive to think that wealth has nothing to do with the worsening plight of more than half of mankind.

How can institutions educate business students for leadership in the business of all mankind, the exploited as well as the exploiters, the clever and the unskilled, the advanced and the economically retarded, the suppliers and the demanders? This requires looking beyond the self-interest of existing business and political organizations to the formation of new kinds of

alliances, designed to meet fundamental human needs around the globe, designed to move within a variety of political systems and motivated to measure profit by more than money alone — not to the exclusion of money, but to the *inclusion* of other measures of success. How does one apply the principles of management, finance, communications and marketing to the survival of people too poor to buy anything and too weak to work? How do we manage, finance and sell the enterprise of ecological survival? Perhaps Adam Smith's notion of the wealth of nations has evolved over 214 years to a radically different concept of wealth and nationhood.

A few years ago, 30 nations finally agreed to the Montreal Protocol that proposed a 50-percent reduction in the production of chlorofluorocarbons (CFCs) by the year 2000, in order to slow down the deterioration of the ozone layer. Most environmentalists lamented that this gesture was too little too late. The DuPont Co., which invented CFCs decades ago, reversed its earlier position that the danger to the ozone layer was exaggerated and announced that it would dedicate resources to the development of an environmentally safer alternative. That provocative move, along with growing evidence that the danger was greater than imagined, led the Montreal Protocol signatories to change their target to total elimination of CFCs. Participation increased to 60 countries and special provisions were advanced to help Third World countries comply. DuPont challenged the old dogma that the corporation's sole responsibility is to look out for its own self-interest. Of course, DuPont has its own agenda, but it recognized that the world has a larger agenda — survival. Wouldn't we be proud if our graduates were part of the management team that fashioned DuPont's decision?

Similar to this environmental matter is the concern for the millions of people starving in Africa and India. The world grows enough food to feed them, but



*The Space Shuttle Challenger lifting off: Engineers warned their superiors against the launch. The fact that they were punished for telling the truth did not nullify the impact of their testimony upon NASA and the space industry. Photo courtesy of NASA.*

Most colleges would like to think that occasionally they educate men and women who do indeed rise to positions of leadership in medicine, politics, science and business. But leadership can take on many different meanings. Unfortunately, we generally think of leadership in the context



much of the food is discarded by growers, transporters, markets and consumers. If there were a way to cash in on starvation, following the accepted practices of the free market, someone would find a way to deliver food by hook or by crook. In the absence of a market solution to the problem of world hunger, the solution is left to governments which often consider starvation a card to be played in a more important power game. The Sudanese government, for example, has used hunger as a weapon in its nine-year civil war by obstructing international relief efforts and even bombing food supplies.

The human rights that we take for granted are denied to hundreds of millions of people, even in economically advanced countries. The conditions of Blacks in South Africa is a case in point. Great pressure has been put on international firms to exercise their influence on the South African economy in order to persuade the minority White government to end apartheid. When all other strategies failed, the Sullivan Principles were developed to encourage businesses operating in South Africa to use their presence to improve the lives of Black workers through better health care, housing, education, fair employment opportunities and working conditions. The scheme was abandoned by many because it appeared to be ineffectual.

History, however, may reveal that the Sullivan Principles marked an indispensable step in the slow process toward ending South African racism. The point is that those corporate subscribers who were willing to do business in a way that promoted social justice were advancing toward a goal that no other force was capable of reaching at the time. The strategy shifted from disengagement to a business decision made by businesspeople, with business advantages in mind — but including the more universal human goal of political and economic freedom for those outside the decision-making process. Corporate self-interest and the interests of the disenfranchised coalesced.

Individuals can lead in the business world in other ways. Consider the engineers at Morton Thiokol Co. who warned their superiors against launching the space shuttle Challenger when the temperature was dangerously low. The fact that they were brushed aside with the comment that

the launch go-ahead was a management decision, and the fact that they were later punished for telling the truth during a congressional probe, did not nullify the impact of their testimony upon NASA and the space industry. But where in the study of business do we alert students to conflicts between company loyalty and other loyalties — to human life, to nation, to one's profession, to the advancement of science?

The Japanese offer many lessons about the world's business. Consider the case of Kenji Kuan, the founder and head of Group Koike, Japan's most prestigious design organization. Kenji Kuan is a Buddhist priest, artist and designer who comes from Hiroshima, where he witnessed the effects of atomic devastation. After that experience, he says, he studied art and design to try "to make things look natural again by designing things that would improve people's lives." Recently he reflected on how the simplicity, compactness, power and elegance of the Japanese tea ceremony and flower arrangements often find expression in the design of Japanese cars, trains, pianos, stereo systems and cameras. It has been observed that elegance of design not only revived but enriched that once broken nation. The Japanese were able to apply metaphysical insights to the demands of the marketplace. There is a significant difference between concentrating on the way things look on the outside and the way one looks at things from the inside out. That difference affects the way people engage in business, the way they work, the quality of the goods they produce and the scope of the decisions they make.

**I**n light of the growing strength of the European Economic Community, the radical transformations of the socialist countries of Europe and Asia and the role of Japan and Southeast Asia in the planning of the world's economy, we must question the old dogmas about laissez-faire relationships between business and government. Our fear of government and business cooperation in long-range planning is dangerously passé.

To resolve the confusion in the Middle East, we must better understand the profound influence of Islam upon all aspects of the Arab world. The theology of Islam

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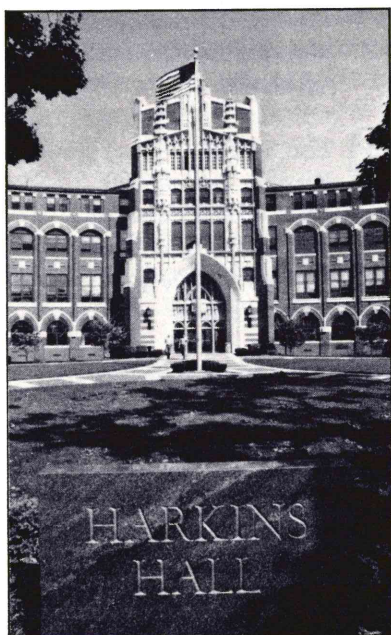
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runs deeper than oil. There is more at stake in the Persian Gulf than oil and power politics.

Then there is the Third World, suffocating under unbearable debt, squandering natural resources such as forests and minerals, polluting water and land with chemicals prohibited everywhere else on earth and being victimized on the one hand by a lack of technology, and on the other, by technology it does not understand or control.

Nothing more dramatically illustrates the confusion affecting the business of the Third World than the disaster at the Union Carbide plant in Bhopal, India. Scholars I met in India characterized their country as the technological laboratory of multinational firms whose only rule is "anything goes." The Bhopal catastrophe — from the original deal between the Indian government and Union Carbide to the handling of the disaster itself and the final settlement of liability — represented a total collapse of the rule of law in the country. It is fair to say that whatever good Union Carbide expected to do for itself or for the Indian people was nullified by its failure to control conditions that were well within its power to control. Think of how many Union Carbide executives, financial planners, engineers, managers and political consultants were aware of the potential catastrophe in the planning, construction and running of that plant. Every individual made a choice to speak or remain silent, which is now etched in the roster of 3,000 dead and more than 100,000 seriously injured Indians who were given no choice in the matter at all.

**T**here has to be a better way to conduct the business of the world. First, we must educate the leaders of business in a world of new structures, opportunities and obligations. I am not suggesting some massive reform of the curriculum. We do not need to change direction; we need to intensify the thrust. We do not need new principles; we need new ways to apply those principles. Moreover, it is not only *what* we teach but the passion that we bring to our profession that determines the quality of the outcome.

In a way, our mission is prophetic, not in terms of predicting probable outcomes

in the marketplace, but prophetic in the Hebrew sense of a voice that changes events, that thunders in discontent at the gods of the status quo. A prophetic voice shapes the future that others guess at, worry about or try to ignore. Teaching with such conviction can hardly be boring, though at times it might lead us into healthy disagreement.

Events in the Soviet Union, in Czechoslovakia, Hungary, Romania, in China, South Africa and in the Middle East make one wonder whether it is possible to foster in our students the same courage, the same imagination, perseverance and moral commitment the world expects of their counterparts in these volatile places. They are expected to make quantum leaps into a frightening future without all the safety nets others require. Do students expect less of us? Should we expect less of our students?

To educate for world business leadership is to see history not as a vindication of everything we think and teach, but as an unfolding drama in which all dogmas must adapt.

To educate for world business leadership is to see history not as a vindication of everything we think and teach, but as an unfolding drama in which all dogmas must adapt. If old systems and beliefs are disintegrating, the leaders of the new economic order — and their teachers — have a unique opportunity, even responsibility, to cooperate in the weaving of a new political, economic and cultural fabric.

If we are thinking only as far as the immediate job market for graduates, we may be missing one of the greatest opportunities in higher education's history.

Nothing should bring more excitement and hope to our work than the discovery that some student measured his or her success in the business world against the need for food, for human rights, for a safe environment, for an equitable distribution of the benefits and burdens of civilization. □

*William P. Haas is a professor of humanities at Bryant College. He is the former president of Providence College and North Adams State College.*



# Now for Something Completely Different:

*Private colleges put the brakes on tuition,  
while publics hit the gas*

**T**he 1980s saw U.S. colleges and universities stung by accusations of charging — in the words of former U.S. Secretary of Education William Bennett — “whatever the market will bear.”

Among the defenders of the tuition increases that ultimately doubled the cost of a college education was former Harvard University President Derek Bok. In his report last year to Harvard’s board of overseers, Bok attributed the

Now it appears the “higher-priced colleges” are doing just that.

Following a decade that began with tuition and mandatory fee increases approaching 20 percent and ended with average hikes around 9 percent, some prestigious, private colleges and universities in New England are announcing their smallest percentage tuition increases in years. “I think they’re worried about losing their enrollments,” says Michael Spence of Parsons, Howland and Spence, an independent college admissions counseling firm in Boston. “I think they’re worried about losing potential candidates who may be put off by an ‘I don’t care’ attitude about tuition increases.”

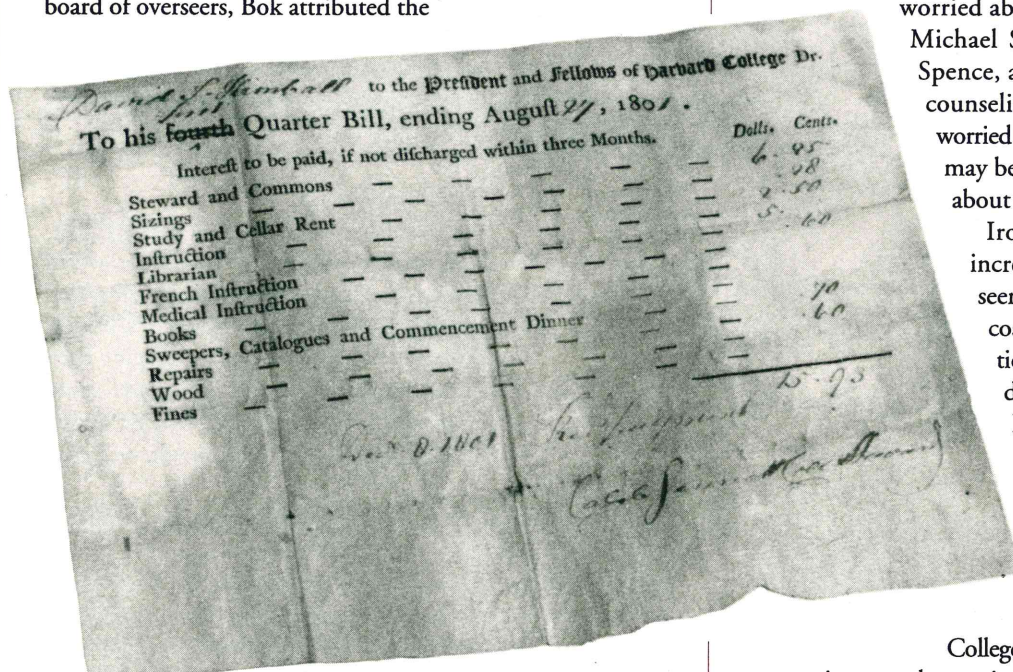
Ironically, the scaleback in tuition increases comes at a time when colleges seem to need money the most. “College costs have gone up above general inflation throughout the 1980s,” says Middlebury College President Timothy Light. “Schools are all having to look at budgets seriously and find ways of economizing.”

Middlebury recently announced an increase in total costs of only 4.5 percent, its lowest percentage increase since 1974. Amherst

College’s 6.9-percent increase follows a 10.8-percent increase the previous year. And other pricey schools following suit include Brown University, with a 5.9-percent hike, Dartmouth College, with a 5.9-percent total cost increase, and Harvard, Tufts University and Bowdoin College, all with increases under 7 percent. Worcester Polytechnic Institute captured headlines by announcing it wouldn’t raise tuition at all.

But while the trend among the more expensive private institutions — many of whose total costs top \$20,000 a year — is to keep tuition increases down, there is a tradeoff. Budget cuts — now the norm for New England’s *public* campuses — have begun to sting places like Dartmouth and Brown. For in the words of Dartmouth spokesman Alex Huppe, “You just can’t depend upon tuition alone to make zero meet zero at the bottom line.”

In 1981, tuition and fees at WPI were \$5,930. Today, those



*A Harvard student's  
1801 quarterly tuition bill: A whopping \$15.73.*

steep hikes of the 1980s to the sluggish increases of the 1970s. By the 1980s, institutions needed the increases, Bok said, to raise faculty salaries, address mounting construction and maintenance costs and to provide the state-of-the-art equipment, facilities and programs that today's consumer-oriented students demand.

“Campus officials often raise tuitions rapidly in order to provide more of these services,” Bok said. “On the other hand, if tuitions rose to the point that students no longer considered the added benefits worth the cost, applicants would begin to apply to other, lower-cost schools, and higher-priced colleges would soon have to moderate their charges.”

J E N N I F E R M C A U L E Y



charges are \$14,125. Total charges including room and board are \$20,045.

The school is not alone. Few colleges and universities escaped the 1980s unscathed, with most seeing double-digit hikes that tapered off to around 9 percent by the end of the decade. As costs edged closer to — and in some cases, surpassed — the \$20,000 mark, however, both parents and the media launched a barrage of criticism, accusing colleges of setting unnecessarily high charges.

Many college officials today defend the large tuition hikes of the 1980s with the same reasons Bok gave in his report last year. The 1980s, they say, was payback time for the moderate tuition increases of the 1970s, when double-digit inflation forced colleges and universities to hold down tuition and defer expenditures such as faculty raises and building construction and maintenance — issues that had to be addressed when the 1980s rolled around.

In addition, officials say they were faced with a shrinking pool of college-age students who seemed to expect much more from colleges than earlier generations of students. To remain competitive with other schools, they built new facilities and laboratories, bought state-of-the-art computers and equipment, and added new academic disciplines and extracurricular activities. And the pricetag on all these items tended to increase much faster than those measured by the Consumer Price Index.

"There is an expectation [among students] that seems insatiable in terms of services," says Brian Hawkins, associate provost for academic planning at Brown.

Middlebury's Light agrees. "People have expected more out of colleges without asking who is going to pay for it."

#### Aid conundrum

But most officials agree the real "budgetbuster" of the 1980s was financial aid. While federal dollars remained fairly constant, inflation in effect resulted in a decrease in financial aid. Meanwhile, the *demand* for aid was increasing.

"The more we raised tuition, the more [students] needed financial aid," says Dartmouth's Huppe. "The federal support was coming in at constant dollars, but that meant Dartmouth had to come in and fill the difference."

In 1983, Dartmouth allocated \$7.5 million of its own funds for financial aid, according to Huppe. By 1989, that figure had nearly doubled. During the same period, federal financial aid went from representing 23 percent of total aid to Dartmouth students to 15 percent.

And while WPI's tuition rose 138 percent from 1981 to 1990, the college's financial-aid budget skyrocketed 470 percent.

According to WPI President Jon C. Strauss, approximately 75 percent of WPI's students receive need-based financial aid. Fifty-five percent receive aid directly from the school. As a result, even a modest tuition increase would not have generated much new revenue for the school, Strauss says, because most of the money would have been put back into financial aid to help stu-

dents cover the tuition increase. Instead, WPI opted to hold tuition to this year's costs.

"We're not going to increase tuition until we get increasing revenue," Strauss adds. "That just doesn't make sense."

With less new revenue coming in, however, colleges, both independent and public, are scrambling to find places in their budgets where cuts can be made. And most schools say few if any areas will be exempt. "There is not one item in [Dartmouth's] budget that is not under very close scrutiny," says Huppe. "That includes ... pretty much everything but tenured faculty positions."

In January, Northeastern University announced it would lay off 175 employees — 10 percent of its administrative and support staff — to combat budget problems. Yale is preparing to cut up to 10 percent from selected academic department budgets and may reduce its faculty in an attempt to cut \$10 million from its budget. WPI's efforts to trim \$2.5 million have resulted in 23 staff positions and some extracurricular activities being cut. Dartmouth has eliminated 52 administrative positions and several junior varsity sports. And Norwich University recently announced \$1.5 million in cuts, with up to 30 jobs being eliminated.

#### Public tuitions up

The cutting is commonplace at New England's public colleges and universities, which are fighting their own battle of the budget. But there is one notable difference: While the expensive private colleges are keeping their tuition increases down, New England's public campuses have seen double-digit tuition hikes in recent years. And the cuts and price

hikes aren't over.

In Massachusetts, Gov. William Weld's proposal to cut nearly \$100 million from public higher education received vigorous opposition from Beacon Hill and state educators. Weld's original proposal would have closed as many as five state colleges, set tuition on a sliding scale and cut \$17 million from the state's scholarship program while converting the remaining \$40 million to loans. (In addition, the administration proposed abolishing both the Board of Regents of Higher Education and the state Board of Education, which oversees K-12, and centralizing control under a new cabinet-level secretary of education.)

But in April, the administration softened its stance, saying that while campus closings this year would be unlikely, it would still try to trim \$79 million from the higher-education budget through a 7-percent, across-the-board cut in administration as well as tuition and fee increases. At press time, the Board of Regents was considering tuition increases as high as 25 percent at state colleges and universities, 15 percent at community colleges, and 32 percent at the Massachusetts Maritime Academy and the Massachusetts College of Art.

Weld reportedly also supports a proposed merger of the University of Lowell and Southeastern Massachusetts University with the University of Massachusetts, a plan favored by the

Budget cuts —  
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schools themselves, but not yet acted on by the state's legislative leadership.

Meanwhile, Rhode Island's public higher-education employees will take a 10-percent cut in salary for the remainder of this fiscal year in order to avoid program cutbacks or layoffs. Under the "Petrocelli Plan," named after Higher Education Commissioner Americo Petrocelli, the salary-reduction plan will continue for the first 19 biweekly pay periods of fiscal 1992. In return, staff will accrue an equivalent amount of paid leave, which may be used as additional vacation or sick leave or be paid out at retirement.

In Connecticut, Gov. Lowell Weicker has called for tuition increases as high as 33 percent, while ordering layoffs of more than 2,600 state employees. Nearly half of those layoffs — about 1,200 — could be state college and university jobs, including more than 400 faculty. But higher-education officials have said that such a major reduction in staffing would necessitate cutting up to 3,600 full-time students and the loss of nearly \$15 million in tuition revenue.

#### A shift from publics?

With budget cuts come changes. Changes in staffing, changes in resources, changes that may offset the benefits of a traditionally lower-priced public education or the recent lower tuition increases at the more expensive private colleges. In fact, budget cuts and tuition increases at both the independent colleges and state schools may be a boon to those in the middle: the more moderately priced private colleges.

According to Elwood Farber, executive director of the Rhode Island Higher Education Assistance Authority, college-bound students may find that New England's public colleges and universities have raised tuition for out-of-state students to the point where they are comparable to some private colleges. "A student might say, 'Gee, the University of Rhode Island is about the same price as Bryant, and Bryant has better name recognition, so I might as well get Bryant on my diploma,'" says Farber.

Public universities may also lose students to more moderately priced public colleges. According to Farber, while the number of applications to URI decreased slightly last year, applications to the less expensive Rhode Island College rose 17 percent.

In the end, what may have to change most on college campuses, both public and private, are expectations. "Students will not have quite the same choice in some extracurricular activities that they had," says Dartmouth's Huppe. "They may not have all the services that they once demanded."

Indeed, when Light sent letters informing Middlebury students of the 4.5-percent price increase, one angry student called the president to protest the waste of paper. But the Middlebury letter may just sum up the situation at today's colleges and universities: "Like all organizations, public or private," the letter read, "we will have to spend the '90s figuring out how to do more with less." □

*Jennifer McCauley is a staff writer for CONNECTION.*

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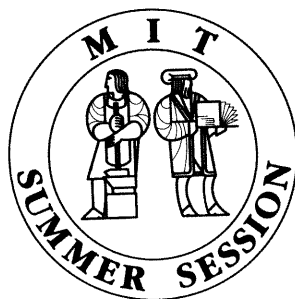
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# Summer Schools: Good Service and Good Business

BONNIE NEWMAN

Ask New England college administrators about their plans for summer, and they'll tell you: an institute on drug policy for secondary-school teachers, a six-week program in international relations in the French Alps, dramatic productions by 7- to 10-year-olds, an ecological exploration of the Isle of Shoals, an English as a Second Language program for students of all ages ... and that's just the beginning.

The notion that school is closed for summer is as outmoded as the one-room schoolhouse. Two-thirds of all four-year colleges and universities in New England now offer academic summer sessions. And for good reason: Besides putting facilities to year-round use, summer school allows campuses to reach new populations, develop innovative curricula and generate additional income.

Summer programming falls into three basic categories: sessions offering standard courses for credit; special programs for targeted populations; and leasing of space to outside groups for conferences. Institutions tend to do what best fits their mission and resources. For example, a rural college with stables may run a summer equestrian program, while an urban university may form a partnership with a city school system to provide workshops for teachers.

## Summer's advantages

Because summer programs don't depend on tenured faculty and required curriculum, they can serve as a liberating force for staff and faculty. A course can be redesigned to meet the needs of practicing teachers; a distinguished visiting faculty member can be brought to campus and a course for which there is no room during the traditional academic year can be added or tried for the first time. Summer school promotes experimentation as

well as a needed response to the emerging needs of students and society.

Summer's compressed format and pleasant weather allow for one-of-a-kind courses that are not realistic during the traditional year, such as studying ecology at the seashore or art in Mexico. Students who may not be able to afford the cost or time of a "junior year abroad" may take advantage of numerous international, off-site summer programs. Summer internships and research opportunities with faculty offer students credit for unique individualized learning.

Summer school classes are often smaller, allowing for more faculty and student interaction. The cost can be lower too — as low as 50 percent of academic-year tuition at some private institutions. The reason is that while traditional academic-year budgets generally cover the full cost of college services and facilities, summer program budgets usu-

ally cover only those faculty salaries and institutional services that are used. Because fewer services are available, the savings can be passed on to the student.

Who attends? Mostly the college's year-round students who want to get ahead, catch up on a missed course, concentrate on a particularly difficult course, or com-



bine a summer job and coursework. Students from other colleges who are home for the summer are another key audience, as are adults who have time during the summer to enjoy an area college's resources.

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For many students, there is simply no value in taking three months off each year — a holdover practice from our agrarian past. An estimated 56 percent of U.S. college students must attend school part-time in order to juggle career and family responsibilities. They often rely on summer courses to complete their college education.

### New populations

Many colleges and universities now offer summer programs giving high-school students an insider's look at college life as well as data to use in choosing a college. In some cases, the students earn college credit while testing their academic abilities in a campus setting. By allowing potential applicants to experience campus life, those programs also provide a boost for college admissions officials dipping into a declining pool of college-age students.

On many campuses, summer is also the time for intensive professional institutes. For a lot of professionals — particularly educators from elementary school teachers to college professors — summer is the only time they can pursue their interests;

they appreciate the concentrated format of a one- to three-week program. College faculty also enjoy seeing some new faces in their classrooms to share their expertise.

Meanwhile, adults of all ages, particularly people over age 60, re-experience their love of learning through "alumni colleges" or programs such as Elderhostel, where they live on campus and study topics ranging from geology to autobiographical writing, from medieval tapestries to physical fitness.

### The bottom line

While all these benefits are laudatory, the chief rationale for summer school is the significant financial contribution the programs make to individual faculty and their host institution. Many faculty count on the supplemental salary from summer teaching to offset base salaries, which are often lower than in other settings.

Although most public institutions offer a summer session as simply another term, most private institutions minimally expect the summer school to be self-supporting or, more likely, to return a surplus that

might be as high as four times expenses. In the current economy, there is increasing financial pressure on summer schools to help offset budget difficulties elsewhere in the institution. The summer school director needs to be market-sensitive and make tough decisions with regard to the bottom line without sacrificing quality.

*In the current economy, there is increasing financial pressure on summer schools to help offset budget difficulties elsewhere in the institution.*

Summer schools face other battles, too. For one, there's an image problem — the perception that summer schools offer only "remedial work." They offer much more. In addition, questions have been raised about the quality of compressed courses — meeting in four to eight weeks instead of a standard semester. National studies, however, show no difference in the quality of learning in a compressed-format course. While most courses can be successfully reorganized in a compressed format, some are better suited to this model than others. The compressed format is usually offset by sensitive instructors and the acknowledgement that a full-time load is two courses, rather than four.

Finally, summer school administrators often need to invest time in internal public relations, reminding their colleagues that the college is still in operation during the summer. For example, office staff should stagger their vacations in order to provide needed services, and building-repair schedules should work around summer programming.

The excitement in running summer schools is in balancing the inherent tensions, while producing quality programming, responding quickly to student and societal needs, encouraging innovation and operating a fiscally responsible enterprise. In that sense, summer schools may well be a model for the academic enterprise of the 1990s. □

*Bonnie J. Newman is the director of summer school and associate dean of arts and sciences at Tufts University and the treasurer of the North American Association of Summer Sessions.*



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## Student Aid at the Grassroots

STEPHEN M. PRATT

□ When the 1980s construction boom transformed the waterfront of Cambridge, Mass., residents began to worry about the future of their community. They persuaded waterfront developers to contribute \$250,000 to a new East Cambridge Scholarship Fund.

□ In nearby Arlington, Mass., the town scholarship fund sought and won approval from the Massachusetts Legislature to add a check-off item to town tax bills for contributions. All town residents — including adult students — are eligible for the scholarships. And a fund made up of voluntary overpayments has grown to more than \$100,000.

□ In Hartford, Conn., the Greater Hartford Inter-racial Scholarship Fund supports students from area schools, with a special emphasis on minority students. With a board comprised of leaders from the inner city, the business community and public schools, the fund last year distributed more than \$66,000 to students from families with average incomes under \$17,000.

□ In Norway and Paris, Maine, students used to shuffle through a heap of forms to take a shot at the various small scholarships available. The scholarship funds have been reorganized into a single fund, managed by a cross-section of community leaders under the auspices of the Kiwanis Club. Students now complete one application to be eligible for all community grants.

From Fairfield County, Connecticut, to the northern reaches of Aroostook County, Maine, a coordinated grassroots effort is helping New England families overcome the triple threat of rising college tuitions, sinking student financial aid and economic decline.

More than 100 New England cities, towns and neighborhoods have organized community scholarship founda-

tions run by the community, for the community, with money raised in the community. Rather than waiting for Washington or state legislatures or banks to solve their problems, each of these communities has pooled its resources and organized scholarship foundations, which are linked to a national grassroots network of "Dollars for Scholars" chapters in more than 530 like-minded communities.

### Triple threat

The effort is gaining in importance. Tuition increases at private four-year colleges averaged 8 percent last year; public college tuition rose an average 7 percent. It was the 10th straight year that tuition rose faster than inflation. Meanwhile, federal student-aid programs have shifted away from grants and toward loans, resulting in a significant decline in college attendance among the poor, who are less likely to assume heavy debt to finance education.

In New England, the news is especially bad. Ongoing state budget crises have caused across-the-board cuts in the financial-aid budgets of state universities and colleges. Four of the six New England states — Vermont, Massachusetts, New Hampshire and Connecticut — rank among the top 10 nationally in tuition and fees at flagship state universities. All six states are considering cutting — or at best, level funding — their scholarship programs.

In Massachusetts, for example, Gov. William Weld's proposed fiscal 1992 budget would raise tuition by more than \$1,000 for some state residents who attend the University of Massachusetts system, while converting the state's \$57 million scholarship fund to a low-interest loan program.

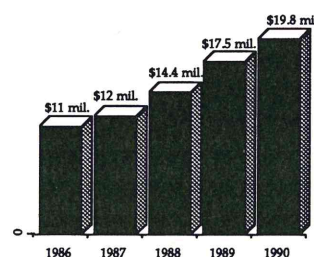
The news would be discouraging to New England families under any circumstances. But to make matters worse, the government's troubles are linked to widespread economic problems. In 1990, New England lost nearly a quarter of a million jobs. Unemployment during the spring topped 9 percent, the highest level since the 1982 recession.

The increase in personal economic hardship, combined with rising tuitions and declining government aid, have put higher education out of reach for many young people in New England. At a time when efforts to reduce crime, drug use and teen pregnancy are intensifying, the ultimate solution to these problems — education — seems unattainable. Enter Dollars for Scholars.

### Network benefits

The Dollars for Scholars network is a program of Citizens' Scholarship Foundation of America (CSFA), a national nonprofit student-aid organization founded in Fall River, Mass., in 1958. Last year, CSFA — through local Dollars for Scholars chapters and its corpo-

AMOUNT OF  
CSFA-GENERATED AWARDS



rate scholarship programs — distributed \$19.8 million in scholarships to more than 20,000 students.

CSFA programs last year granted 3,044 scholarships totaling \$2.8 million to students attending New England colleges and universities.

Each Dollars for Scholars chapter enjoys the strength of an independent foundation based in the community as well as access to other groups working toward the same goals. The New England regional office, based in Cambridge, Mass., acts as a conduit for the exchange of ideas among the New England chapters, while introducing ideas from outside the region.

The North Reading, Mass., chapter, for example, might get a good idea from as nearby as Wakefield, Mass., or from a sister program in Houlton, Maine, or Franklin, Indiana. In fact, North Reading has imported an Indiana variation on bingo for successful fundraising. Instead of using vinyl bingo cards at a



local church, residents gather at a town football field and gamble that a rented cow will feel nature's call on the section of the field they've chosen. "Cow chip bingo" raised more than \$8,000 for the North Reading chapter.

The CSFA affiliation also benefits Dollars for Scholars chapters by eliminating the headache of applying for 501(c)(3) status with the Internal Revenue Service. All affiliated organizations are listed on CSFA's group-exemption rosters and issued their own employer identification numbers, so they can immediately receive tax-deductible contributions. CSFA also provides "How-To" guides on recruiting and organizing volunteers, running publicity campaigns, raising funds and distributing awards.

In addition, five New England corporations and foundations have recently made it much easier for communities to start their own scholarship funds. New England Telephone, Raytheon, Arthur D. Little, The George Alden Trust and the Jessie B. Cox Charitable Trust have all contributed to a "challenge fund," which will provide a new scholarship program with \$2,000 once the program raises its first \$2,000 locally.

### Helping the region's colleges

The Dollars for Scholars program is also producing benefits for New England colleges and universities, which have witnessed the disappearance of above-average yields on endowment principal, slowed increases in government research contracts and a student market apparently no longer willing to stomach large, annual tuition hikes. Many colleges such as Yale University and Northeastern University have announced major cost-cutting measures.

As the economic challenges loom larger, the competition for a dwindling pool of freshmen is now taking its toll, particularly on private, tuition-reliant institutions. To survive, New England's colleges and universities will have to find new ways to attract students and the financial resources to support them.

More than 300 colleges and universities across the country have recognized the growing importance of private-sec-

tor aid in setting their financial-aid budgets. The Collegiate Partners Program connects member institutions to a growing movement of grassroots scholarship programs as well as innovative corporate initiatives, such as the Pepsi Challenge program in inner-city Dallas and Detroit.

Some of CSFA's Collegiate Partners have taken their commitment a step further, becoming Matching Grant partners. By agreeing to match CSFA awards within set limits, more than 100 colleges across the country are encouraging communities to continue developing grassroots scholarship aid while attracting more of that aid to their campuses.

CSFA sends a catalogue of its Matching Grant partners to the high-school guidance offices of every community where it has an affiliate program, giving its partners unique access to more than 500 high schools nationwide. Suffolk University, St. Michael's College, New Hampshire College and Johnson & Wales University are among the many CSFA matching grant partners in New England.

Recent trends in higher education financing indicate that government programs at both the federal and state levels will no longer meet the needs of students or of postsecondary institutions. As "downsizing" gains favor among policymakers, students and institutions are finding they must look to themselves to meet those needs.

Dollars for Scholars and the Collegiate Partners Program represent a first step toward self-reliance for communities and colleges that hope to prosper in the 1990s. For communities, scholarship programs can be linked effectively to efforts to increase graduation rates, improve schools and create economic opportunity. For colleges and universities, partnership with communities provides a vital source of private-sector scholarship resources while enhancing the institutions' appeal to students whom they rely on to survive and grow. □

*Stephen M. Pratt is the New England program development officer for the Citizens' Scholarship Foundation of America.*

## A Next Step for Community College Students

PIEDAD  
ROBERTSON

**B**ecause of their strategic locations, community colleges provide the primary road to higher education for underrepresented ethnic minorities and other disadvantaged groups. To fulfill their mission, however, the public two-year colleges must aggressively promote the transfer of students — especially low-income Black and Hispanic students — to four-year colleges and universities.

Successful transfer from community colleges to four-year schools often depends upon *articulation* agreements worked out by the participating institutions. These agreements are designed to encourage smooth transfer by clearly identifying prerequisites for admission into the four-year programs. These requirements may include a specified distribution of courses or level of advancement in certain course areas. The central goal of the agreements is to minimize loss of time and credit for the graduate of the two-year college.

Community colleges must be assured that students who complete a lower-division program with satisfactory grades — often C's or higher — as specified by the receiving four-year institutions, will be admitted to bachelor's degree programs. Four-year institutions, meanwhile, must be assured that transfer students have received the quality education needed to successfully continue their studies.

The effectiveness of transfer articulation is demonstrated by student achievements, graduation rates and job placements. Too often, however, articulation agreements lose their impetus because the parties involved cannot successfully collaborate. For example, four-year institutions may impose requirements on transfer students that go beyond the original agreement (such as requiring transfers to earn higher grades than non-transfers in



certain courses) or simply intimidate transfer students with their bureaucracies.

A barrier of bad attitudes also stands between community colleges and four-year institutions. In some cases, faculty at the institutions do not respect each other's work. Along with this comes an assumption that community college transfers are less capable than students who entered four-year institutions straight from high school.

Another major barrier is financial. It is not unusual for a community college student to be supporting his or her family while attending college. The student is likely to need a commitment of financial support from the higher-priced, four-year institution.

### Successful arrangements

How can institutions encourage smooth transfer? For starters, common or "articulated" numbers can be assigned to community college courses that are considered equivalent to courses at the four-year institutions. Articulation, however, should also encompass courses taken in lieu of equivalent courses. For example, Lesley College, a four-year institution, requires its freshmen to take a course titled "Global Perspectives." The objective of the course is to give students exposure to non-Western culture and literature. Through an articulation agreement with Bunker Hill Community College, Lesley accepts credits for any non-Western literature elective earned at Bunker Hill in lieu of the "Global Perspectives" requirement.

Information about articulation agreements should be disseminated to counselors who advise transfer students and to faculty, who have chief responsibility for developing agreements covering course equivalency and transferability in specific degree programs. Campuses also should provide an appeals process for institutions and students to address what are considered to be unfair articulation agreements.

Because transfer students may encounter social and personal problems in acclimating themselves to the four-year college environment, student support staff in both the two- and four-year institutions should collaborate on services such as outreach and recruitment, counseling, academic advising and financial aid. While

these services should not be limited to disadvantaged students, strong efforts are needed to identify, motivate and support ethnic minority and other disadvantaged community college students who may otherwise lose the opportunity to complete a bachelor's degree program. This is essential if educational equity is to be achieved.



*Robertson: Aggressively promote student transfer.*

**No published material outlines  
what the six New England states  
are doing to  
promote transfer.**

At Bunker Hill, we encourage and advise students to go on to four-year institutions that can provide them with opportunities for cultural enrichment and maximum academic achievement.

With this in mind, Bunker Hill and Roxbury Community College are using articulation agreements to open doors to six historically Black colleges and universities, including Florida A&M University, Howard University in Washington D.C. and Tuskegee University in Alabama. Under the agreement, community college graduates who complete specified courses and maintain academic standards are assured acceptance and credits at the participating four-year colleges, as well as some financial aid.

Bunker Hill is in various stages of articulation agreements with two dozen other institutions.

### Leadership needed

Institutional cooperation and articulation agreements may get a boost now that New England colleges are faced with a smaller group of traditional college-age students and severe fiscal constraints. But leadership is needed to guarantee the integrity of transfer articulation. Educa-

tion officials in New England should provide a strong show of support and a tough demand for compliance with articulation agreements. Artificial institutional barriers to transfer can be removed if student mobility and access are the focus.

Legislative mandates used in some states for transfer articulation agreements are not needed if New England's faculty, administrators and student personnel officers collaborate effectively.

But governors, legislatures and appropriate agencies should issue and support policies that provide direction, oversight and monitoring of the effectiveness of the transfer articulation process. Moreover, information should be collected periodically to analyze the process and recommend changes in policies, regulations and practices.

Articulation is a guarantee beyond the good intentions of agreements like the 1990 Massachusetts Transfer Compact, which outlines for public institutions the standards and minimum requirements to be followed for student transfer. This compact should set the stage for equitable student transfers between all higher-education institutions in Massachusetts. But it is not as effective as it could be because there is no directive or strong support from above to ensure compliance.

The region should also support efforts by the New England Transfer Articulation Association to increase awareness of what the region is doing — or *should* be doing — to promote transfer articulation. Research could help determine changes needed at both community colleges and four-year institutions to help students transfer and succeed. Yet no published material outlines what the six New England states are doing to promote transfer.

In the absence of such research, the feeling that, as one official put it, "we're probably no worse than anyone else" will keep us all short of our educational missions. Meanwhile, the population of our community colleges is growing — and growing impatient, waiting for doors to open for advancement. □

*Piedad Robertson is the president of Bunker Hill Community College.*



# NEW ENGLAND COLLEGES HAVE A HAND IN BUILDING THE NEW SOUTH AFRICA

MAYA RANCHOD with JEREMY BORAINÉ

**T**he Indian Ocean seaport of Durban is known as a resort city because of its subtropical climate. But like all cities and towns in South Africa, Durban deals daily with the persistent effects of apartheid. Political strife in the country's eastern province of Natal has had a severely destabilizing effect on the region, damaging economic growth, education and social conditions.

Durban is said to be one of the fastest growing cities in the world. But much of this growth is unplanned and even unseen, hidden in the sprawling townships where the illiteracy rate in

receive OSSF support are the universities of Cape Town, Rhodes, Western Cape and Witwatersrand.

## Growing demand

Founded in 1910, the University of Natal now enrolls some 14,000 students, 36 percent of whom are Black. Its medical school, until recent legislative changes, was the traditional place for Blacks to receive medical training in South Africa. Steven Biko trained there.

In the past decade, the demand for higher education by able men and women of color has put severe stress on the institution. The university has mounted large-scale, financial-aid schemes and tutoring plans to enable Black students to enter the demanding university environment and not only survive but succeed. At the same time, the university has faced declines in state subsidies. (Like all universities in South Africa, Natal receives about 60 percent of its funding from the government.)

Black enrollment will continue to increase at a rapid pace. According to university projections, two-thirds of the student population will be Black in 20 years.

Dormitory integration already has led to increased social interaction between Blacks and Whites. "Initial friendships between Black and White students were distant, but prolonged integration in dormitories and classrooms resulted in lasting friendships," says Jeffrey Smith, a student of mixed race who is supported by an OSSF scholarship through Dartmouth College. Smith notes that the majority of house presidents or dormitory heads are Black — a dramatic shift from recent days when Black students did not participate in official university functions.

Judy Brightman, an administrator in the Student Support Department, says she thinks Black student participation in a number of traditionally White student organizations will increase over the next year. A plan to merge the predominately White Student Representative Council and the Black Student Society later this year is an indication of the cautious, but definite, move toward integration of Black and White.

But having only recently seen an end to state attacks on academic freedom, police on campus and students and faculty members hauled off to detention, the university and its students will need moral and material support to face the challenges ahead.

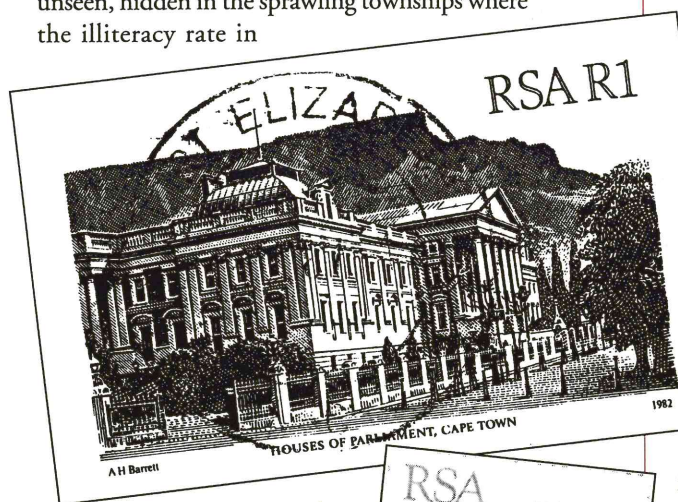
some cases is said to approach 87 percent, and unemployment runs over 50 percent.

Operating amid this troubled landscape is the University of Natal. With campuses in Durban and Pietermaritzburg, it is one of South Africa's 21 universities and one of the five historically "open" universities that receive scholarship support for Black students through the Open Society Scholars Fund (OSSF), which is operated by the New York City-based University of Cape Town Fund.

U.S. institutions that provide financial assistance to Black South African students through the OSSF are playing a key role in helping the open universities push social reform forward through increased Black enrollment, fully integrated living accommodations and expanded student services.

But more is needed. The OSSF is now seeking three-year commitments of \$4,200 per year to provide tuition, housing and academic support to Black South African students.

The other historically "open" institutions where students





## New England Campuses Helping Black South African Students:

Bentley College  
Boston College  
Boston University  
Bowdoin College  
Bryant College  
Connecticut Regional Technical  
and Community Colleges  
Dartmouth College  
Massachusetts Institute of Technology  
Middlebury College  
Norwich University  
Providence College  
Radcliffe College  
Saint Anselm College  
Simmons College  
Southeastern Massachusetts University  
Tufts University  
University of Connecticut  
University of Hartford  
University of New Hampshire  
University of Southern Maine  
University of Vermont  
Wellesley College  
Wesleyan University  
Williams College

The continuing violence in Natal has seriously affected students. Brightman reports that not a single Black family has been untouched by the conflict between the African National Congress and Inkatha. Large numbers of students — some commuting from embattled townships, others living in university residences and worried about their families — have needed psychological counseling.

In addition, the apartheid education system has left Black students ill-equipped to handle the academic demands of a university. Natal, like other schools supported through the OSSF, seeks to address the basic inequalities in South African society through a system of academic support.

Foundation courses in English, math and science and ongoing specialized tutorial support give students an opportunity to compete effectively and succeed. Not surprisingly, there is a clear correlation between academic support programs and grade performance. The university plans to institutionalize academic support services to reach all students, Brightman says.

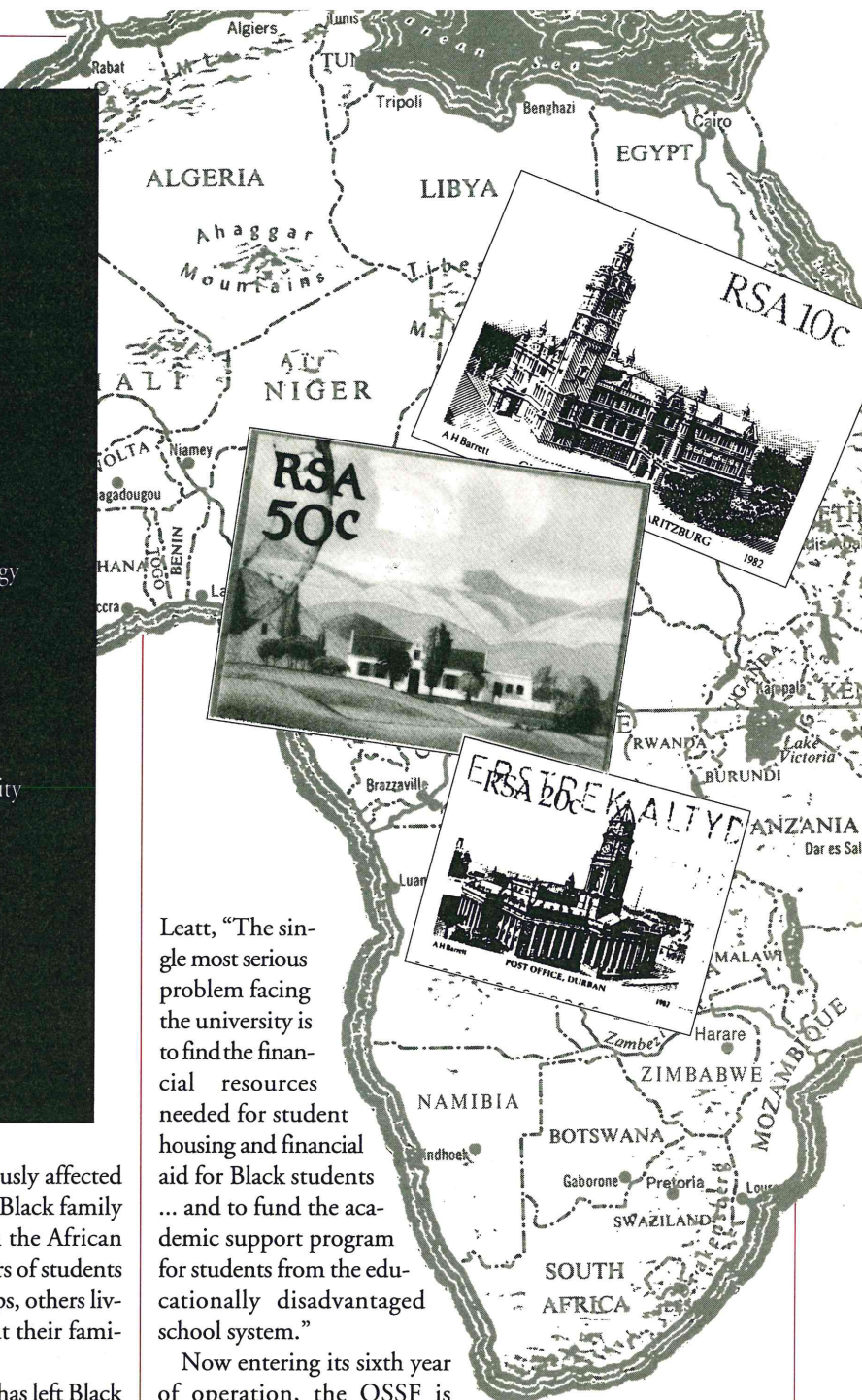
But the chief barrier to increased Black enrollment and support remains. Says incoming Vice Chancellor James

Leatt, "The single most serious problem facing the university is to find the financial resources needed for student housing and financial aid for Black students ... and to fund the academic support program for students from the educationally disadvantaged school system."

Now entering its sixth year of operation, the OSSF is designed to address that problem. Forty U.S. institutions, including 24 in New England, are currently participating in the program, providing over \$200,000 annually in financial aid for 63 Black South African students.

The New England Board of Higher Education continues to play a vital role in the OSSF — and the new South Africa. NEBHE-associated institutions are providing \$113,000 to help support 35 students. □

*Maya Ranchod is the former coordinator of the Open Society Scholars Fund. Jeremy Boraine is a freelance writer in New York City. Both attended the University of Cape Town.*





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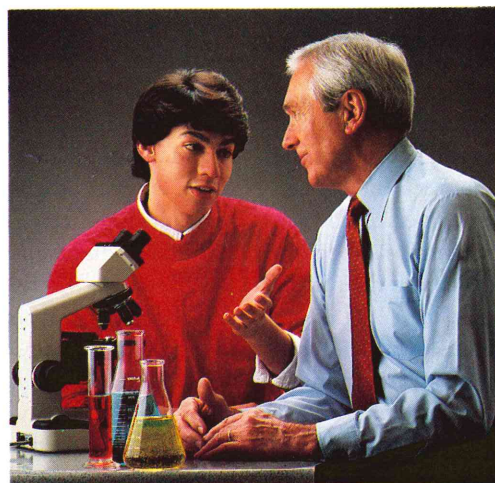
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## A Community?

John C. Hoy's article, "Pride of Institution and New England's Resurgence" (CONNECTION, Winter 1991), is a superb introduction to your excellent collection of articles on the troubling economic and educational issues we face in this region.

While our region's economies, social policies and tight geographic area all lead us toward being one unit, we instead emphasize diversity, often at a very contentious level. As states and as institutions, we compete rather than cooperate. As a lawyer, I would say the New England states and their institutions, both public and private, do at times remind me of the parody of some types of lawyering in which adversarial posturing becomes more important than results.

The clear messages of the articles are that cooperation among the states and the public and private sectors is critical, and research requires state as well as private support. Without such support, New England will experience a "brain drain" to other sections of the country and to other better-funded — and wiser — institutions.

The states, even in these parlous times, must be willing to spend funds for long-range development and advanced research. Institutions must work in teams. The political forces in the region must fight for the region — not just a single constituency — on a continual basis and at a substantial level.

Ben Franklin's statement that "if we don't hang together, we will all hang separately" is admonitory to New England. Individualism is an important part of our tradition, but if it results in fragmentation of effort and will, we will surely not sustain any future leadership role in the nation's economy and culture. We need to perceive ourselves as a single community and act accordingly. We are not just a collection of states and institutions, playing one-upmanship among ourselves.

We should remind ourselves that the lawyers of England became unimportant in determining national policy during the Tudor and early Stuart reigns. The reason was simple: Lawyers were so busy fighting among themselves for various strands of authority that they had neither time nor energy for the critical national issues.

It was not so many years ago that New England's industries moved elsewhere, and the region was considered an economic relic of the past. Let's not repeat what is surely still in our collective memory.

*Richard G. Huber  
Professor of Law  
Boston College Law School  
Newton, Mass.*

## Beyond the Magnet Loss

In his essay "Pride of Institution and New England's Resurgence" (CONNECTION, Winter 1991), John Hoy rightly expresses concern about the economic consequences of disinvestment in higher education.

A year ago, the University of Massachusetts at Amherst was one of 50 institutions in the second stage of competition for National Science Foundation (NSF) support under the "centers of excellence" program. UMass, in fact, was one of a handful of universities being considered in two areas: in our case, biotechnology and computer science. Most would agree that both fields are vital to the region's future.

The university was dropped from further consideration last fall. Those close to the review process expressed, off the record, their dismay at the lack of commitment and support for the state's principal public research university, as evidenced by indiscriminate, cumulative budget reductions over three years. Our prospects for the future struck them as too uncertain to justify a federal commitment.

In the same issue of CONNECTION, Ian Menzies characterized the NSF decision to fund a high-magnetic field lab at Florida State rather than at the Massachusetts Institute of Technology as a "scientific slap in the face." In our case, I see the decision as a realistic appraisal of the Commonwealth's recent policy of political and fiscal indifference toward public higher education and the role it plays in the state's economy. Just how this policy squares with the public pronouncements of the Commonwealth's political and business leadership — that ours is an economy based on knowledge and trained intelligence — is one of the great mysteries of our time.

*David Knapp  
Ralph Waldo Emerson Professor  
University of Massachusetts  
Boston, Mass.*

## Hosting Post

I was happy to see the reference to Teikyo Post University in James Martin and James E. Samels' article entitled "The Small College Entrepreneur" (CONNECTION, Winter 1991).

Our main campus, however, is located in Waterbury, Conn., not New London as the article indicated. We do have, among our seven continuing education sites located throughout Connecticut, a teaching branch in New London.

*Gwenn Gurnack  
Director of Public Relations  
Teikyo Post University  
New London, Conn.*

CONNECTION welcomes letters from readers.

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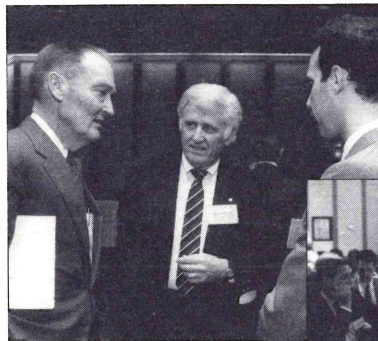
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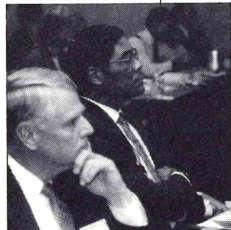
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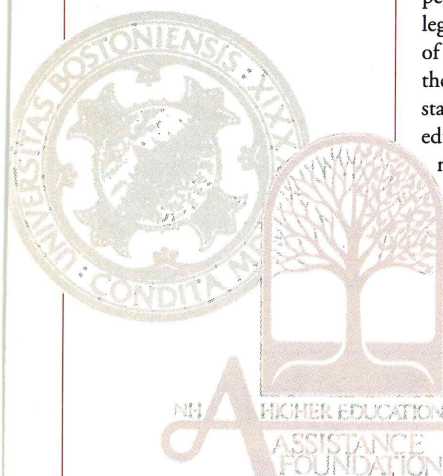
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**QUINCY, MASS. —**

Officials at Quincy College, New England's only city-run college, asked for local and state permission to turn the two-year institution into a four-year college offering a bachelor's degree in liberal studies. According to plans, students would need an associate's degree from Quincy or another college and a few years of work experience to qualify for the program. Because Quincy College is run by the city, the plan would have to be approved by the local school committee, as well as the state Legislature and Board of Regents of Higher Education.

**STORRS, CONN. —**

United Technologies Corp. awarded \$200,000 to the University of Connecticut to advance research in precision manufacturing used in such industries as aerospace, electronics and photo-optics. UConn's School of Engineering is organizing the only major Precision Manufacturing Center in the Northeast. Meanwhile, the Worcester, Mass.-based Norton Co. announced it would commit \$150,000 over three years to support the UConn engineering school's existing Center for Grinding Research and Development.

**BOSTON, MASS. —**

The U.S. Department of Education jointly designated Bentley College and Tufts University's Fletcher School of Law and Diplomacy as one of the nation's 16 federally funded

Centers for International Business Education and Research. The center will offer executive-education sessions and quarterly seminars on critical issues in international business and conduct research and workshops for business faculty throughout New England.

**HARTFORD, CONN. —**

The state Board of Governors for Higher Education announced that minority enrollment at Connecticut colleges rose 5 percent from fall 1989 to fall 1990, while total enrollment of all students dropped 0.7 percent. Minority students now account for 11.6 percent of all Connecticut college enrollments — an increase of 49 percent since 1984, when the Board of Governors began a statewide initiative to increase educational opportunities for minorities.

**KINGSTON, R.I. —**

The University of Rhode Island and the Escuela Superior Politecnica del Litoral in Guayaquil, Ecuador, signed a memorandum of understanding to cooperate on research and academic development at both institutions. URI and the 4,500-student South American school, which specializes in business, engineering and marine studies, will exchange faculty, staff, students and research data. URI also reached an agreement with the 10,000-student Kaliningrad Technical Institute in the Soviet Union to collaborate on research, development and education programs in marine resources and fisheries.

**HARTFORD, CONN. —**

The University of Hartford announced it will expand a merit scholarship program in the fall to address a manpower shortage in the health professions. A governor's task force in Connecticut listed occupational therapy, medical technology, health science, respiratory therapy and radiologic therapy among fields where manpower supply is in critical condition.

**MACHIAS, MAINE —**

The University of Maine at Machias canceled 11 courses for the spring semester because of budget constraints. UMaine-Machias said the courses that were eliminated had low enrollments and were not essential for specific degree programs. But university officials warned that more cuts may be necessary.

**BOSTON, MASS. —**

The U.S. Department of Education awarded a five-year, \$6.3 million grant to a research consortium comprised of Boston University, the BU-based Institute for Responsive Education, Wheelock College, Yale University, Johns Hopkins University and the University of Illinois/Champaign. The consortium will study relationships among families, schools, communities and learning.

**DURHAM, N.H. —**

The University of New Hampshire began a Job Locator and Development Program to help students find jobs in the private sector. The federal government picks up 80 percent of the cost of administering the program, in which UNH matches students with prospective employers.

**NEW HAVEN, CONN. —**

South Central Community College announced it would launch a new associate's degree program in Retail Management and Fashion Designing. South Central officials say major retailers in Connecticut have expressed interest in the program, and the University of Bridgeport has agreed to accept associate's degree credit toward a bachelor's. But with budget cuts in vogue, the college's February announcement was cautious indeed. "The college will admit the first students to the program in September, if funds are available to hire an instructor by then," the college's news release said.

**WATERBURY, CONN. —**

Seven Mattatuck Community College students were chosen by

the National Honors Choir of the American Choral Directors' Association to perform Beethoven's "Mass in C" at the Symphony Hall in Phoenix. Mattatuck and Holyoke Community College are the only two northeastern colleges to have students sing with the group.

**AMHERST, MASS. —**

Two polymer scientists from the University of Massachusetts were among 77 new members elected to the National Academy of Engineering. The two UMass scientists are engineering professor Frank E. Karasz and chemistry professor Richard S. Stein. Stein became one of only 135 scientists and engineers inducted into the engineering academy as well as the National Academy of Sciences. An informal UMass survey puts the university 12th among all U.S. public universities in the number of academy members on its faculty.

**BURLINGTON, VT. —**

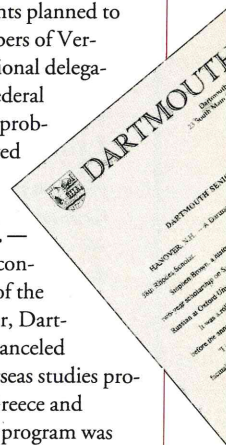
Twelve Trinity College of Vermont students planned to spend spring break working at a Washington, D.C. soup kitchen as part of Trinity's Alternative Spring Break, a program created last year to expand students' understanding of social problems. The students planned to meet with members of Vermont's congressional delegation to discuss federal responses to the problems they observed at the kitchen.

**HANOVER, N.H. —**

Citing safety concerns as a result of the Persian Gulf War, Dartmouth College canceled spring-term overseas studies programs in Italy, Greece and France. Another program was relocated from Spain to Mexico. About 65 percent of Dartmouth students study abroad.

**ORONO, MAINE —**

Sun Microsystems Inc. donated more than \$600,000 in computer equipment to the University of Maine. The largest equipment gift ever received by





UMaine's Department of Computer Science and Computer Center will allow the university to expand both introductory and advanced undergraduate and graduate computer programs while providing more facilities and equipment for research projects.

#### PROVIDENCE, R.I. —

The chairman emeritus of International Business Machines pledged \$25 million to Brown University — the largest gift in Brown's history. Thomas J. Watson Jr.'s donation of \$10 million in cash and \$15 million in a bequest will bring his contributions to his alma mater to \$42 million, making him the university's leading donor. Brown has announced it will rename its Institute for International Studies for Watson, a member of the class of 1937 and former U.S. ambassador to the Soviet Union.

#### WORCESTER, MASS. —

The Kresge Foundation awarded a \$500,000 challenge grant to Holy Cross College for the purchase of new scientific instrumentation for the college's biology, chemistry, mathematics and psychology departments. Awarded under the foundation's Science Initiative Program, the grant requires that the college raise another \$2 million from other sources to create an endowment fund.

Nearly 14 percent of the early decision group for the class of 1995 were minorities, compared with 7.5 percent for the class of 1993. Dartmouth accepted 362 students for early decision.

#### ORONO, MAINE —

The University of Maine became one of 28 institutions nationwide to receive funding for a Ronald E.

McNair Post-Baccalaureate Achievement Program. Named after the Black astronaut and engineer who died in the 1986 Challenger space shuttle disaster, the program is designed to encourage low-income, first-generation college students — particularly minorities — to enter and complete doctoral study and is funded by the U.S. Department of Education. The two-year,

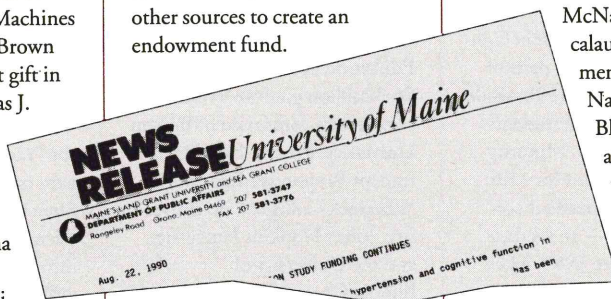
\$104,585 annual grant will allow UMaine to recruit six McNair scholars interested in pursuing doctoral studies in engineering and the sciences.

#### BURLINGTON, VT. —

The University of Vermont's College of Medicine, in conjunction with the University Health Center, is one of eight sites chosen around the country to test a new vaccine developed by Jonas Salk to combat AIDS. The study will eventually follow a dozen participants who will travel to Burlington for periodic injections of the vaccine. The study is sponsored by Immunization Products Ltd., a drug company.

#### PROVIDENCE, R.I. —

An anonymous donor provided Brown University with money to establish a \$500,000 fund to repay college loans for Brown graduates who enter public service or teaching careers. Qualified recipients of the Public Ser-



#### HANOVER, N.H. —

Dartmouth College Director of Admissions Karl Furstenberg credited much of a 6.7 percent jump in applications for early admission to a larger number of minority and foreign applicants.



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- M.Ed.** in Foundations of Education Professional Development Program for Experienced Educators

**Antioch  
New England  
Graduate School**



vice Repayment Fund could have up to 100 percent of their education loans repaid over five years. Second-semester seniors and recent Brown graduates are eligible if they work or will be working in full-time public service or teaching positions.

#### WINOOSKI, VT. —

St. Michael's College was one of 78 colleges and universities chosen from 425 applicants for a National Science Foundation grant to modernize science facilities. The \$375,000 NSF grant must be matched by more than \$1 million raised by the college. The college was specifically recognized for its record in training undergraduate science students, who continue their education at the doctoral level in large numbers.

#### BEVERLY, MASS. —

North Shore Community College announced that its winter/spring semester enrollment of 3,124 day students was the second-highest in the college's 25-year history. An additional 4,000 students were enrolled in the college's evening division.

#### AMHERST, MASS. —

The National Science Foundation awarded approximately \$1.5 million to Five Colleges Inc. to establish a Regional Geometry Institute, which will bring together college and university mathematicians, high-school math teachers and undergraduate and graduate math students. The institute investigators are drawn from the faculties of Amherst, Hampshire, Mount Holyoke, Smith, Holy Cross and Williams colleges, as well as the University of Massachusetts at Amherst. In many New England high schools, "the geometry being taught has not changed substantially in a hundred years," said one of the primary investigators.

#### LEWISTON, MAINE —

The 16-member New England Consortium for Undergraduate Science Education

received a \$2 million grant from the Pew Charitable Trusts' Science Program in Undergraduate Education. The grant is part of a \$7.3 million initiative by Pew to increase the number of college students who major in science and mathematics. Consortium members are Amherst, Bates, Bowdoin, Brown, Colby, Dartmouth, Harvard, Holy Cross, Middlebury, Mount Holyoke, Smith, Trinity, Wellesley, Wesleyan, Williams and Yale.

#### ORONO, MAINE —

The University of Maine's College of Applied Sciences and Agriculture introduced a bachelor's degree program in aquaculture. Degree candidates may specialize in aquacultural technology, aquacultural science or aquaculture business management and marketing.

#### STORRS, CONN. —

The University of Connecticut's Center for Latin American and Caribbean Studies announced publication of a directory of more than 200 Connecticut firms doing business in Latin America. The directory provides addresses, phone and FAX numbers, information on product lines and contact names in Latin America.

secondary schools. Antioch's proposal was one of 10 accepted by the EPA from a pool of about 500. Antioch's project — Critical Skills Training in Solid Waste and Recycling Education — is designed to help teachers integrate recycling and waste-management issues in their courses.

#### HARTFORD, CONN. —

The University of Hartford announced it will begin offering part-time master's degree programs in electrical, mechanical and civil engineering designed for working engineers, beginning in the fall. Of the approximately 14,000 engineers working in central Connecticut, only 57 percent hold advanced degrees or are enrolled in a graduate engineering program, according to UHartford. The university also will begin offering master's of fine arts degrees in painting, photography and printmaking in the fall.

#### BOSTON, MASS. —

Northeastern University received a \$160,000 grant from the National Science Foundation to build a 2,100-square-foot addition to its Marine Science Center in Nahant, Mass. The addition will accommodate eight investigators and their assistants.

#### LEWISTON, MAINE —

A near-record number of high-school students applied to Bates College, despite a demographic downturn. Bates officials said they expected to receive 3,650 applications for admission — second only to 1988's record high of 3,730 applications. Applications for early decision jumped by 35 percent over last year; applications from minorities were up 22 percent. Among reasons for the overall increases, Bates officials pointed to the college's decision to make all standardized tests optional.

#### NEWPORT, R.I. —

The trustees of Salve Regina College voted to change the

institution's name to Salve Regina University. Salve Regina offers graduate degrees in 15 different concentrations and has introduced a doctoral program in humanities.

#### KINGSTON, R.I. —

The University of Rhode Island was awarded a three-year, \$299,348 grant from the U.S. Department of Energy for research in basic energy sciences.

#### AMHERST, MASS. —

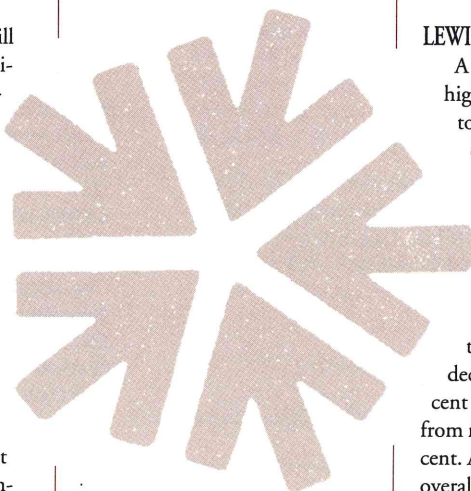
Polymer scientists at the University of Massachusetts said they have developed what they believe to be the world's strongest fiber. The scientist who developed the material says a strand of it has the strength of steel and is seven times lighter. The material is made from simple polyethylene, which is used to make such products as soda bottles and frisbees. Such strong polymers are already used in the military and someday could be used to build products such as car doors that would offer more protection than steel and make the car more energy efficient.

#### DURHAM, N.H. —

The University of New Hampshire's Whittemore School of Business and Economics announced it will offer a new bachelor's degree program in business administration at the university's Manchester campus next fall. With classes offered during the day and evenings, the program is designed for both recent high-school graduates and adults returning to college.

#### NEW HAVEN, CONN. —

Yale University's School of Medicine received a \$10 million gift from a California couple toward construction of a Center for Molecular Medicine. The gift from Mr. and Mrs. Herbert Boyer is the largest in the medical school's history. Boyer is a cofounder of Genentech Inc. and a pioneer in biotechnology. Yale's \$38 million center will house 20 to 25 faculty researchers, who will focus on gene functions.



#### KEENE, N.H. —

Antioch New England Graduate School was awarded \$91,750 by the Environmental Protection Agency for a two-year project to develop recycling education programs for primary and



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WINTER 1989

# 5 YEARS

## New England After Defense Peace Dividend or Peace Liability

SENATOR THOMAS J. SULLIVAN

Value of Exports per capita, 1988

## Hot Hu

These spots may have what it takes to be centers of New England's competitiveness in the '90s

JOHN O. HARNERY

The image of countless Yankee craftsmen and trades in humbler across New England is a hard one to forget. But the regional economic scene today has changed. The pieces of real estate—a few plots with the right geography and the right brains. The East India Trade must follow. Mass. The East India Trade must follow. Mass. The East India Trade must follow. Mass.

In 1986, the New England Board of Higher Education committed itself to publishing America's only regional journal on higher education and the economy. This publication was aptly titled CONNECTION: NEW ENGLAND'S JOURNAL OF HIGHER EDUCATION AND ECONOMIC DEVELOPMENT.

Today, CONNECTION is a major source of information for New England's decision-makers: governors and their advisers; state legislators; members of Congress; business leaders; researchers; foundation executives; college presidents and deans; secondary school principals and guidance counselors; and members of the news media.

NEW ENGLAND BOARD OF HIGHER EDUCATION

NEW FROM THE SCHOOL... NATIONAL EDUCATION ASSOCIATION (NEA) reports on the U.S. Congress based on their survey of legislation. The following are NEA's rank of the New England delegation. Issues raised on the 10 key roll call votes from Jan. 1 to June 21, 1989. Senators' rankings are based on the NEA's 1989 through Oct. 19, 1989. A note: the number supported the NEA position on education-related bills considered.

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Each quarter, CONNECTION explores the links between New England's economy and higher education; provides hard data and analysis that readers can use; reviews campus trends; and offers a record of priority issues in the region. (Refer to Five Years of CONNECTION, Index of Articles, Volumes I-V, p. S6.)

In the fall, NEBHE publishes a special issue of CONNECTION called *FACTS: The Directory of New England Colleges, Universities and Institutes*. This definitive guide to New England higher education provides a wealth of information on all of the region's colleges and universities; state-by-state analyses of higher-education trends; names and addresses of higher-education agencies; and information on financial aid and other important issues for college-bound students.

## Beginnings

Our story really begins in 1955. That year, New England's governors and state legislatures approved a compact creating the New England Board of Higher Education. The goal of the congressionally authorized regional agency: to expand educational opportunity and foster cooperation and the efficient use of resources among the more than 260 colleges and universities in Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont.

Through its research, public policy reports and conferences, NEBHE established itself as a leader on issues of higher education and the New Eng-

land economy.

By the mid-1980s, New England — fueled by its unparalleled higher-education resources and technical research — had become one of the world's foremost economic success stories. NEBHE examined and helped define that success, identified potential obstacles and illuminated new educational and economic opportunities. The import of NEBHE's research became too great to be restricted to the confines of any conference room. The board's prescient work on issues such as emerging industries, labor supply, international competitiveness, research and technology, minority enrollment in higher education and regional quality of life simply had to reach more New Englanders. CONNECTION was the answer.

Five years later, CONNECTION is the meeting place for the region's decision-makers and opinion leaders — a conference room, in a sense, for New England.

Today, newsstand sales are brisk. Requests for reprint permission are the order of the day: The organizers of a meeting of the region's governors require 150 copies of CONNECTION stories on international trade. ... A major regional business group needs 50 copies of CONNECTION's forum on economic recovery to spread around Capitol Hill. ... A high-school principal orders several copies of the special *FACTS* issue for a college fair. ... New Englanders from all walks of life regularly inquire about the issue of CONNECTION explor-

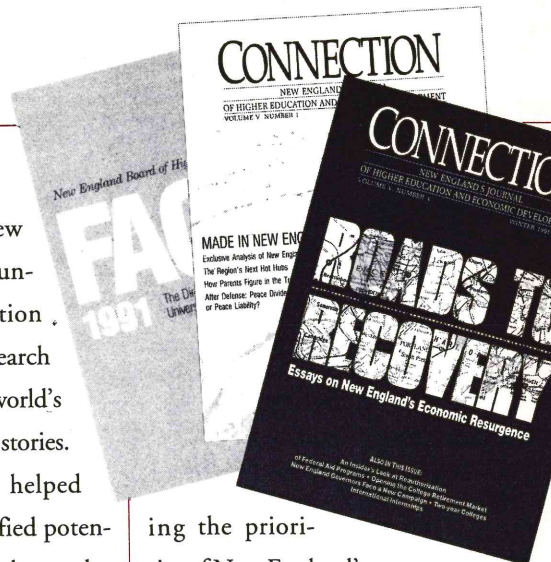
ing the priorities of New England's congressional delegation.

## Writers, readers, advertisers

CONNECTION is a success, in part, because many of our thousands of readers are also contributors. Prominent and promising New Englanders see CONNECTION as the editorial vehicle to convey their insights and expertise on important issues of the day. Others advertise their products and services in CONNECTION, knowing their message reaches the region's movers and shakers. More than a few chip in with the kind of highly personal guidance that keeps CONNECTION on top of trends in New England.

They are all part of our six-state conference. Governors and members of the U.S. Congress outline innovative policies. Award-winning New England journalists provide copy that sings. Business and higher-education leaders help build New England's agenda. And they all do it by way of CONNECTION.

As we celebrate our first five years of publication, we offer a well-deserved thank you to those who have made this venture so rewarding.





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## Support for special editorial projects

In the past five years, many of CONNECTION's most intriguing articles have grown out of the New England Board of Higher Education's groundbreaking research projects. These NEBHE projects, reports and conferences have provided benchmark analyses and recommendations on topics such as biotechnology, international trade, legal education, minority access to higher education and the changing needs of New England's workforce. These special NEBHE efforts have been supported by numerous institutions, foundations and corporations. Supporters include:

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
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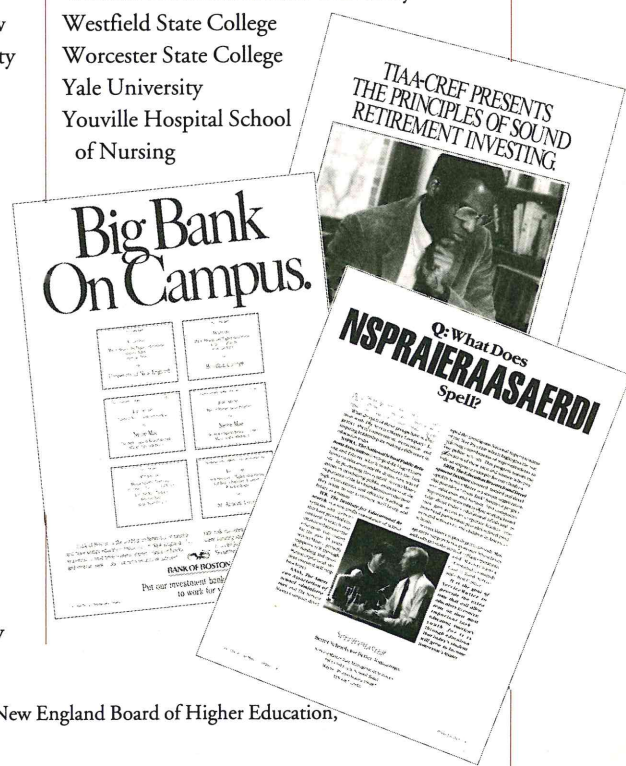
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## Continuing our work

**N**o New England nonprofit enterprise has received a broader base of support in exploring links between educational opportunity and economic achievement. As in 1986 when CONNECTION began, higher education remains at the center of New England's unique contribution to the national and global economy. Issues brought to the forefront in these first five years of CONNECTION have underscored that fact time and time again.

The CONNECTION Index of Articles that follows reflects the breadth of issues in which higher education and economic well-being intersect. As we embark on our sixth year of publication, the New England Board of Higher Education and the staff of CONNECTION will continue to explore these issues. We hope our readers, editorial contributors, advertisers and colleagues in all sectors will continue to support CONNECTION and NEBHE with the level of interest and commitment they have shown in the past.

## FIVE YEARS OF CONNECTION: New England's Journal of Higher Education and Economic Development

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