

# SCIENCE

## Innovations on Campus

### TABLE OF CONTENTS

#### NEWS

##### Campus Innovations: Overview

|                                                            |     |
|------------------------------------------------------------|-----|
| A Time of Trials and Tribulations                          | 844 |
| Coping With the Underprepared Undergraduate                | 846 |
| Coping With Today's Ph.D. Glut and Funding Cuts            | 849 |
| Some Small Schools Are Big On Manufacturing Scientists ... | 850 |
| ... But Caveat Emptor for Small Grad Schools               | 850 |

##### Campus Innovations Part One: Curricula

|                                                     |     |
|-----------------------------------------------------|-----|
| Assault on the Lesson Plan                          | 856 |
| Curricula Reform Hits the Web                       | 858 |
| Novel Program I: Advanced Research in Biotechnology | 863 |
| Novel Program II: Environmental Management          | 863 |
| Novel Program III: Undergraduate Nanotechnology     | 864 |
| Novel Program IV: Commercializing Research          | 865 |
| Novel Course I: Digital Neuroscience                | 869 |
| Novel Course II: 21st-Century Chemistry             | 870 |
| Novel Course III: Undergrad Labs "Get Real"         | 870 |
| Novel Course IV: Survival Skills 101                | 872 |
| Reader Feedback                                     | 873 |

##### Campus Innovations Part Two: Teaching

|                                                          |     |
|----------------------------------------------------------|-----|
| New Modes for Making Scientists                          | 875 |
| Harvard Succeeds in the Teaching of Teachers             | 877 |
| Rewards—at Last—for Top Teachers                         | 883 |
| John Jungck: Godfather of Virtual Bio and Genetics Labs  | 888 |
| Stephen Thompson: Call Him Czar of Small-Scale Chemistry | 889 |
| Ocean Engineering? New Wave in Teaching Marine Biology   | 889 |
| Why Eric Mazur Brings Chaos—Not Chaos Theory—to Physics  | 890 |
| Turning Students On by Simulating the Arcane             | 893 |

#### POLICY FORUMS

|                                                                                                              |     |
|--------------------------------------------------------------------------------------------------------------|-----|
| Producing the Finest Scientists and Engineers for the 21st Century<br><i>Mary Lowe Good and Neal F. Lane</i> | 741 |
| European Union: Fresh Tracks for Academic Exchanges<br><i>Brian Frost-Smith</i>                              | 743 |

**T**he U.S. system of higher education has, over the decades, produced a cadre of researchers that is the envy of the world. Thousands of young people across the globe struggle annually to obtain student visas permitting them to submit themselves to the "Great American Doctorate Factory." And yet this esteemed resource has come under fire of late from above and below.

Corporate executives, congressional representatives, and even many eminent scientists have called for change. In this issue, Commerce Department Undersecretary for Technology Mary Lowe Good, previously vice president for research at Allied-Signal Corp., and National Science Foundation Director Neal Lane, former provost of Rice University, team up in a provocative Policy Forum (p. 741). It is no longer a given that the "academic research and education enterprise" should be primarily devoted to producing "superbly capable and highly specialized students prepared to carry on in the traditions of academic basic research," they argue. If, instead, society's goal might be to produce versatile scientists and engineers able to work in groups and "meet the needs of industry and other sectors, then there is virtual consensus that the current system leaves room for improvement."

Meanwhile from below, complaints filter upward from the young: Traditional courses, some will tell you, don't prepare them for the real world, and traditional teaching methods don't engage their attention. The world has changed, many say, and their universities haven't.

But this is only partially correct. This special section of *Science* celebrates seeds of change being sown across the United States. In small and large schools alike, individual teachers are developing innovative curricula—and novel pedagogical techniques as well—to address the problems created by disaffected (and fearfully underprepared) undergraduates. Programs are sprouting on the graduate level—and even in some undergraduate settings—that bring the real world of interdisciplinary and applied research onto campus or take the student into a corporate lab to do productive research. And, increasingly, the wise heads in scientific societies are sponsoring colloquia to discuss wholesale reforms of the system that trained them so brilliantly.

But all the attention we give to novel educational approaches shouldn't detract from the many brilliant teachers teaching in traditional fashions or the successful programs that already exist. Neither are we suggesting that educational reform, as we have described it, is limited to the United States.

This year, we asked a dozen reporters throughout the United States to interview a score each of students, assistant professors, tenured professors, and department chairs at elite and not-so-elite schools. We wanted to know what they found most worrisome and what most needed to be changed in the way our scientists are being made. Next year, we will expand our inquiry across Europe and into Asia. Write us. Tell us what we've missed and where we've hit a nerve. Your letters will improve our future special reports.

—Ellis Rubinstein

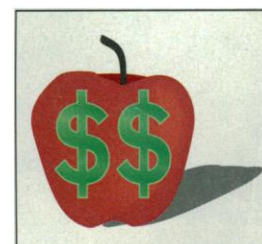
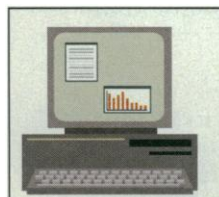
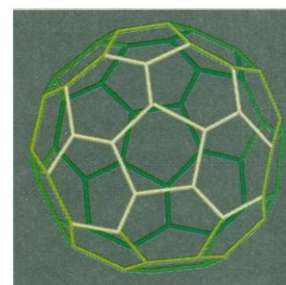


Photo Research: Anne Alvarez; Illustrations: Diana DeFrancesco