

# Civil Engineering in the Next Millennium

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“We may need six computers worldwide, for government, etc.”

T.J. Watson, IBM, late 1940s

“There is no reason for any individual to have a computer in their home.”

Ken Olsen, Digital Equipment Corp., 1977

“640K ought to be enough for anybody.”

Bill Gates, Microsoft, 1981

In the  
Batter's Box



Today's challenges  
require civil engineering  
talent



- Genetically engineered micro-organisms will be used in the manufacture of high-strength building materials.
- Biotechnology disposal will eliminate plumbing pipes for waste.
- Photonics, lasers and fiber optics will replace metallic wiring, and computers will be pervasive in the building environment.
- Wall membranes of new materials will store and transmit light and heat.

Randall Vosbeck  
*Architectural Record*, December 1999

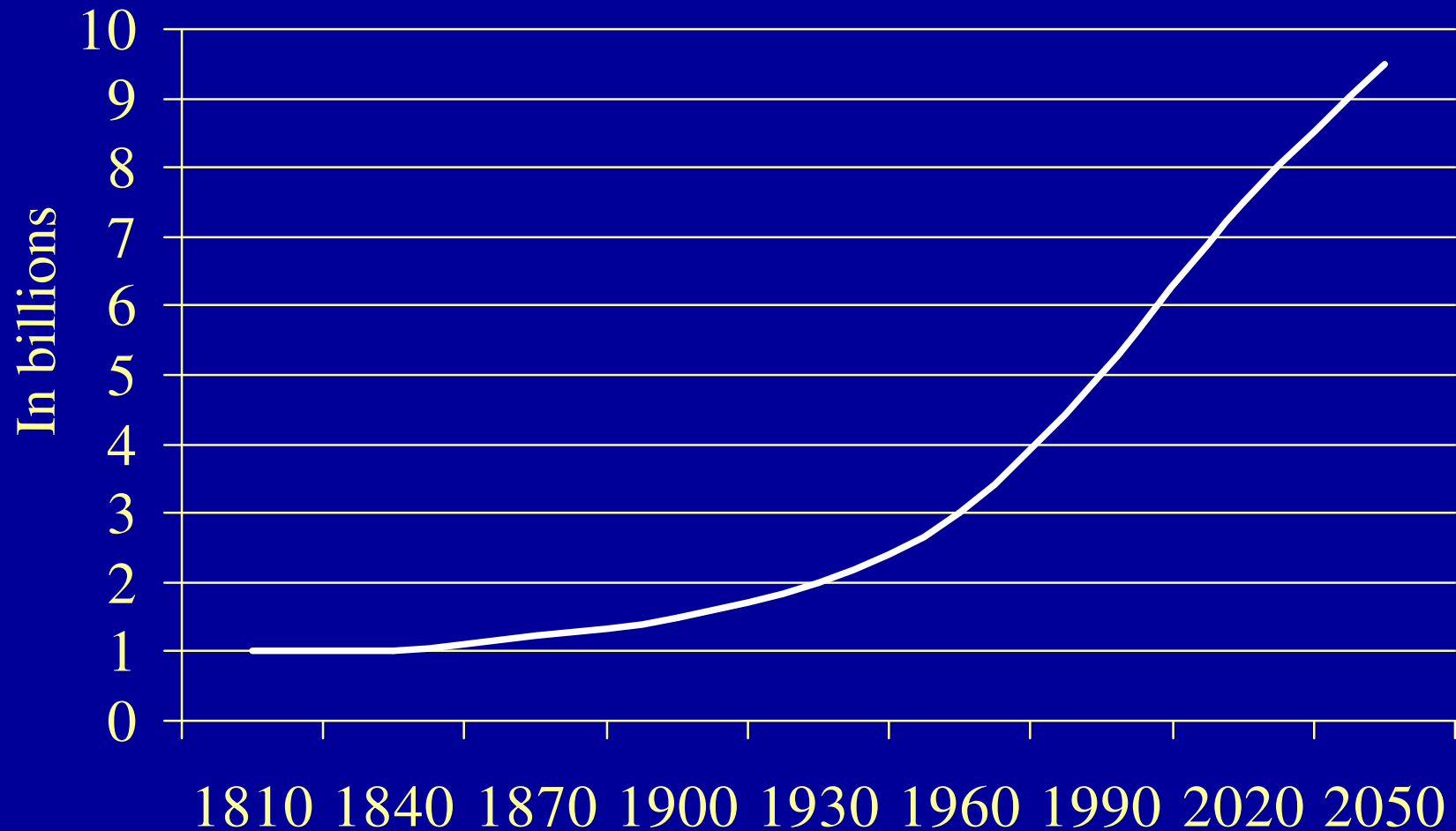


# Finding the Brightest and the Best

# The Gathering Storm

## World Population

# Can We Absorb 4 Billion More?







The Rivers  
Are  
Running  
Dry

“The world has to significantly increase water production while at the same time restoring the world’s rivers if we are to have any hope of meeting the water needs of 8 billion people while protecting the environment.”

Ismail Serageldin  
World Commission on Water for the 21st Century



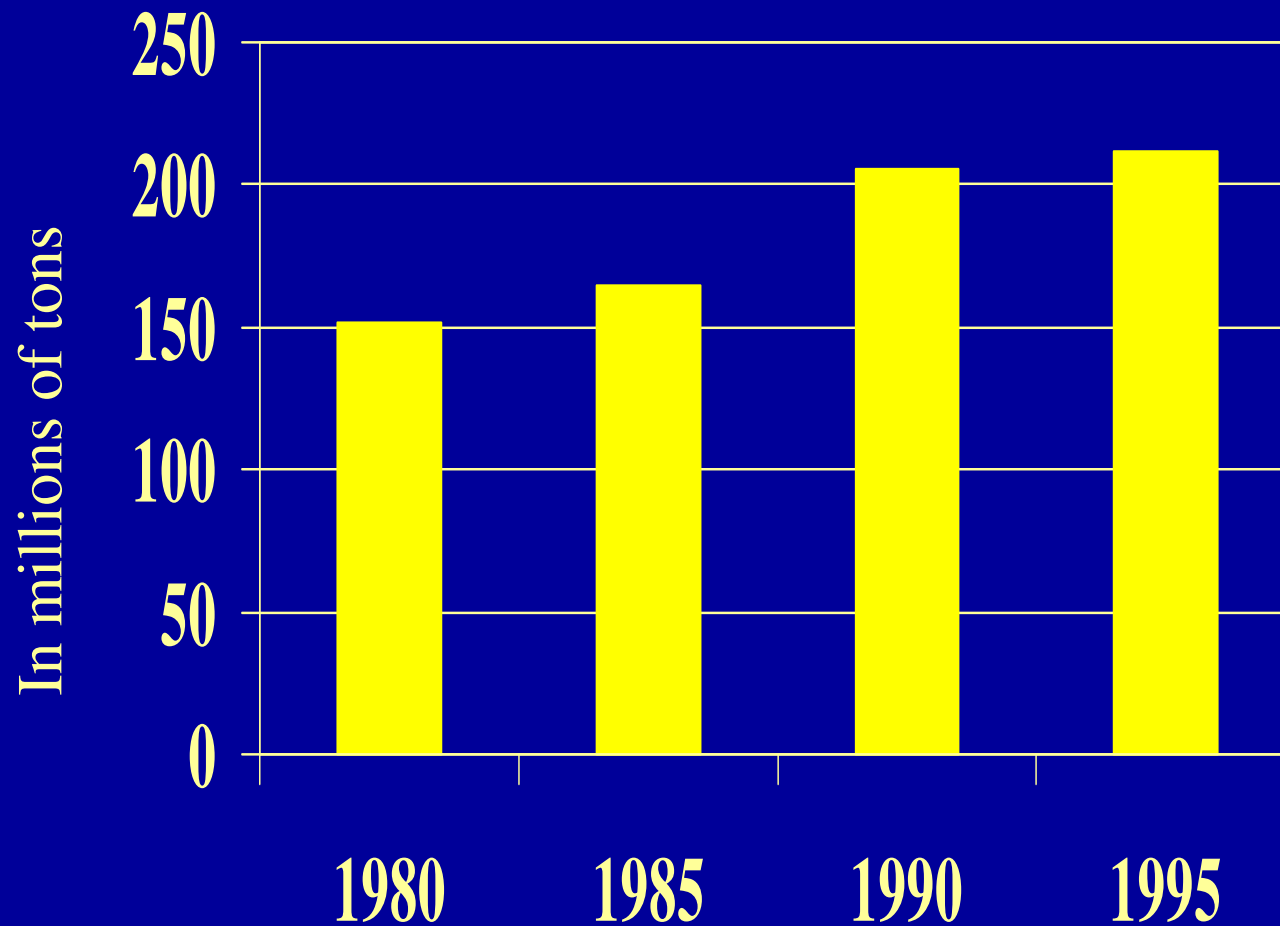
# Infrastructure Fails to Keep Up



One million Americans become sick every year from tainted drinking water, attributed in part to the role of decaying infrastructure in encouraging the growth of bacteria.

Centers for Disease Control

# Waste Just Keeps Piling Up



Solid Waste Generated in the United States

# Transportation Demands Speed Up





Metro Atlanta  
was in violation  
of federal ozone  
standards 23 days  
last summer,  
second only to  
Houston which  
had 50 violations.



# Commercial Air Travel Takes Off





“By 2015 we can expect to see at least one major airliner crash per week... even if the current statistically safe level of air travel is maintained.”

Walter J. Boyne  
Retired Airforce Colonel

Nature's Revenge:

Growing Hazard  
Exposure and  
Global Warming



There are 40% more intense Atlantic hurricanes now than there were 30 years ago.

Bill McGuire  
University College, London

Global warming could increase the destructive power of hurricanes by 40 to 50% by the middle of the 21st century.

Kerry Emanuel  
MIT

“More than any other time in history, mankind faces a crossroads: One path leads to despair and utter hopelessness. The other to total extinction. Let us pray we have the wisdom to choose correctly.”

Woody Allen  
*Side Effects*

Armed with the right talent and technology, civil engineers can build the safe harbor humankind needs in the face of the gathering storm.

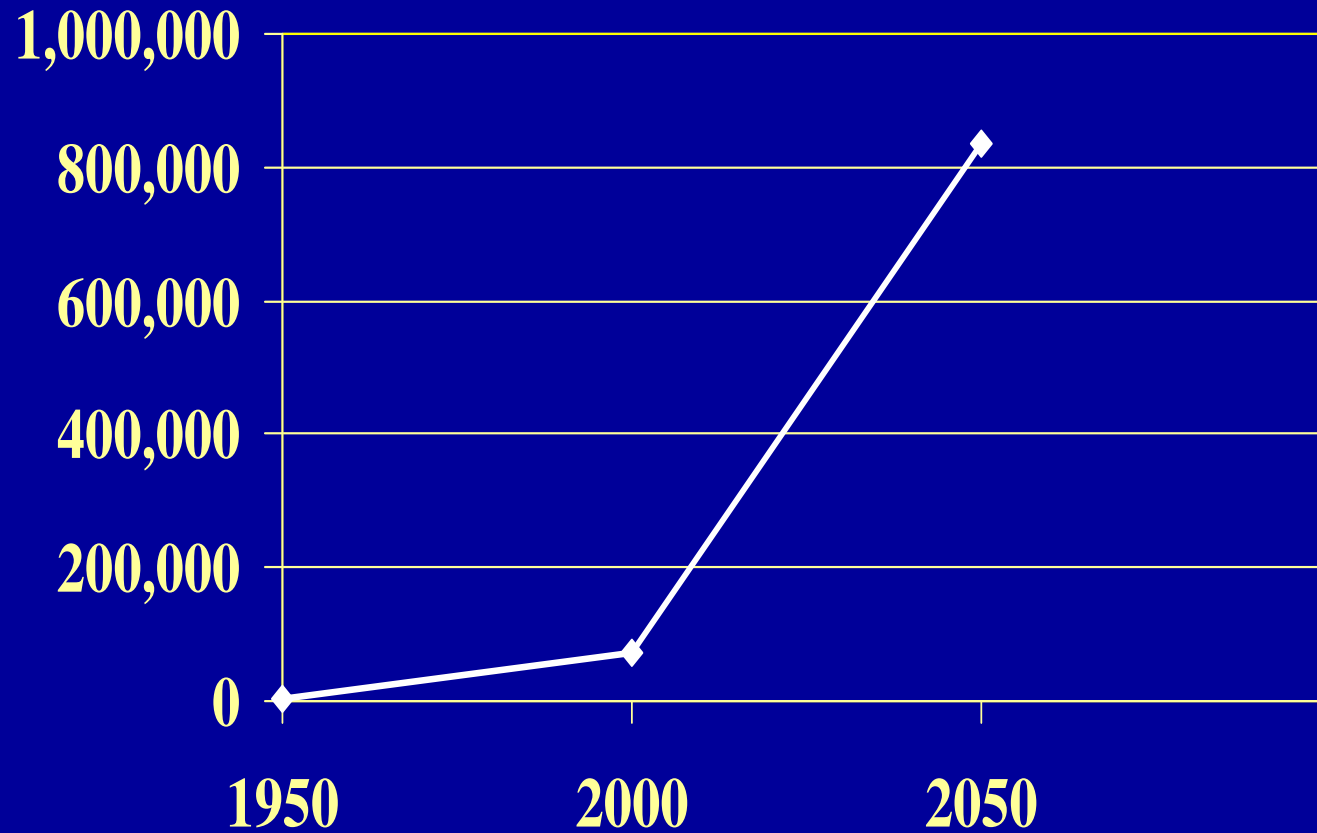
Technological Answers  
Looking For  
Civil Engineering  
Solutions



# Biotechnology


- Mapping the genome
- Implanting silicon chips
- Engineering living tissues
- Stretching cell longevity

# American Centenarians\*



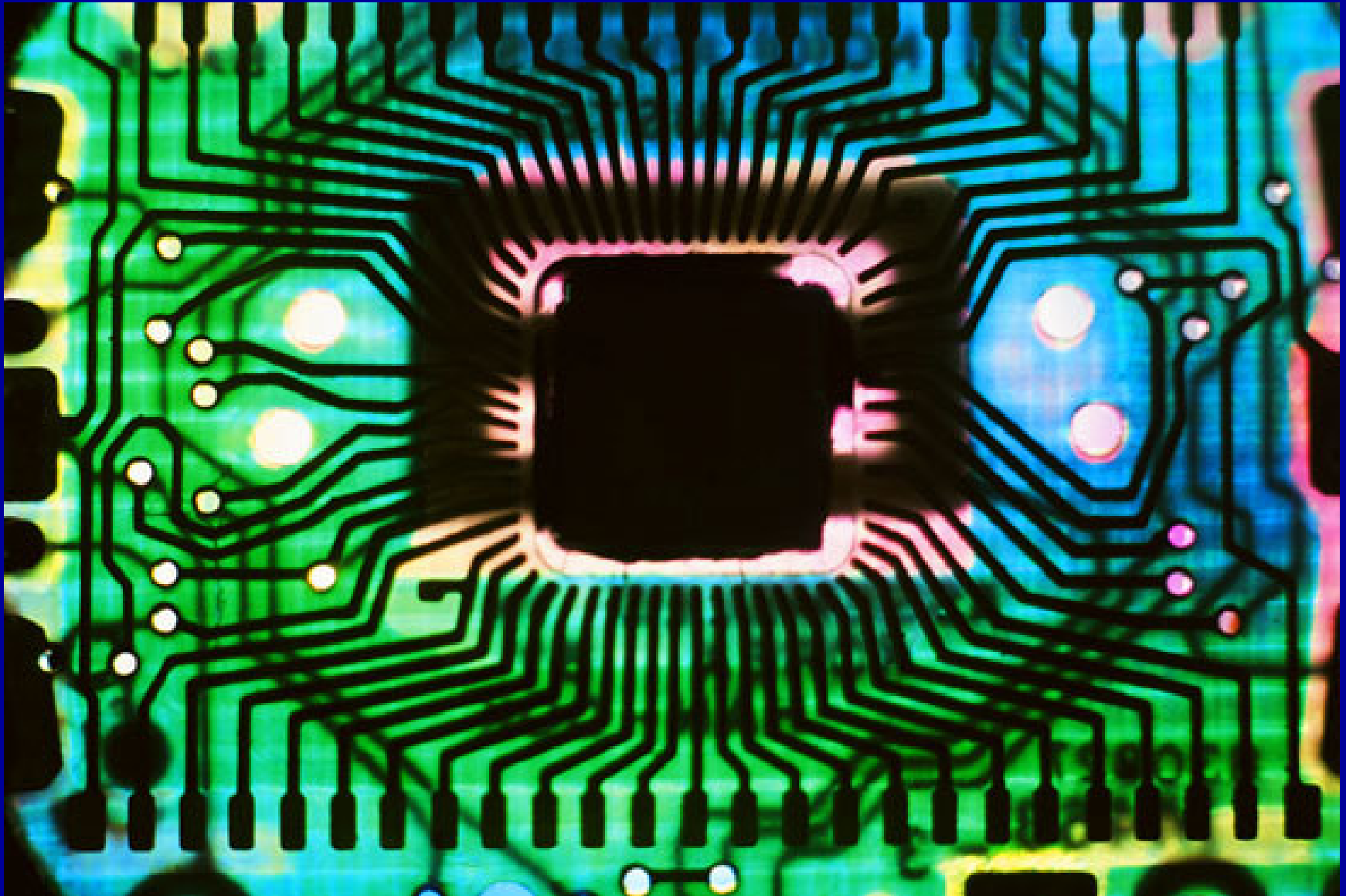
\*Persons who are at least 100 years old.



A microscopic image showing various types of microbes, including large, circular, and elongated structures, some with internal details, set against a dark, textured background. The microbes are stained, showing different colors like blue, green, and yellow. The text is overlaid in the center in a bold, yellow, serif font.

**Microbes now clean up  
80% of the world's oil  
spills.**

# Advanced Communications: Do We Get IT?



# Drafting Goes 3-D



Today's structures:  
Intelligent as well as good-looking





Digital cameras survey highways, sending a constant flow of images to a computer that manages an intelligent transportation system.

Today: Virtual  
reality with  
headgear and  
tactile gloves





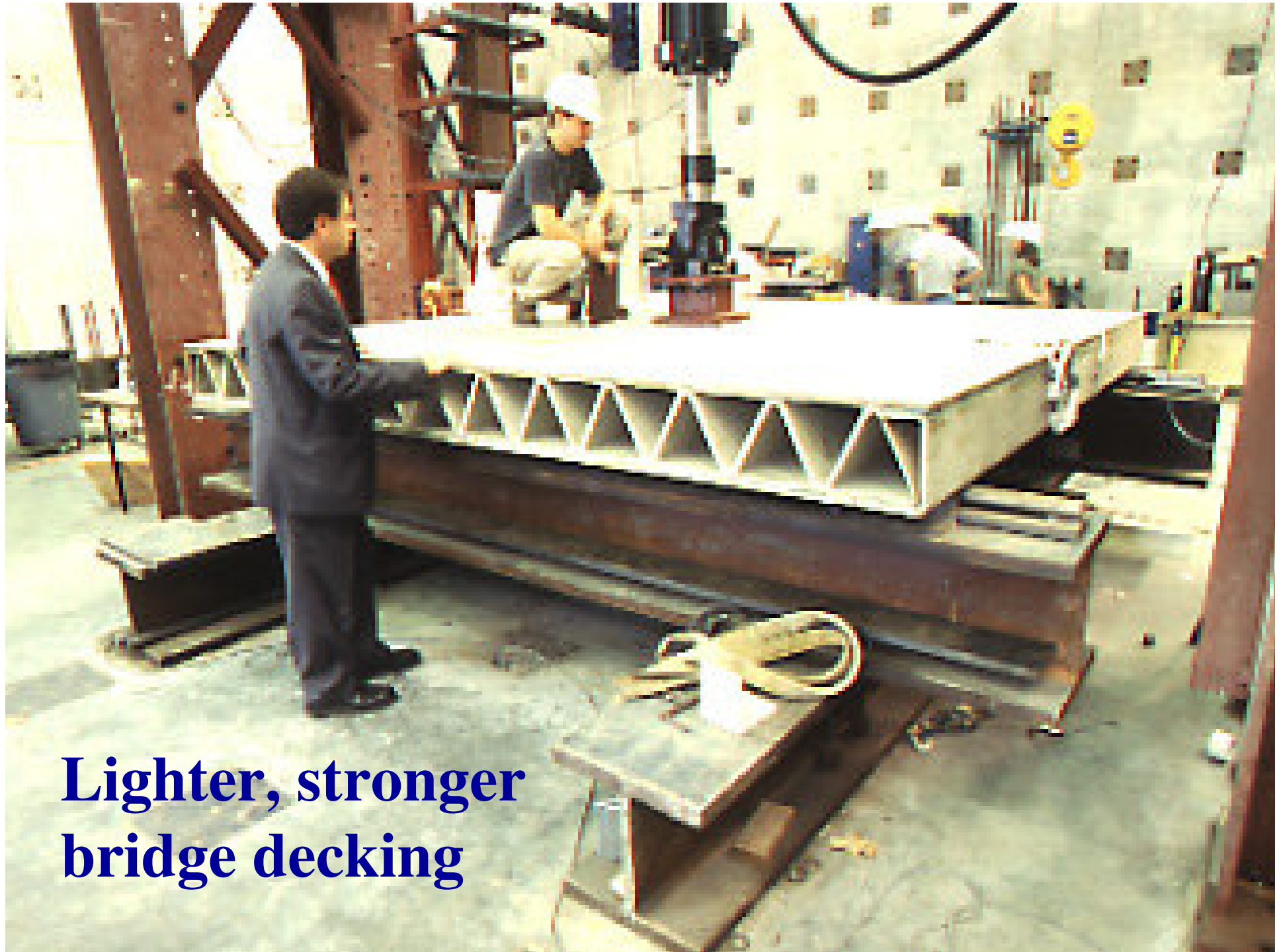
# Tomorrow: Virtual reality with neural implants



# Nanotechnology and New Materials

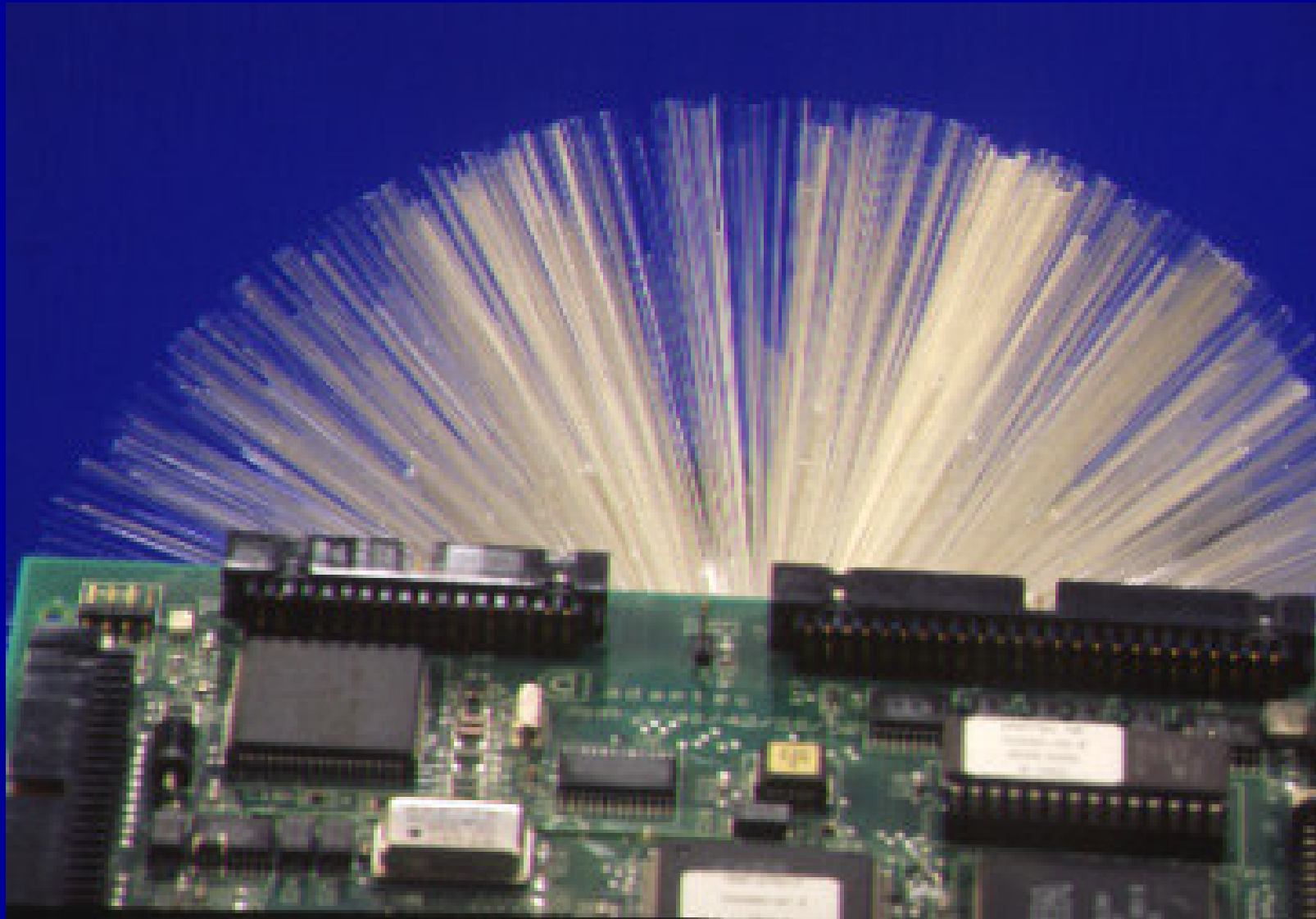






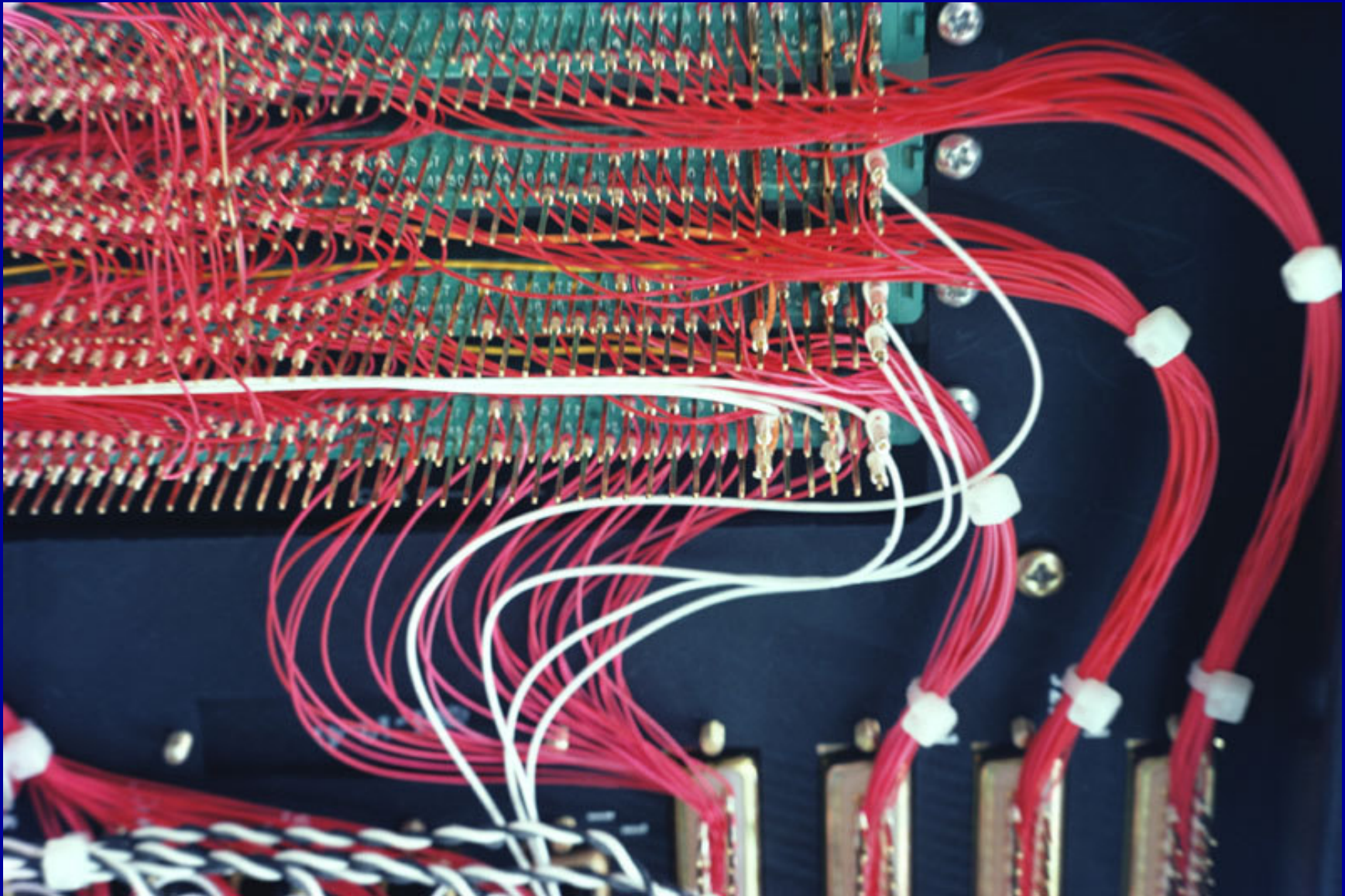
**Lighter, stronger  
bridge decking**

# Lacing Materials with Optical Sensors



# New Management Strategies

# Taking Business Online



The Boeing 777 has “132,500 uniquely engineered parts with a total of 3 million items. More than half of the airplane was manufactured by 487 U.S. suppliers and 58 suppliers in 12 nations... Powerful digital computer-aided design technology enabled designers to create the 777’s parts and systems as three-dimensional images... eliminating the need for a costly full-scale mockup of the plane.”

Philip H. Abelson  
*Science Magazine*

# Streamlining the Construction Process







Design-build  
brings all parties  
together around a  
consensus vision  
for the project.



# Sustainability





“The environment is not a competing interest; it is the playing field on which all other interests intersect.”

Peter Dunne  
*The New York Times*



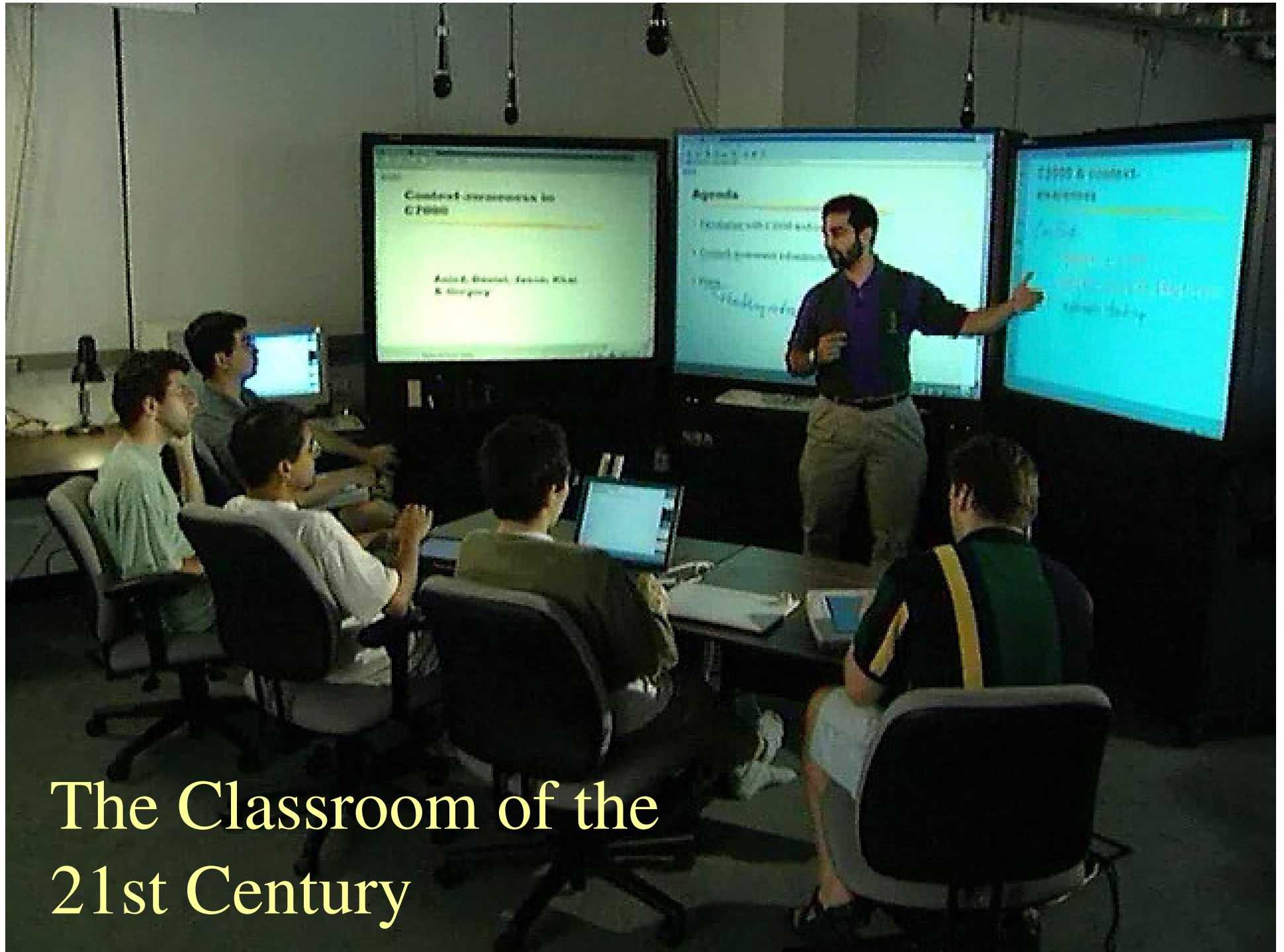
“It’s not easy  
being green.”

Kermit the Frog

# Educating a New Civil Engineer for a New Millennium

# Conducting Hands-on Laboratory Work





The Classroom of the  
21st Century



Lifelong Learning Online

“The next big killer application for the Internet is going to be education. Education over the Internet is going to be so big it is going to make e-mail look like rounding error.”

John Chambers  
CEO, Cisco Systems



Updating  
the Formal  
University  
Curriculum



# The Changing Face of Civil Engineers



# Drawing Minorities into our Profession



“The world is very different now,  
for man holds within his two  
hands the power to destroy all  
forms of human poverty and the  
power to destroy all forms of  
human life.”

John F. Kennedy



The first step  
toward  
achievement  
is to  
acknowledge  
the challenge.

