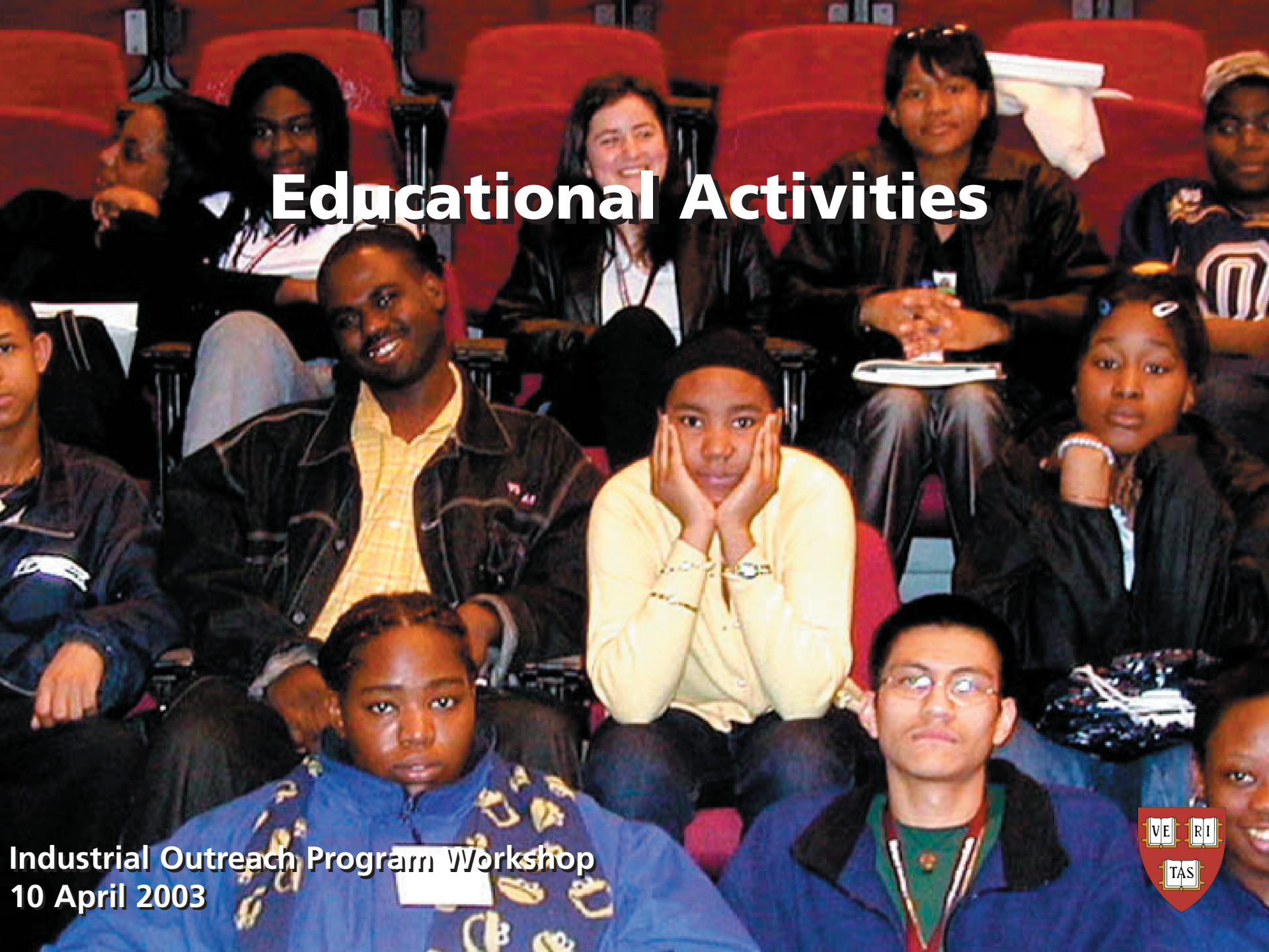
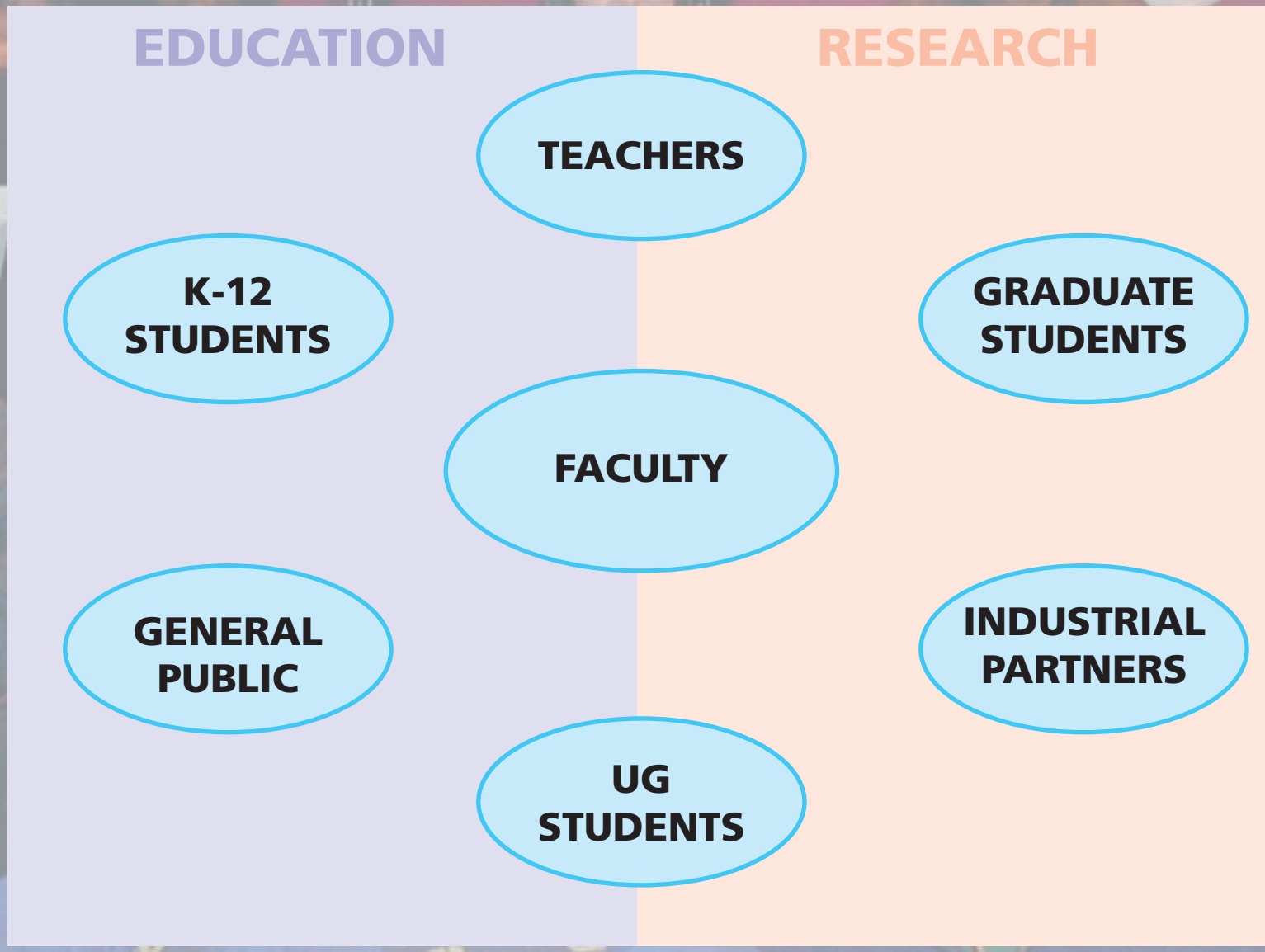
Educational Activities

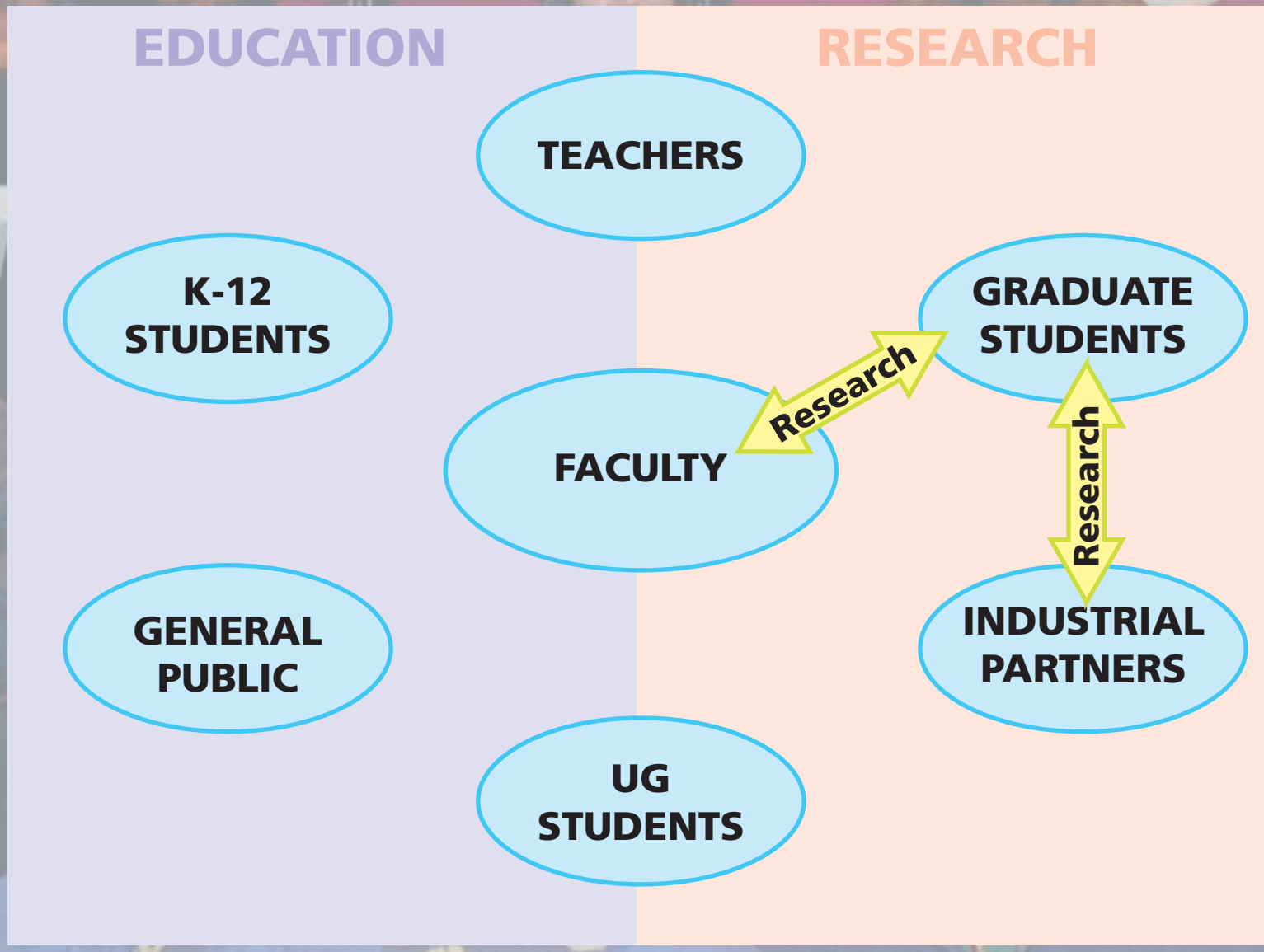


Industrial Outreach Program Workshop
10 April 2003

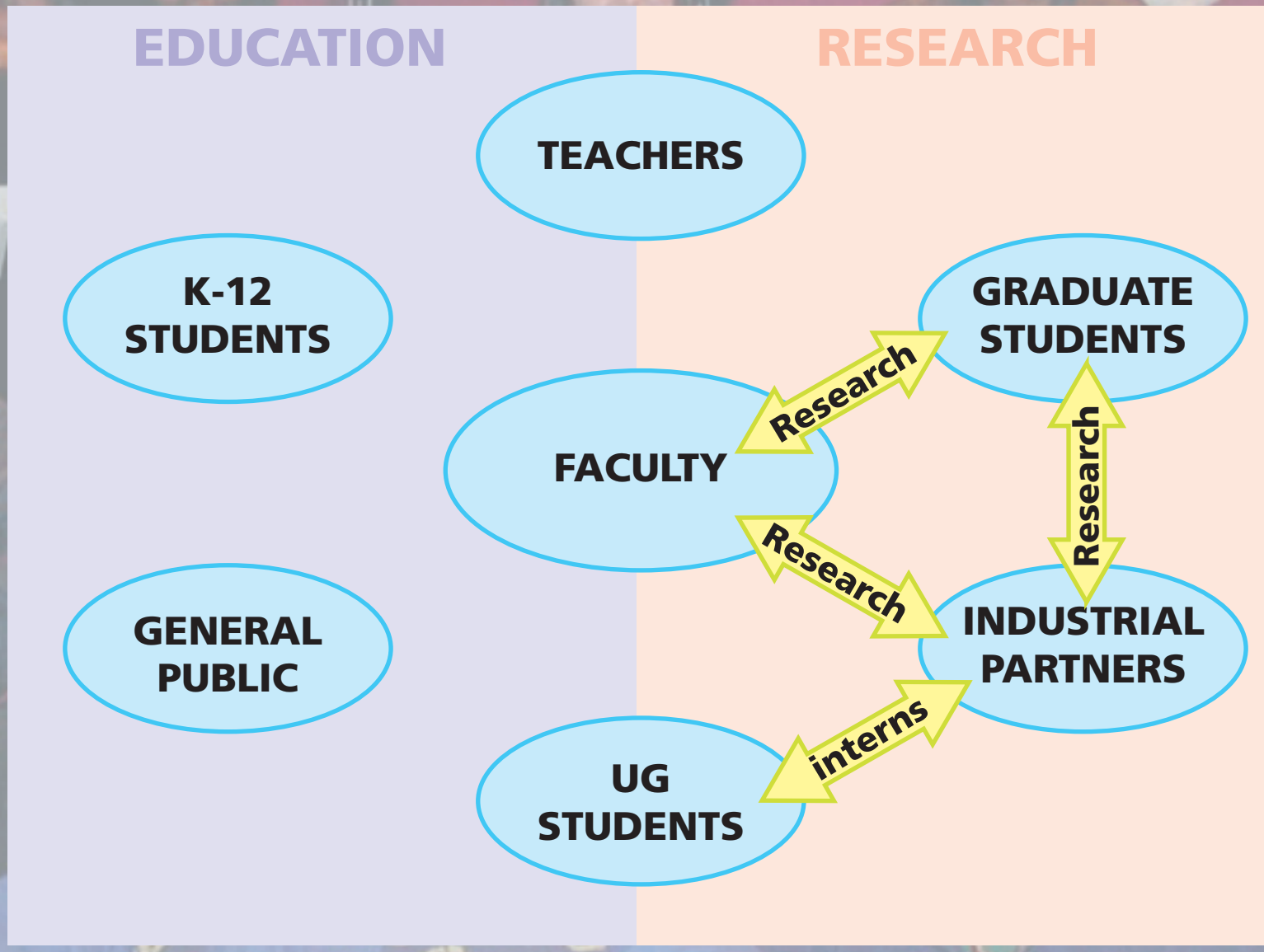
Making connections



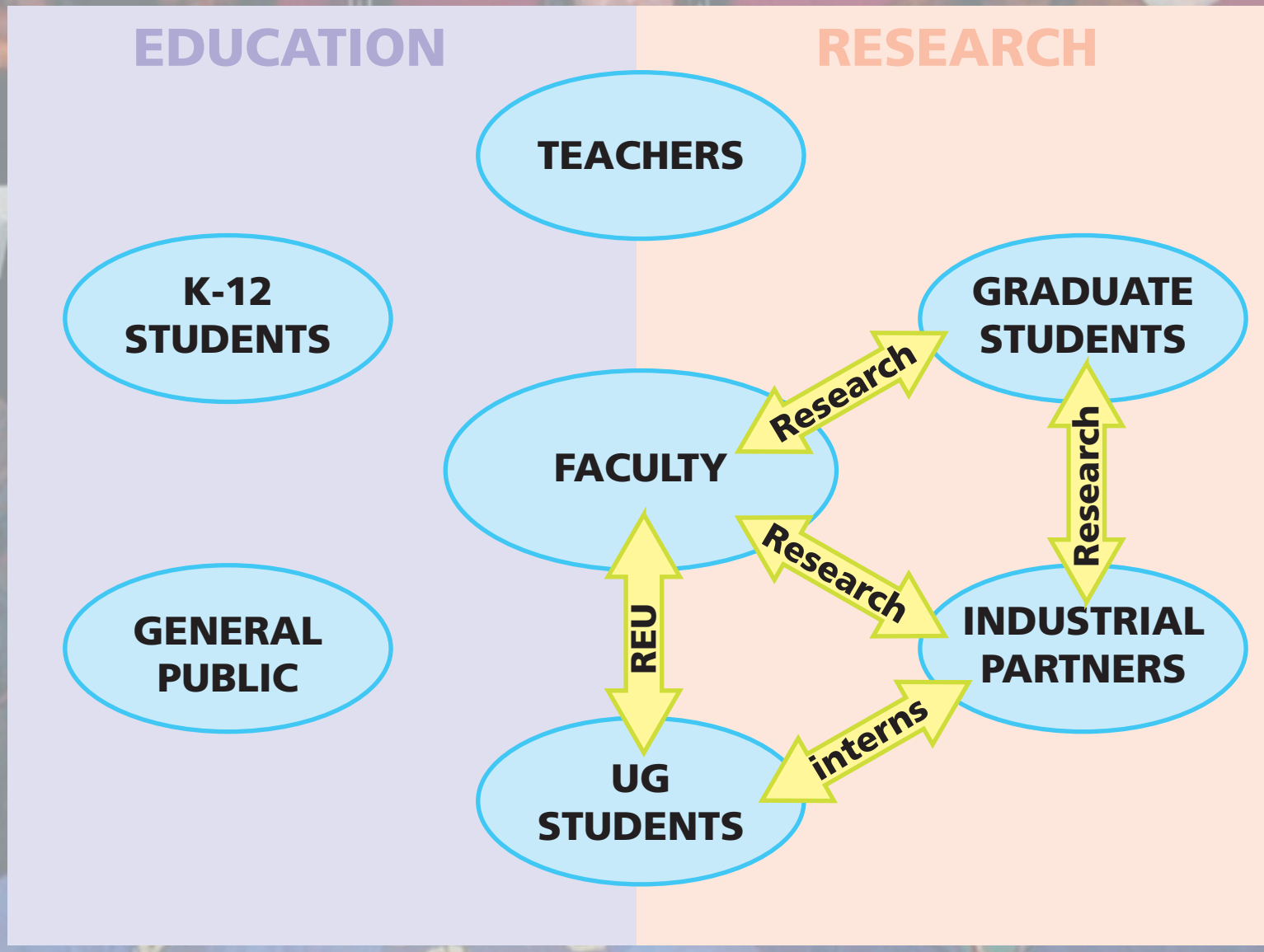
Making connections



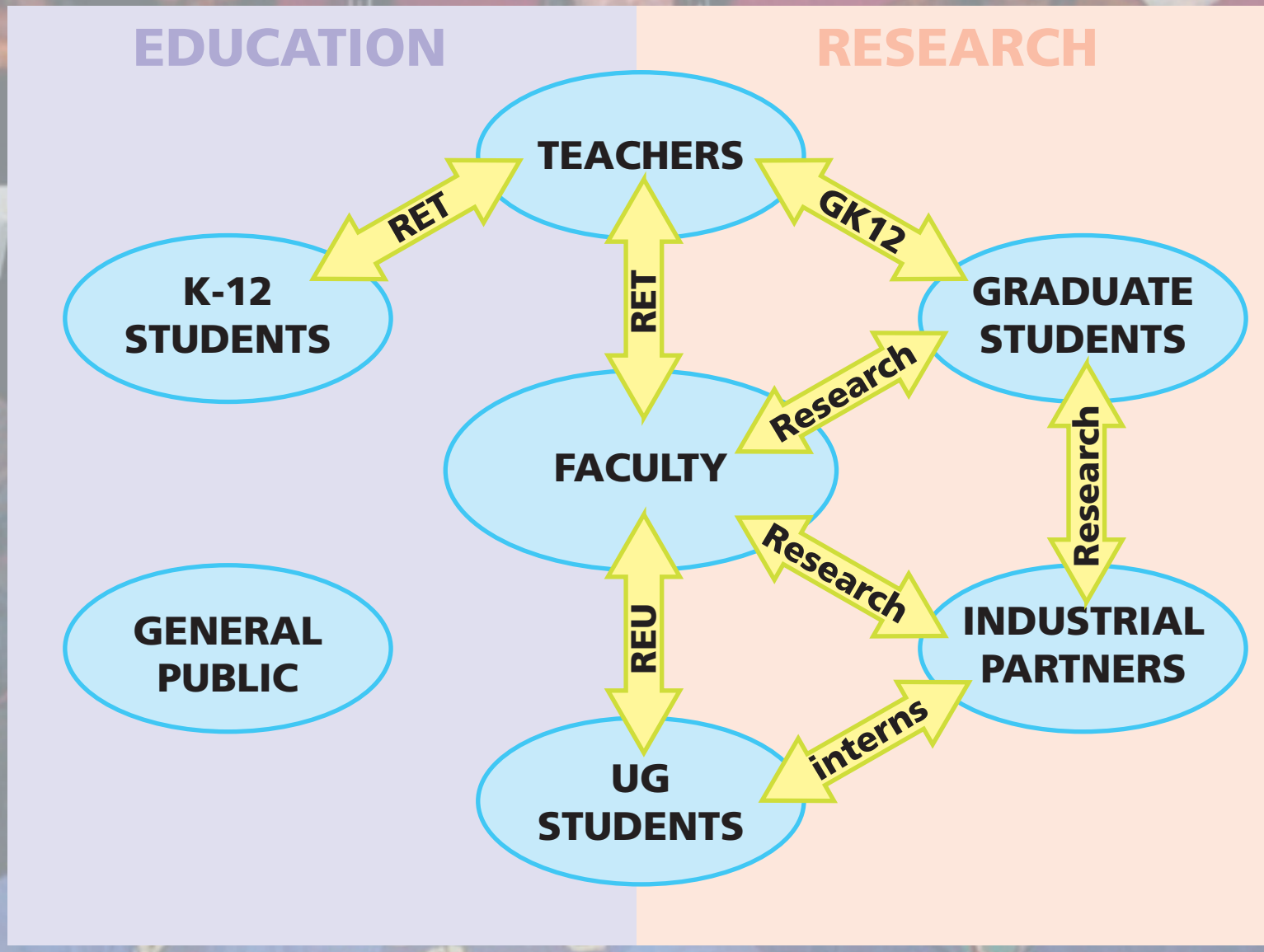
Making connections



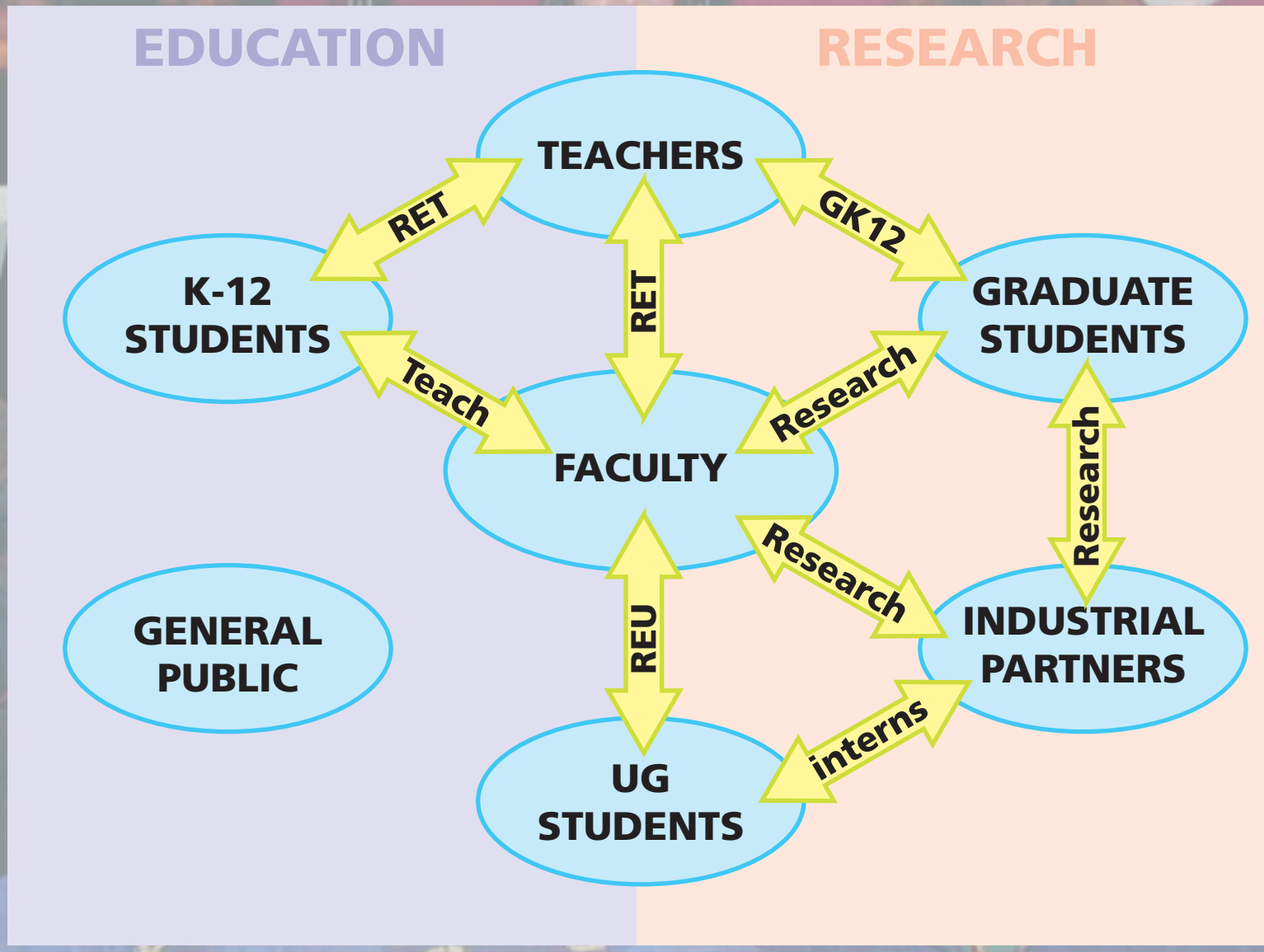
Making connections



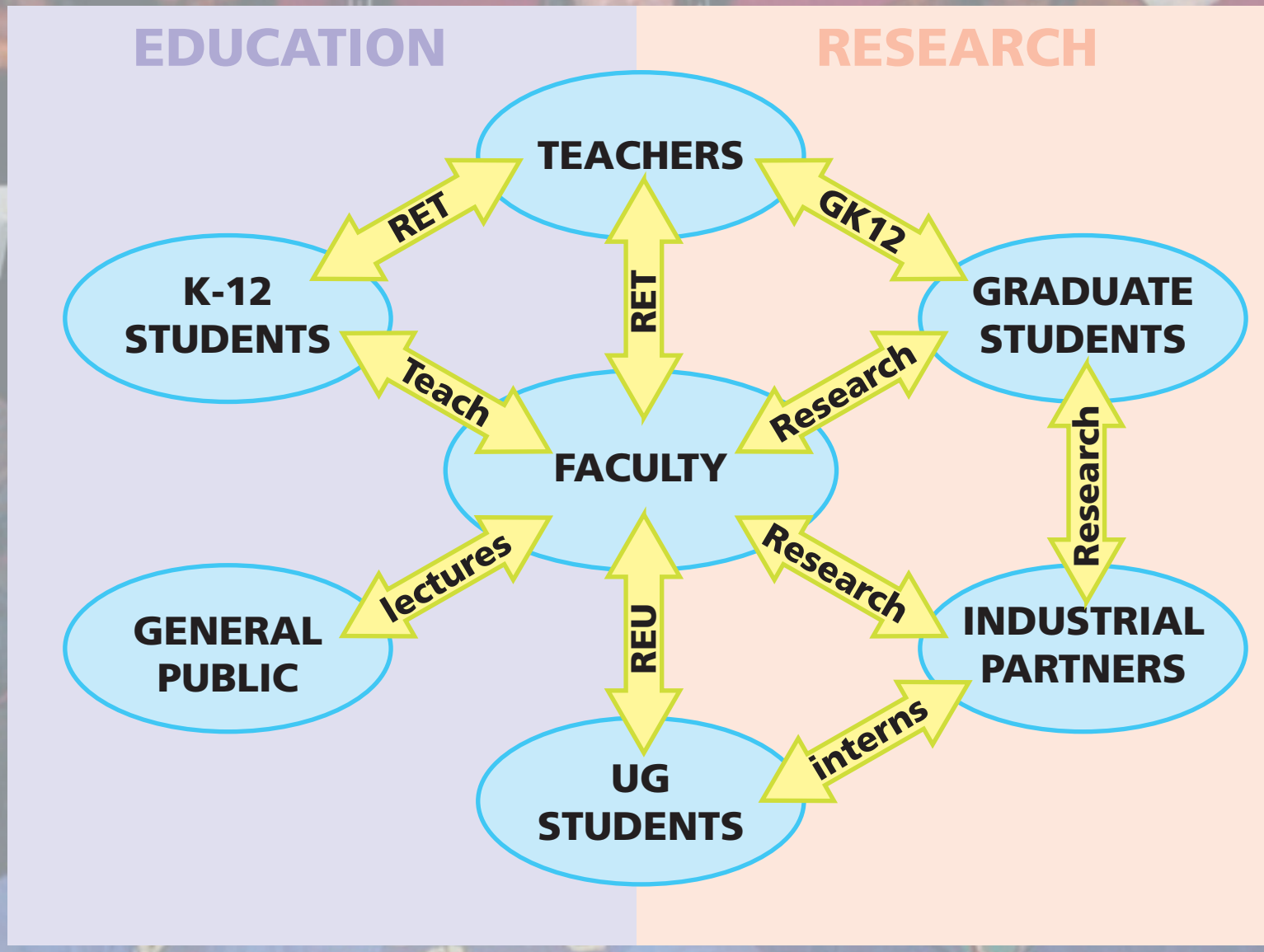
Making connections



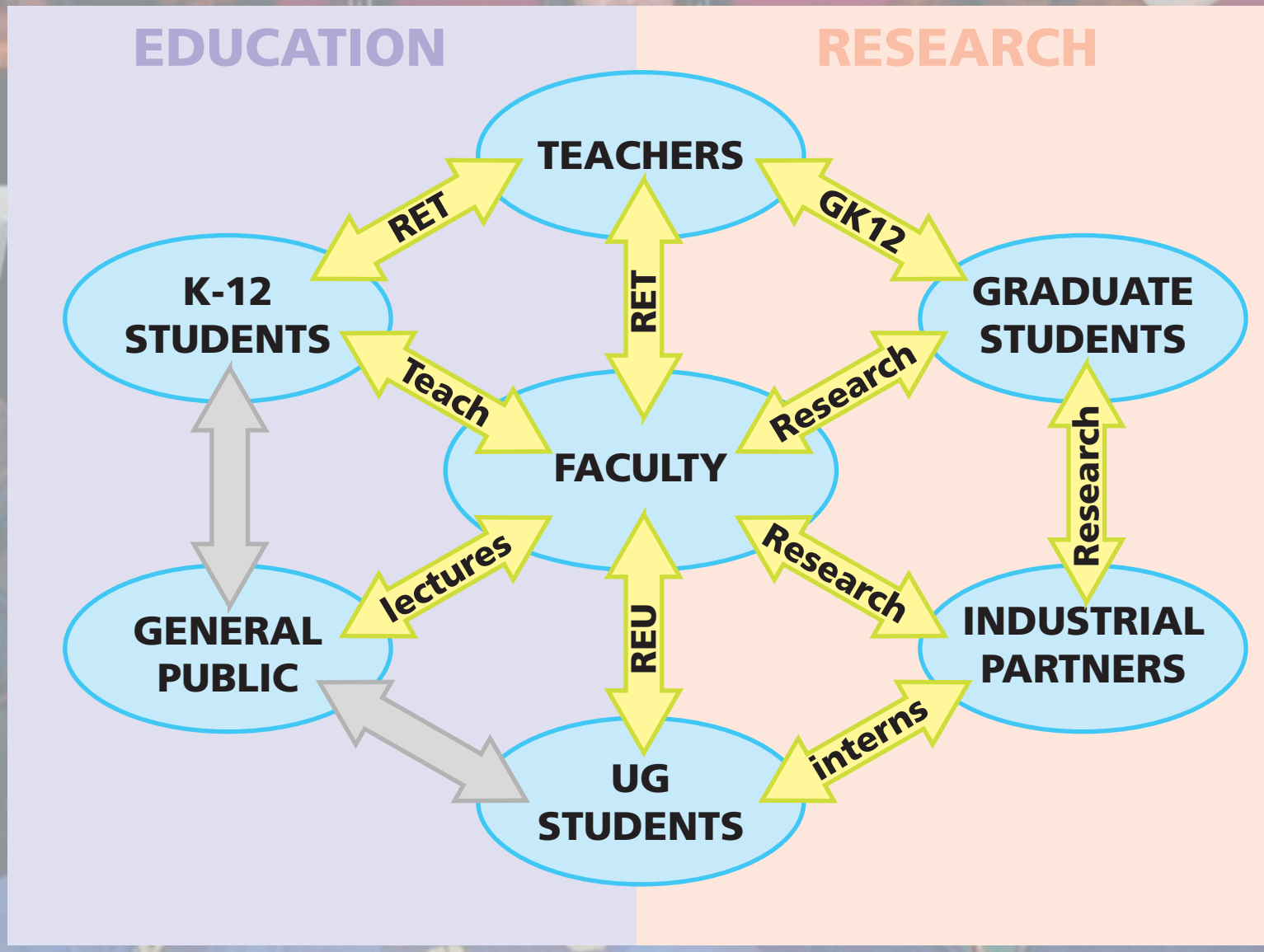
Making connections



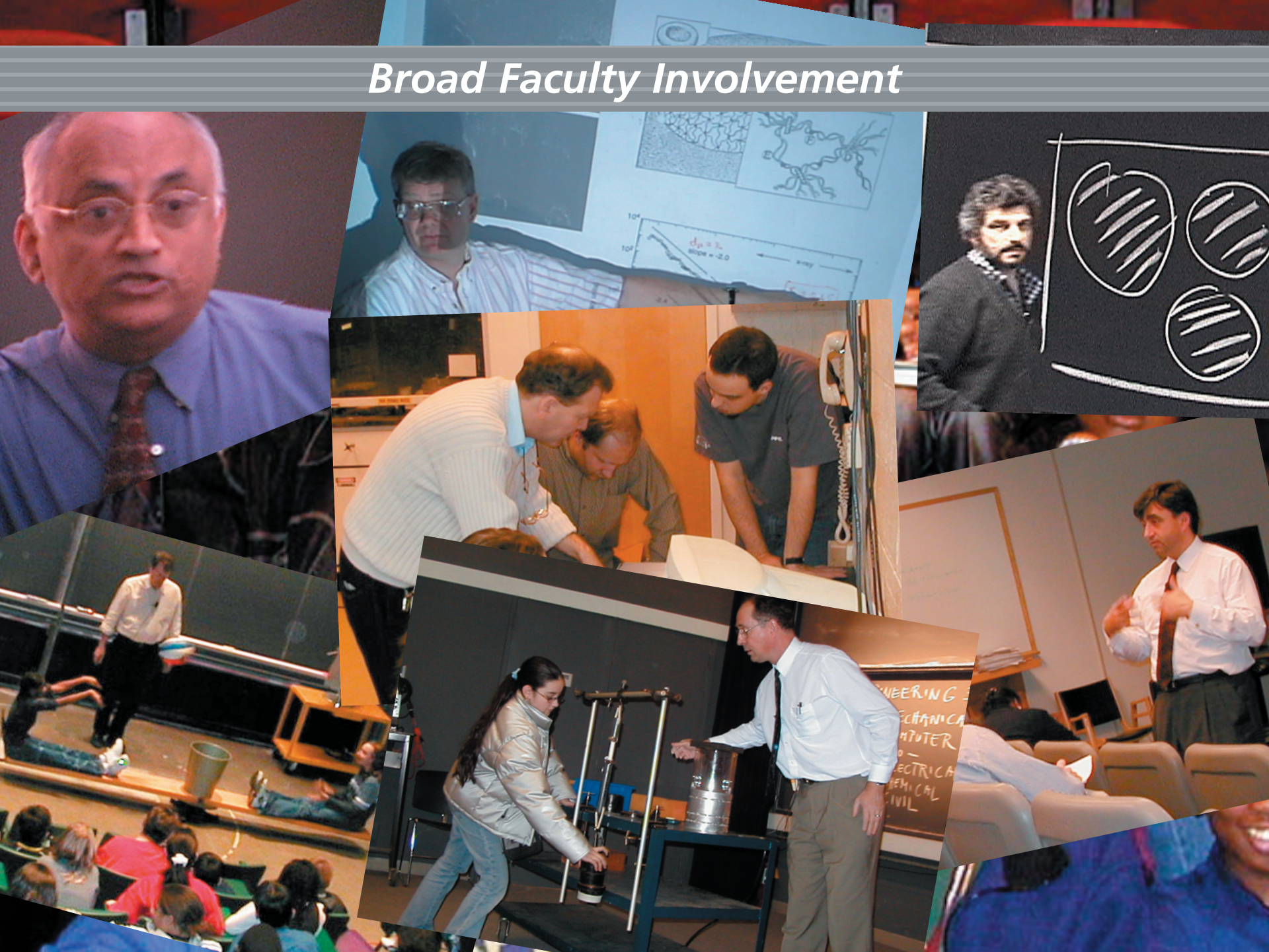
Making connections



Making connections



Broad Faculty Involvement



Science presentations

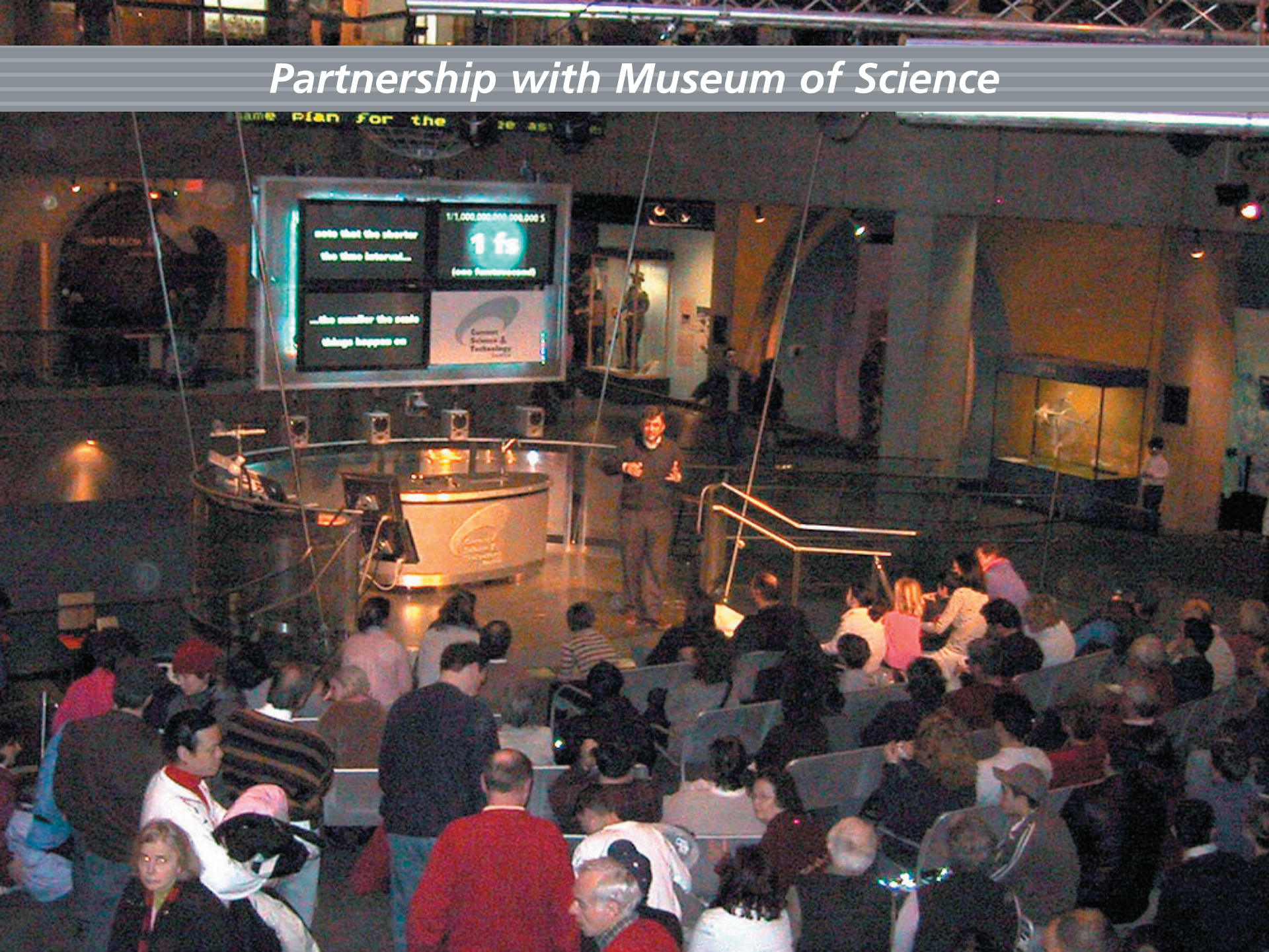
Science presentations

Workshops for teachers

GK-12 Fellows Program

GK-12 Fellows Program

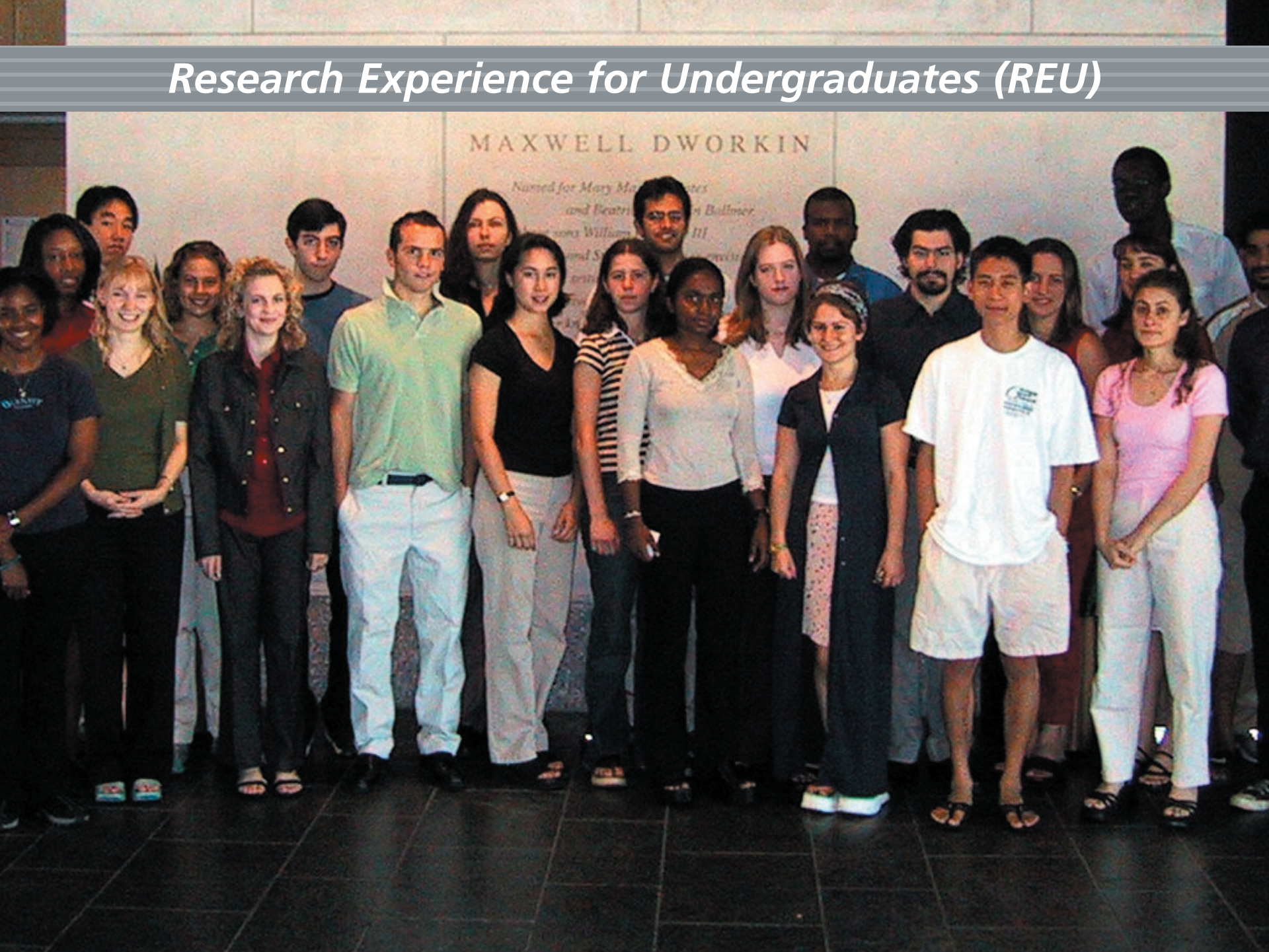
Partnership with Museum of Science



Research Experience for Undergraduates (REU)

- Summer research projects for undergraduates
- Matching funds provided DEAS and College
- Interdisciplinary research environment
- Use of shared experimental facilities

Research Experience for Undergraduates (REU)



Research Experience for Teachers (RET)

- Summer project for teachers
- Direct exposure to research environment
- Development educational activities
- Joint activities with REU participants

Interactions

Undergraduate

Nadya Mason

Harvard College, Stanford University

Junior Fellow


The CNA Corporation
Harvard University

RET participant

Jim McNeil

Geology

Middle School

Project (Stone Group):

Research: Effect of bubble size on foam drainage

REU participant

Tanya Hadzic

Eckerd College

Now: University of Iowa (Immunology)

Project (Whitesides group):

Research: Self-assembly of mesostructures

7 MAY 1999 VOL 284 SCIENCE www.sciencemag.org

Design and Self-Assembly of Open, Regular, 3D Mesostructures

Tricia L. Breen, Joe Tien, Scott R. J. Oliver, Tanja Hadzic, George M. Whitesides*

Self-assembly provides the basis for a procedure used to organize millimeter-scale objects into regular, three-dimensional arrays ("crystals") with open structures. The individual components are designed and fabricated of polyurethane by molding; selected faces are coated with a thin film of liquid, metallic alloy. Under mild agitation in warm, aqueous potassium bromide solution, capillary forces between the films of alloy cause self-assembly. The structures of the resulting, self-assembled arrays are determined by structural features of the component parts: the three-dimensional shape of the components, the pattern of alloy on their surfaces, and the shape of the alloy-coated surfaces. Self-assembly of appropriately designed chiral pieces generates helices.

We describe a procedure that uses self-assembly of patterned, three-dimensional (3D), mesoscale (millimeter- to centimeter-scale) objects to generate open, regular, 3D structures. These types of structures may eventually find use as the cores of densely interconnected, 3D electronic and optical elements for high-performance computation and

Department of Chemistry and Chemical Biology, Harvard University, 12 Oxford Street, Cambridge, MA

“my experience that summer helped me decide that I truly loved research and that I wanted to do research full time”

7 MAY 1999 VOL 284 SCIENCE www.sciencemag.org

Design and Self-Assembly of Open, Regular, 3D Mesostructures

Tricia L. Breen, Joe Tien, Scott R. J. Oliver, Tanja Hadzic, George M. Whitesides*

Self-assembly provides the basis for a procedure used to organize millimeter-scale objects into regular, three-dimensional arrays ("crystals") with open structures. The individual components are designed and fabricated of polyurethane by molding; selected faces are coated with a thin film of liquid, metallic alloy. Under mild agitation in warm, aqueous potassium bromide solution, capillary forces between the films of alloy cause self-assembly. The structures of the resulting, self-assembled arrays are determined by structural features of the component parts: the three-dimensional shape of the components, the pattern of alloy on their surfaces, and the shape of the alloy-coated surfaces. Self-assembly of appropriately designed chiral pieces generates helices.

We describe a procedure that uses self-assembly of patterned, three-dimensional (3D), mesoscale (millimeter- to centimeter-scale) objects to generate open, regular, 3D structures. These types of structures may eventually find use as the cores of densely interconnected, 3D electronic and optical elements for high-performance computation and

Department of Chemistry and Chemical Biology, Harvard University, 12 Oxford Street, Cambridge, MA

RET participant

Kristy Lenihan

Physics

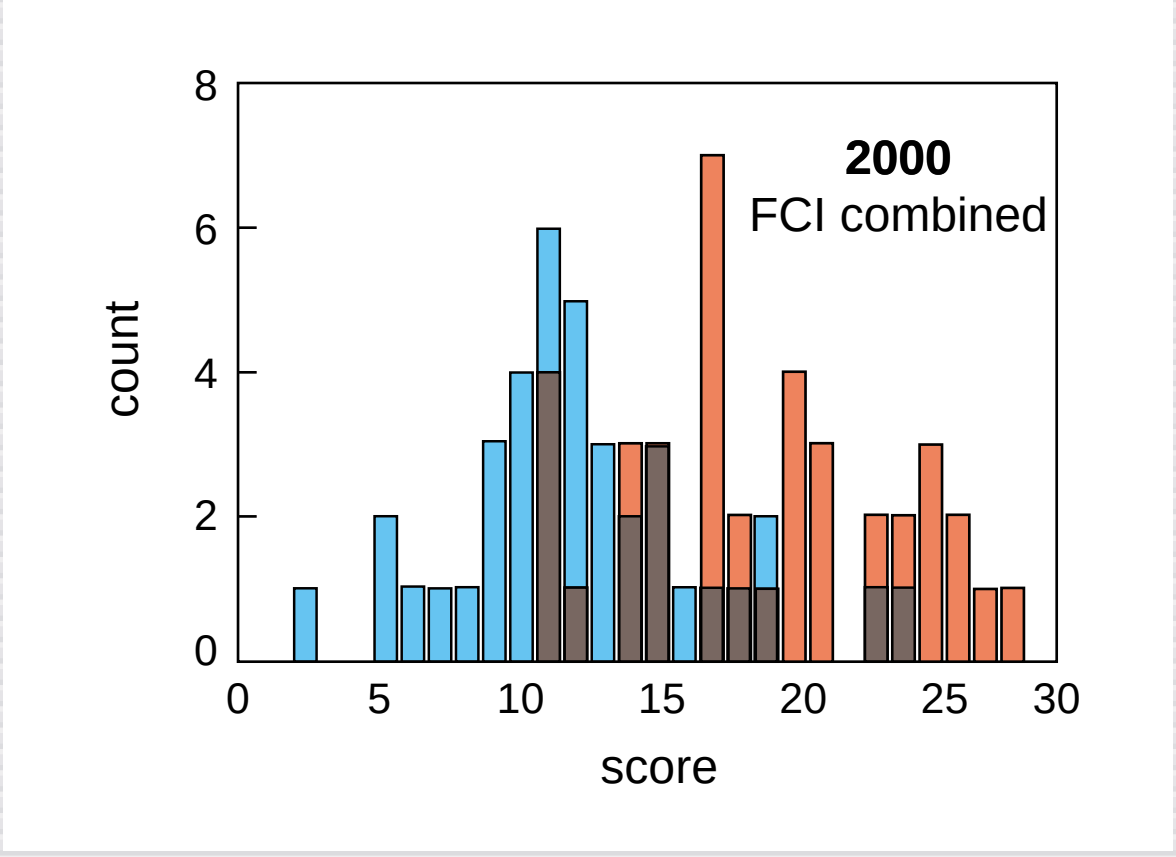
High School

Project (Mazur Group):

Research: Micromachining of transparent materials

Education: Development of optics curriculum

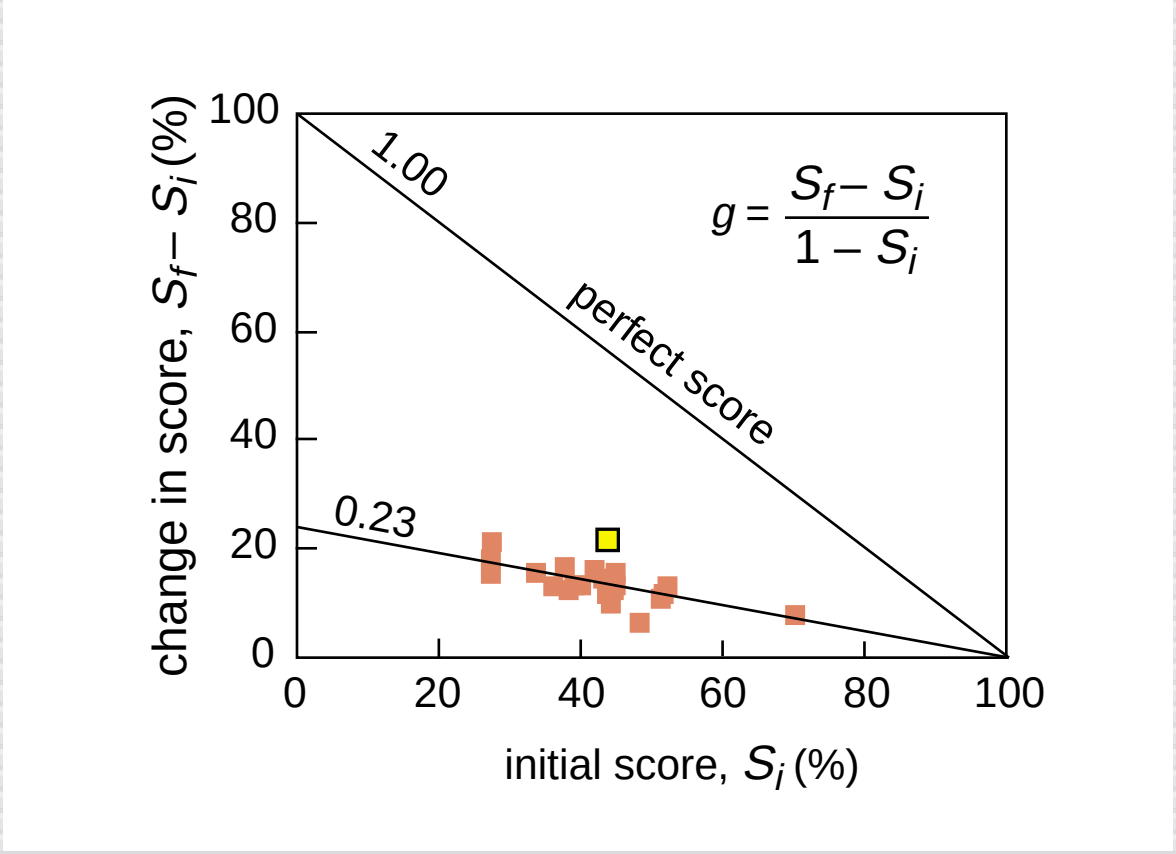
FCI data



gain: 22%

FCI data

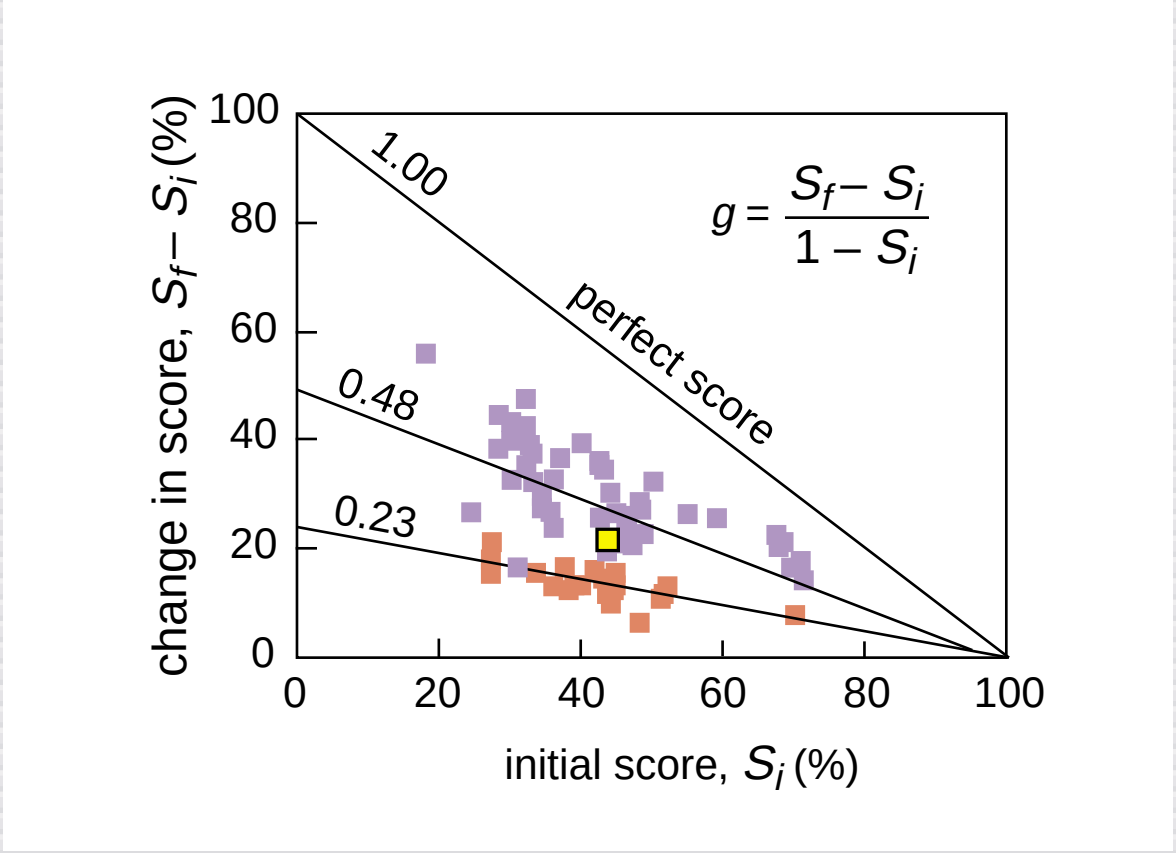
traditionally taught courses



R.R. Hake, *Am. J. Phys.* 66, 64 (1998)

FCI data

interactively taught courses



R.R. Hake, *Am. J. Phys.* 66, 64 (1998)

Undergraduate

Andrea Kurtz

Harvard College

Now: Stanford University (Chemistry)

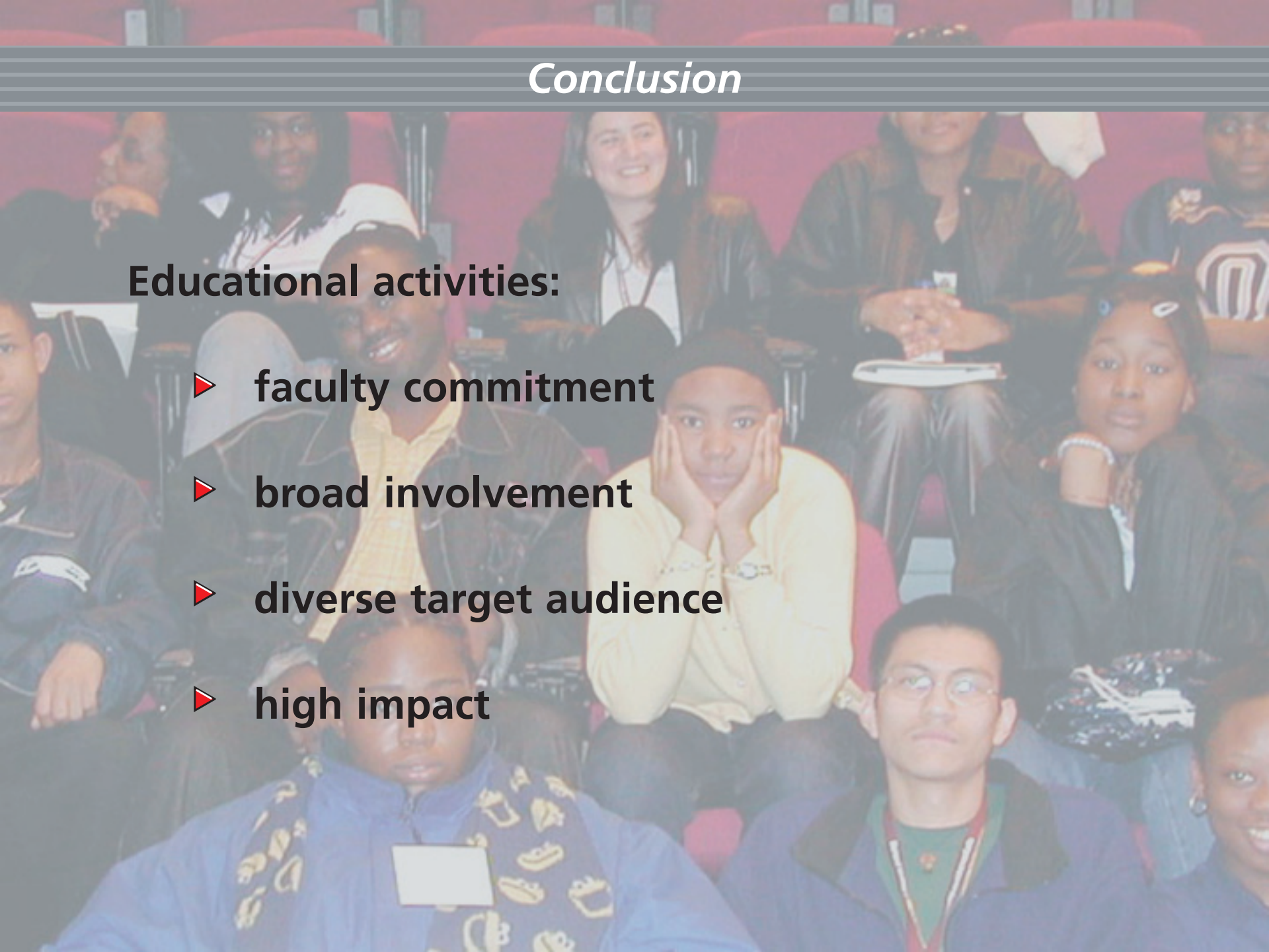
Senior Thesis (Hongkun Park):

Research: Colloidal nanotube catalysts


BERKELEY
PHYSICS


"communication is such a big part of science: in order
to convey the interest in science you need
to be able to present it clearly"
BERKELEY
PHYSICS

Conclusion



Educational activities:

- **faculty commitment**
- **broad involvement**
- **diverse target audience**
- **high impact**