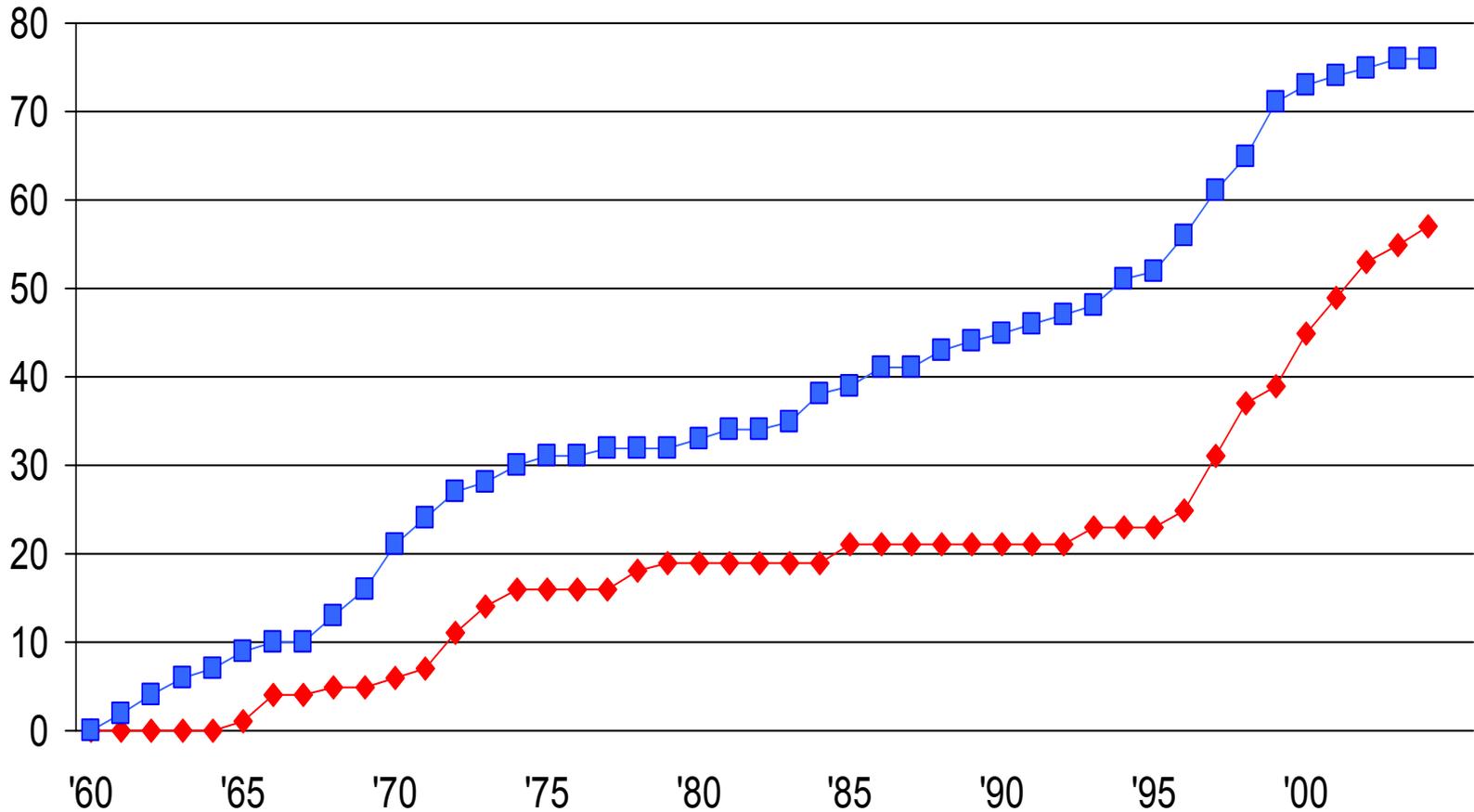


BME education after Whitaker

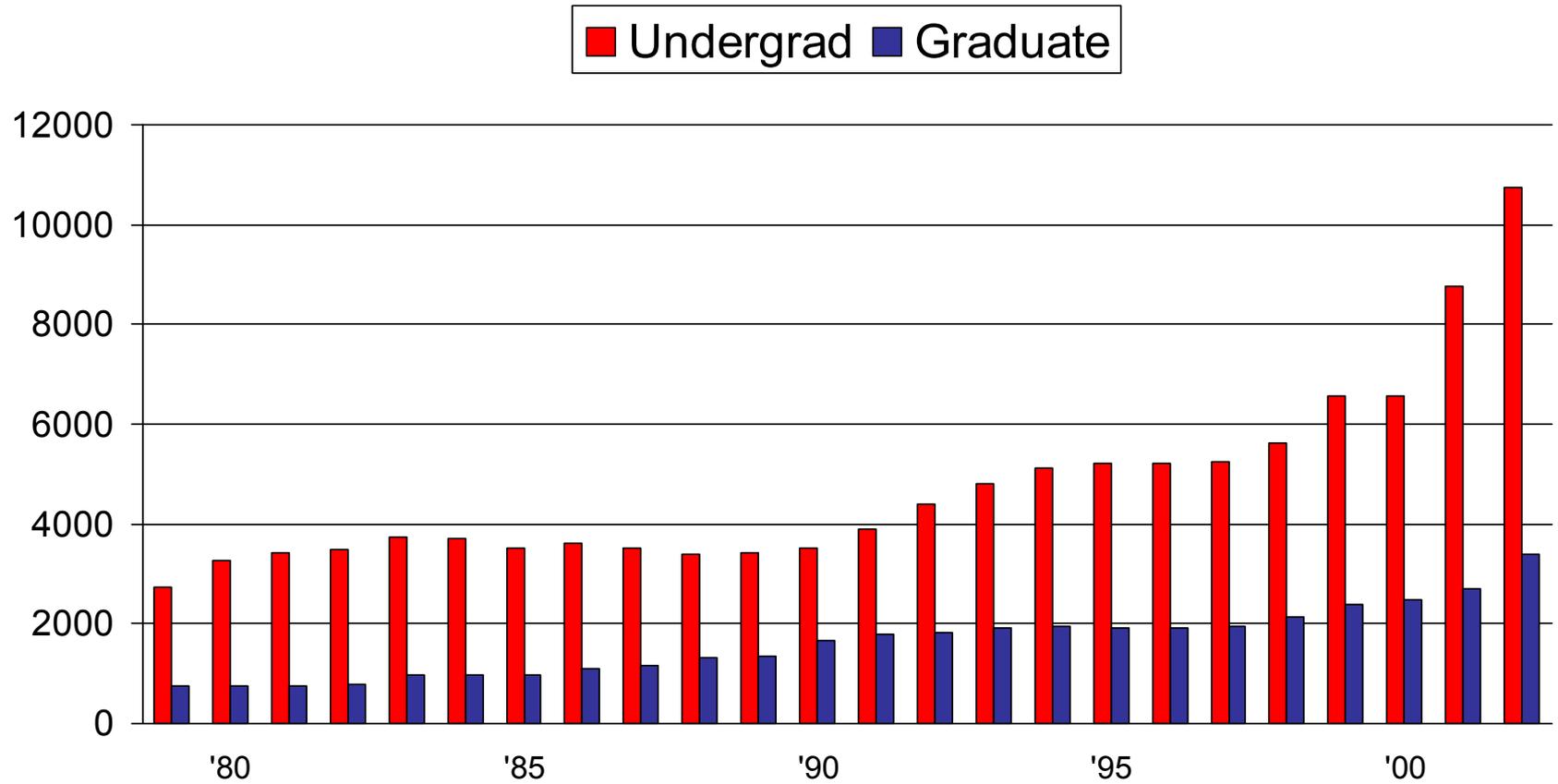
- Overview of BME and Whitaker
- Brief history of The Whitaker Foundation
- Future prospects
 - scientific developments
 - educational developments
 - ABET and BME education

Cumulative number of BME programs

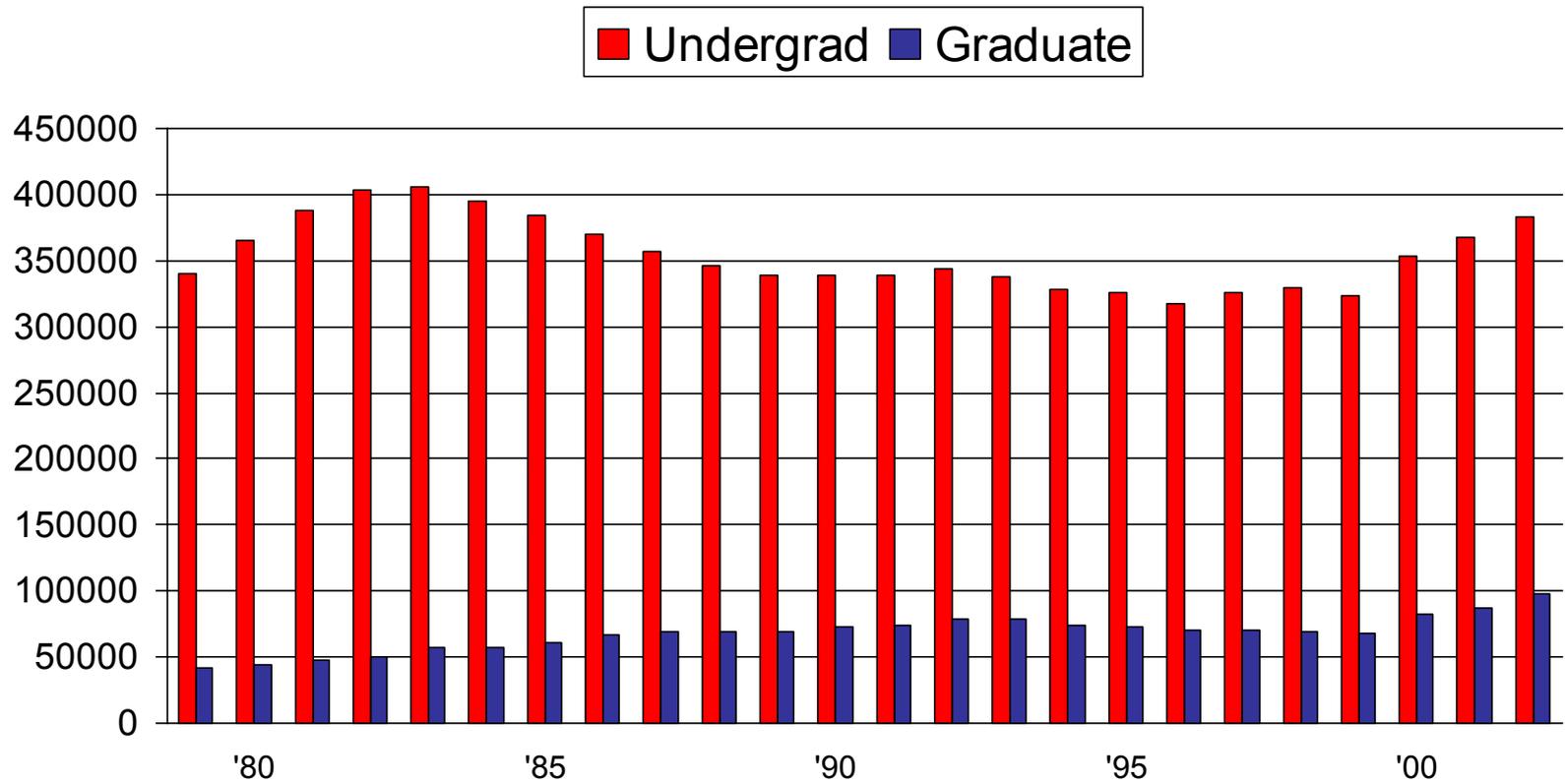
◆ Undergraduate ■ Graduate



Biomedical engineering enrollment



Engineering enrollment



Reasons for growth of BME

- Technology development
nano-, micro-, computation
- Understanding of biological systems
- Student interest
challenge, beneficial results
- The Whitaker Foundation

The Whitaker Foundation

Established in 1976

Emphasis is on biomedical engineering

Spent \$62 million in 2003 on BME

Will terminate in 2006 (by design!)

Major grant programs

Programs for individuals

Research grants (young faculty members) – over 1,300

Fellowships (graduate students) – over 400

Institutional awards for educational programs

Development Awards

Leadership Awards

Leadership/Development Awards

Special Opportunity Awards

Is biomedical engineering
dependent on Whitaker?

NO!!

The field will continue to prosper after 2006

Expected effects of closing

Fellowships:

excellent students will get other support

Institutional awards:

growth of programs will moderate (*good?*)

Research grants:

Whitaker will be missed, but there is cause for optimism

Funding opportunities

Everyone likes interdisciplinary research

NIH (Roadmap and BECON)

Howard Hughes Medical Institute (Janelia Farm)

National Academies & Keck Foundation (Futures Initiative)

New agencies

National Institute of Biomedical Imaging and Bioengineering

Technology-driven research

Also emphasizes training!

Wallace H. Coulter Foundation

Translational research

Scientific trends

1) Increased role of basic biology

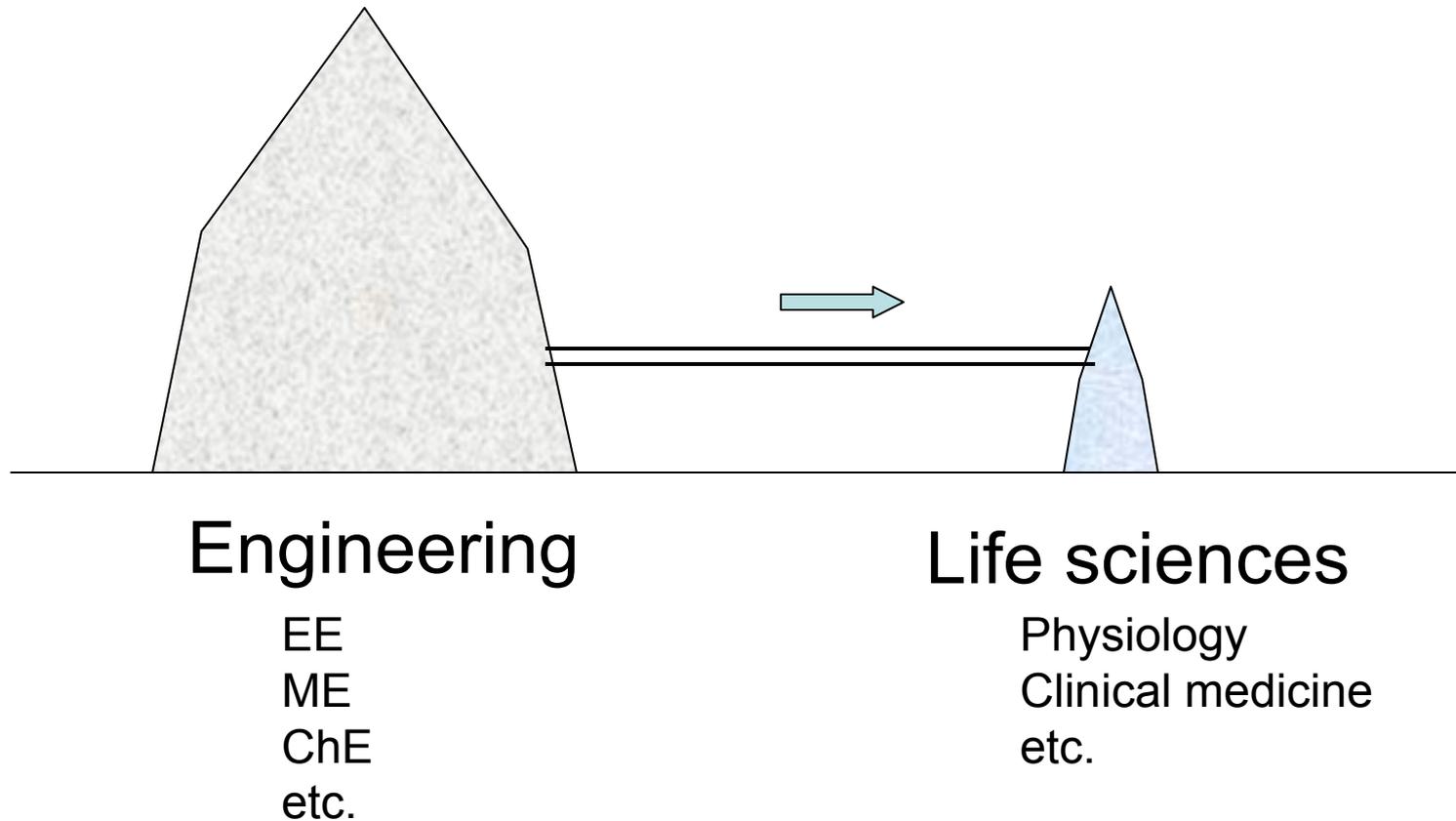
Biological understanding suggests new solutions

2) Increased role of integrative view

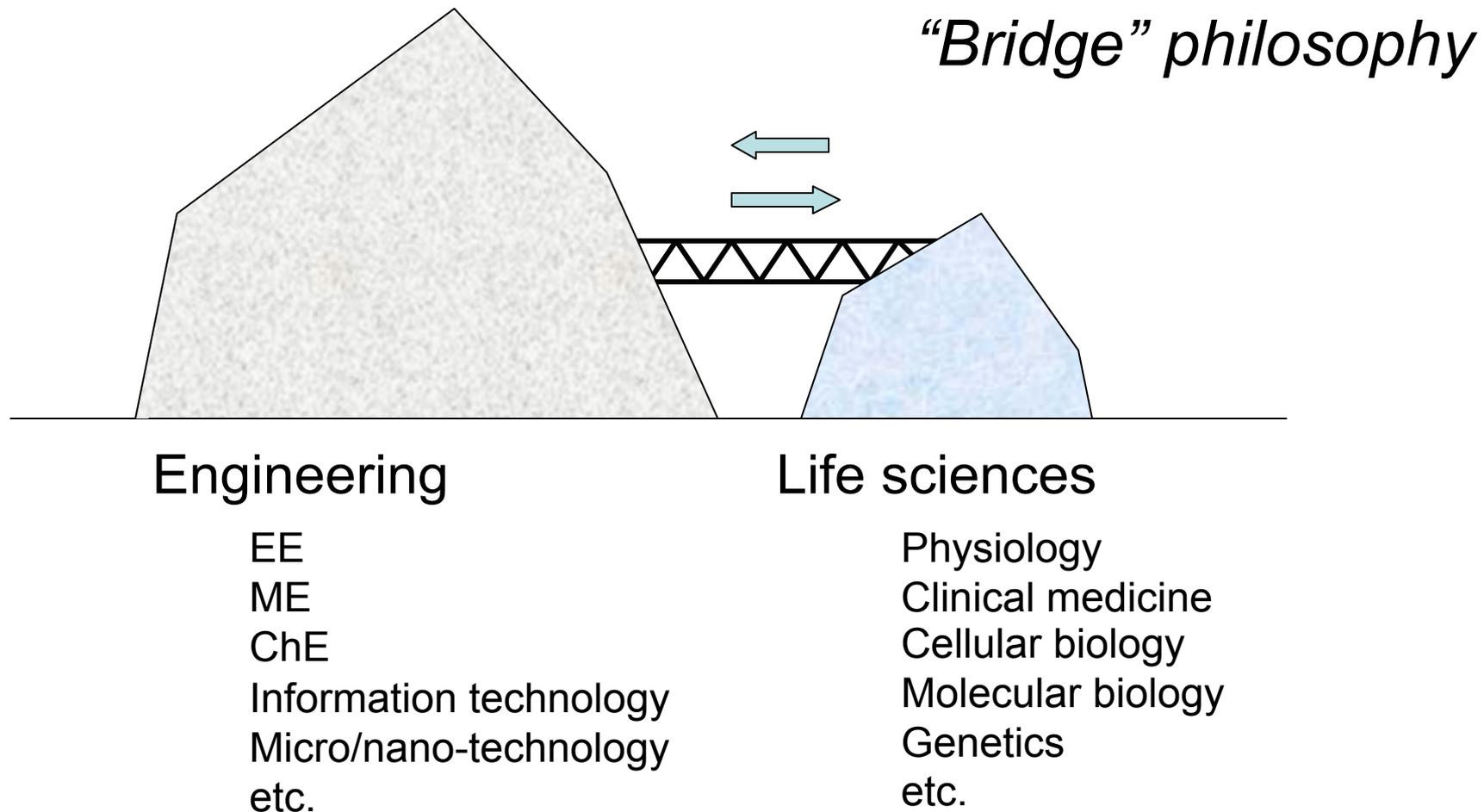
Such approach is natural for engineers

Major tool used: modeling

Curriculum Philosophy ca. 1960 - 1980

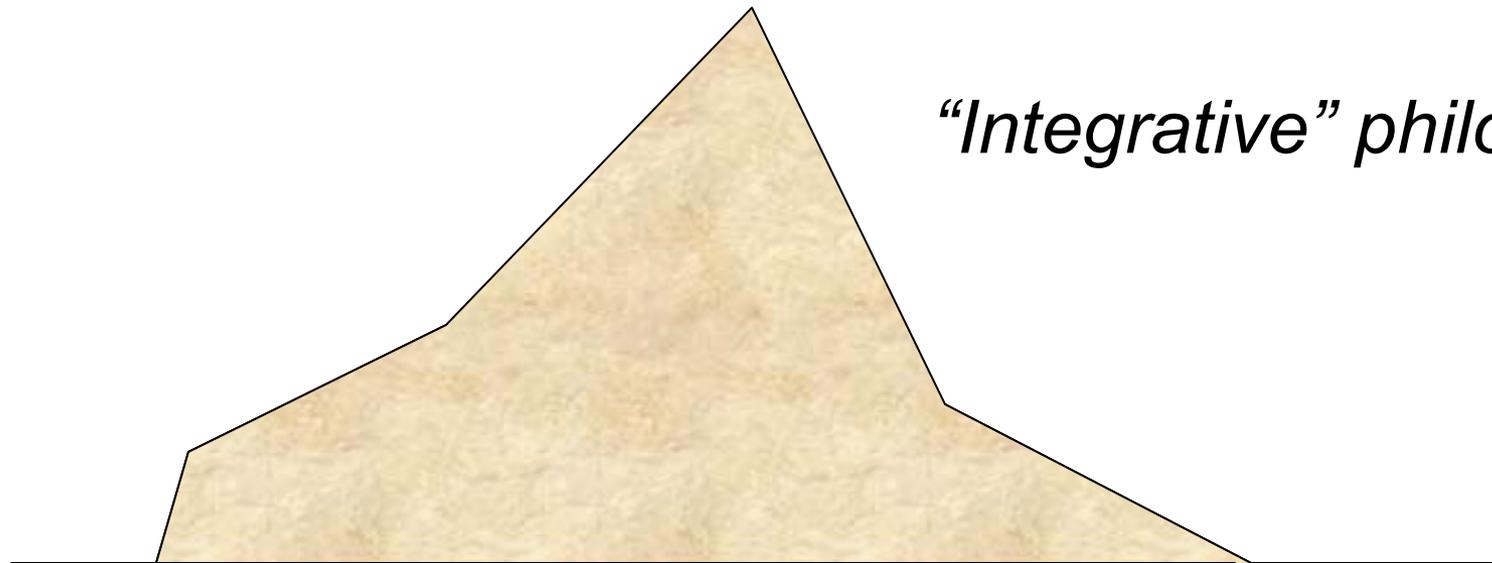


Curriculum Philosophy ca. 1980 - present



New Curriculum Philosophy late 1990s - 20??

“Integrative” philosophy



Engineering

EE
ME
ChE
Information technology
Micro/nano-technology
etc.

Life sciences

Physiology
Clinical Medicine
Cellular biology
Molecular biology
Genetics
etc.

No Value Judgment!

- *Bridge philosophy*: engineers working on biomedical problems
- *Integrative philosophy*: biomedical engineers

Both are appropriate; the difference is only on emphasis

Trends in BME

BME is getting more integrative and life science oriented, embracing integrative educational philosophy

BME is getting more research oriented
(R01's help promote faculty members)

BME undergraduates are increasingly involved in research

More programs are seeking ABET accreditation

Trends in ABET Accreditation

ABET focuses on engineering practice

There is an increasing emphasis on design

ABET design criteria are clear:

“demonstrate ability to design ... to meet need”; #3/c

“major design experience”; #4

The Conflict

BME



ABET

Research oriented

Practice oriented

Senior research
project is often
used to satisfy design
criteria

Design is an
explicit
requirement

Role of BMES

BMES is now responsible for accreditation visits

However, BMES visitors are charged to evaluate existing ABET general criteria

They have discretion for making judgments, but they have no choice but to answer ABET's questions truthfully

The Solution



BME curricula need to include design

Senior research, without explicit design component, cannot be used for design

This is appropriate since most BME graduates will practice in industry

How about research?

Optional research experience *can* be included in the curriculum – but not instead of design

Danger of overloading students

But, BME students are among the best; it is in the field's interest to keep it that way

The bottom line

- There is life after Whitaker!
- The field will continue to grow
- Must maintain high quality – people and education
- Curriculum must balance research and practice, with design playing a major role