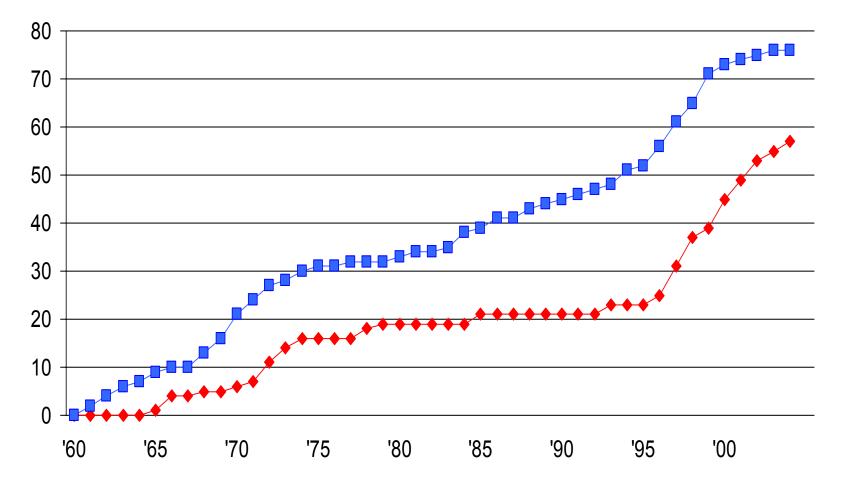
BME education after Whitaker

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

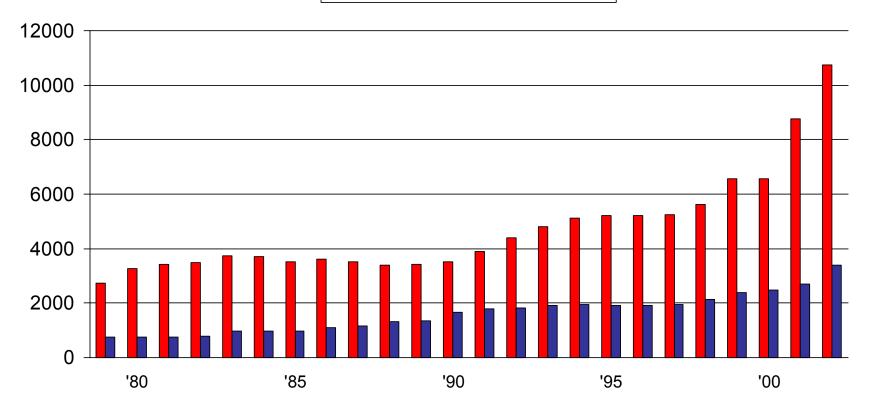
Cumulative number of BME programs





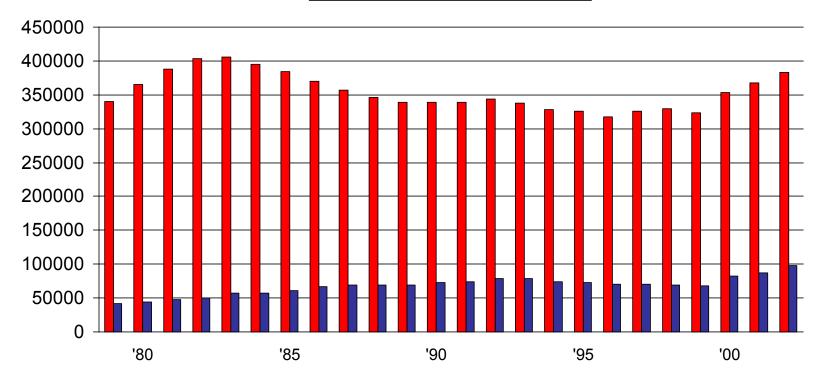
Biomedical engineering enrollment

Undergrad Graduate



Engineering enrollment

Undergrad Graduate



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!

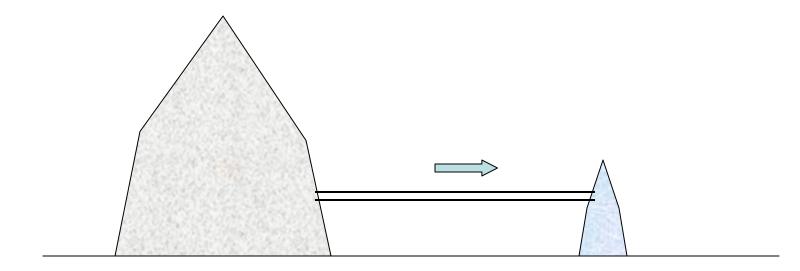
Wallace H. Coulter Foundation Translational research

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

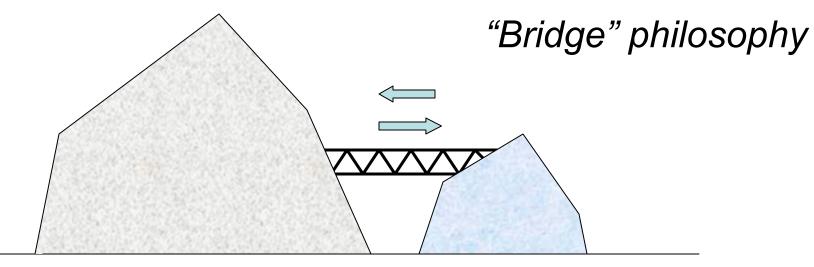


Engineering EE ME ChE etc.

Life sciences

Physiology Clinical medicine etc.

Curriculum Philosophy ca. 1980 - present

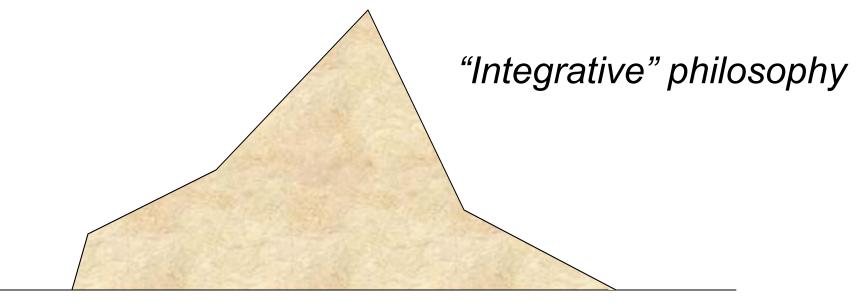


Engineering EE ME ChE Information technology Micro/nano-technology etc.

Life sciences

Physiology Clinical medicine Cellular biology Molecular biology Genetics etc.

New Curriculum Philosophy late 1990s - 20??



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



<u>BME</u>

<u>ABET</u>

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





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