

Education and Training in Genetics and Genomics: A United States Perspective

Joann A. Boughman, PhD
Executive Vice President
American Society of Human Genetics

By way of introduction – Boughman

- Population geneticist
- PhD Medical Geneticist (Board Certified)
- University Dean of Graduate School
- University Vice President for Research and Development
- University Provost
- Member of National Advisory Committee
- Association Executive

American Society of Human Genetics (ASHG)

- 8000 members (~ 5% from UK)
- Researchers, academicians, industry scientists, clinicians, counselors, others
- All areas of genetics
 - Basic molecular biology
 - Genomics (including bioinformatics)
 - Translational
 - Clinical applications
 - Ethical, legal and social issues

Genetics Community

- ASHG (American Society of Human Genetics)
- ACMG (American College of Medical Genetics)
- ABMG (American Board of Medical genetics)

The Challenge

- Genetics knowledge and technologies are being rapidly generated in genetics and genomics
- Integration of genetics into health care and public health practice driven by 3 main forces:
 - Scientific and Technological Advances
 - Consumer/Patient Demand
 - Cost Considerations/ Emphasis on Prevention
- Health professionals are the ultimate arbiters of how and when (and if) new technologies and practices are integrated into health care

Key Stakeholders

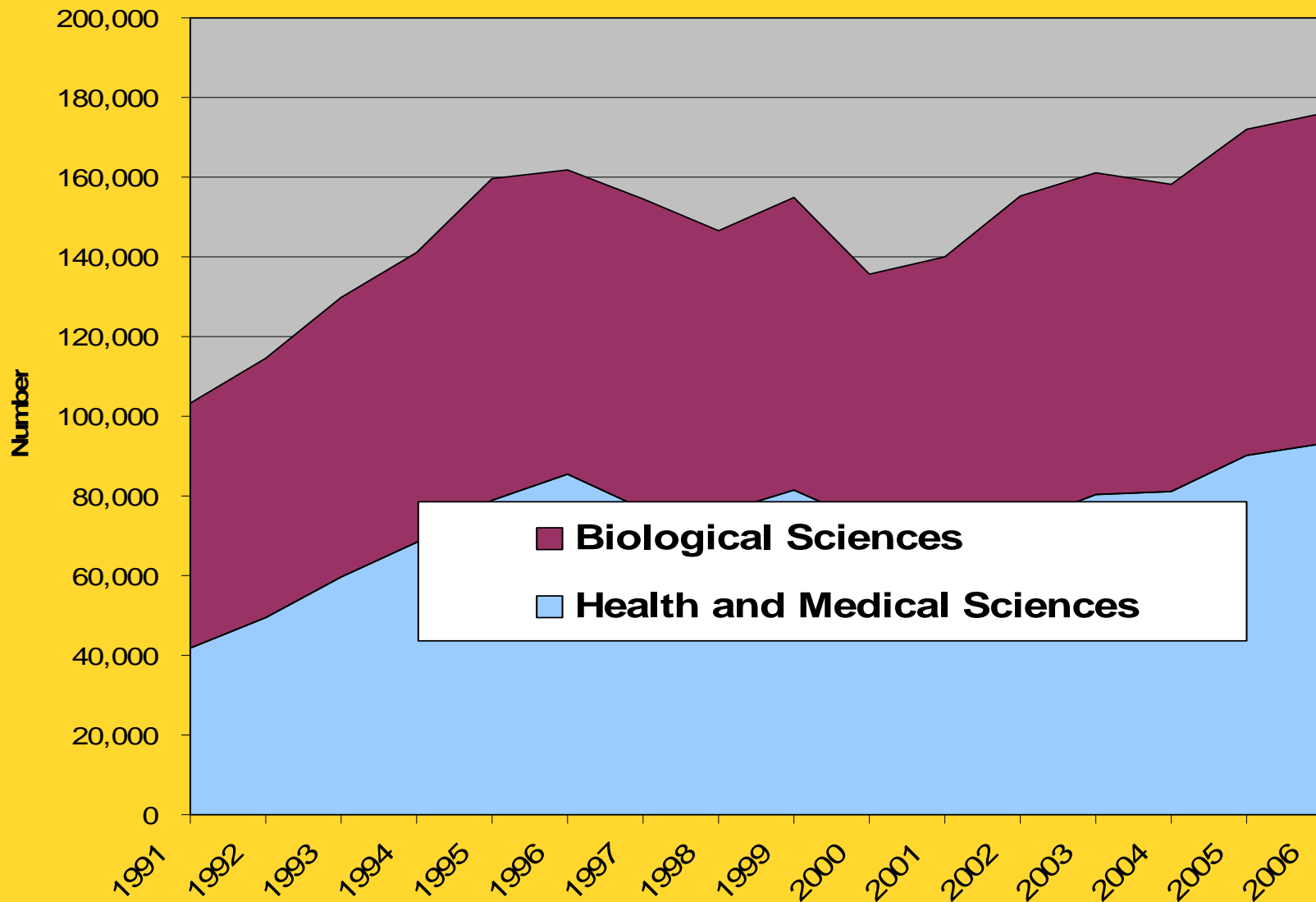
- Basic Scientists and translational researchers
- Genetic Specialists
 - Medical Geneticists, Genetic Counselors
- Physicians
 - Peds, Ob/Gyns, Internists, Fam Practitioners
- Public Health Professionals
- Nurses
- Allied Health Professionals
- Patients, Consumers, General Public

Research Scientists

- PhD trainees in a variety of basic science programs
- PhD following 4 year bachelors degree
- PhD training averages 5-6 years

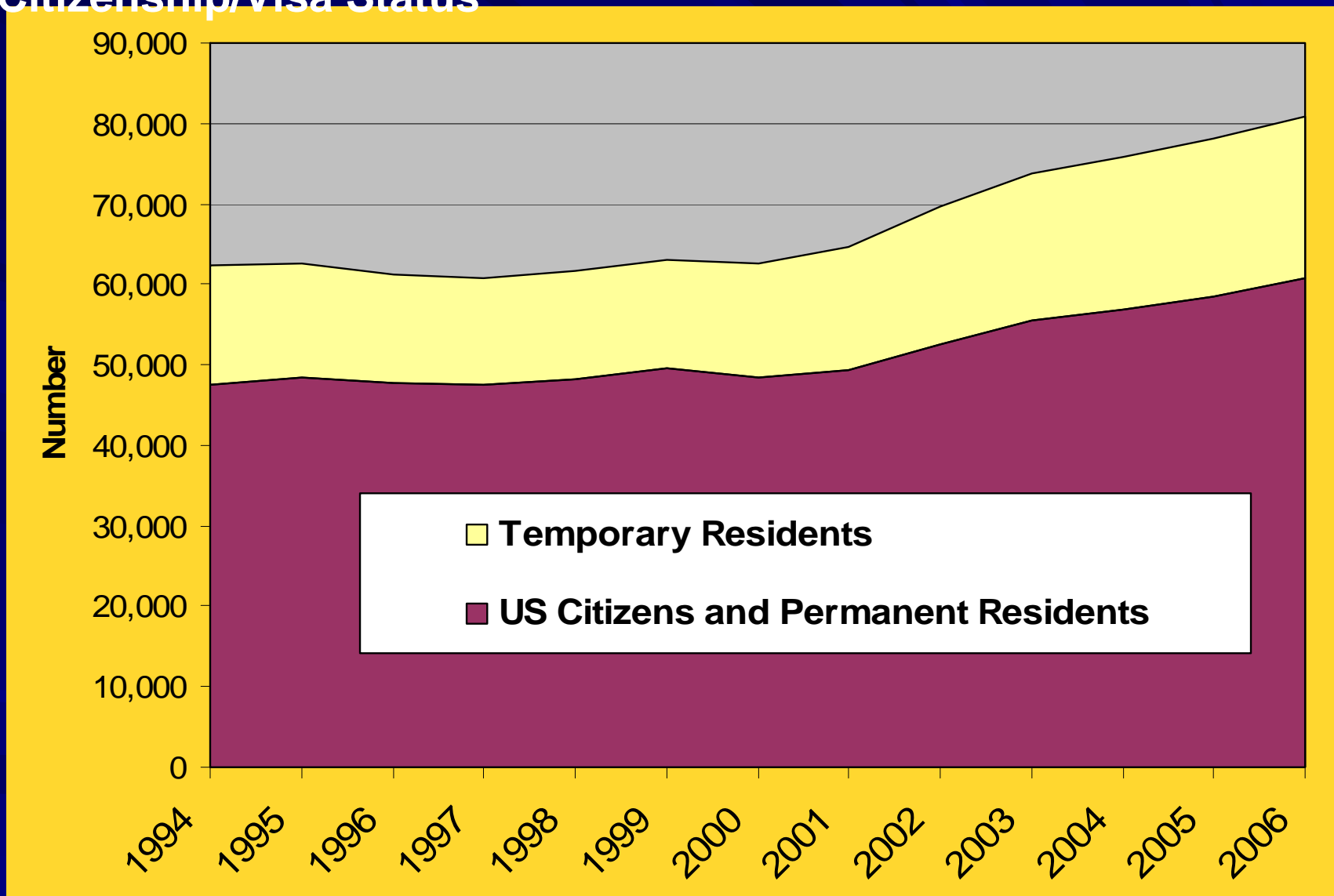
Graduate School Applications in Health and Biological Sciences

FASEB



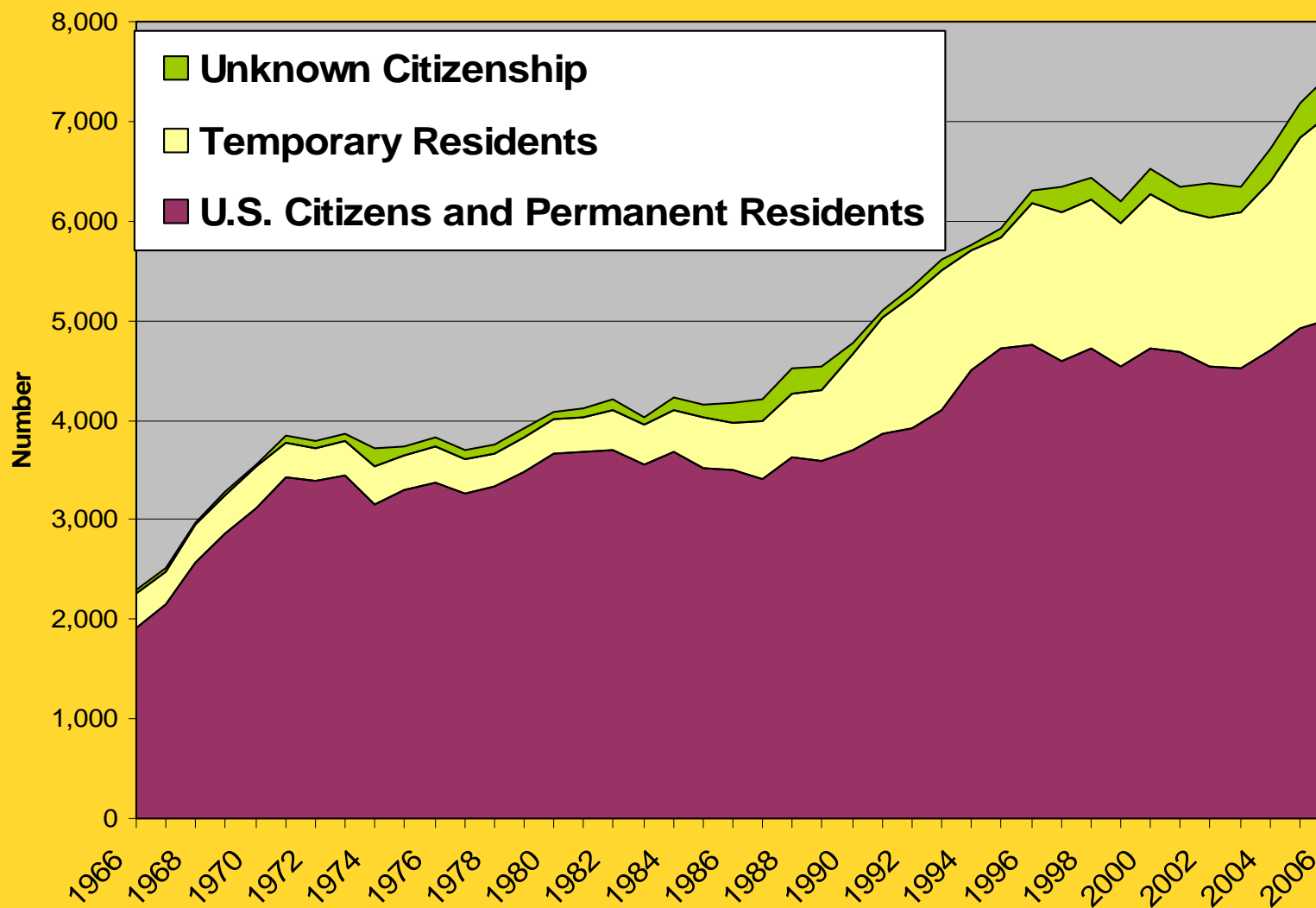
Source: <http://www.cgnet.org/>

Total Biological and Medical Sciences Graduate Students in Doctorate Granting Departments by Citizenship/Visa Status



Source: <http://www.nsf.gov/statistics/gradpostdoc/>

Doctorate Degrees Awarded in the Biological and Medical Sciences by Citizenship/Visa Status



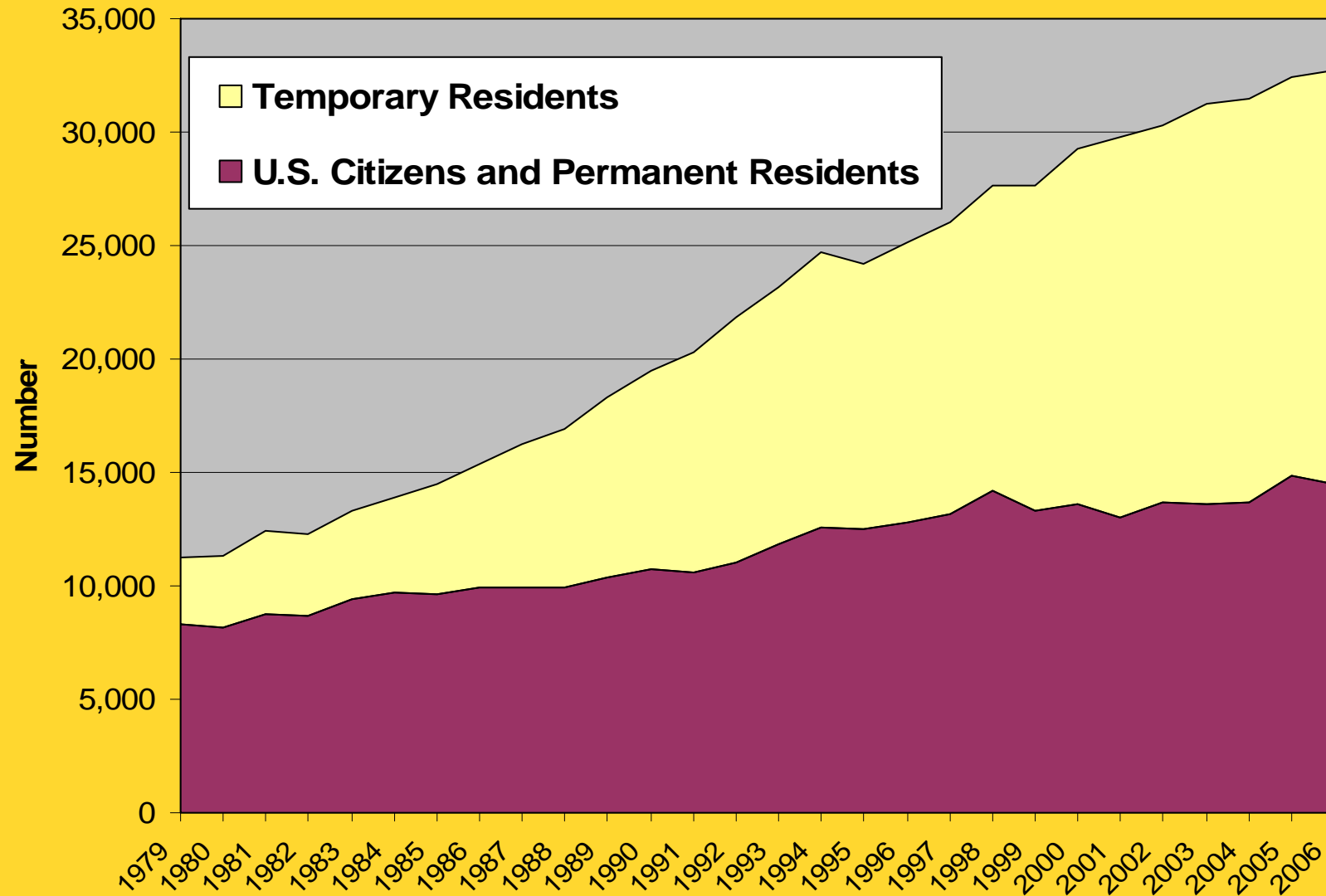
Source: <http://www.nsf.gov/statistics/doctorates/>

Research Scientist Careers

- Postdoctoral fellowship (2 years)
- Additional Postdoctoral training
- Academic position
- Other position

Biological and Medical Sciences Postdocs by Citizenship/Visa Status

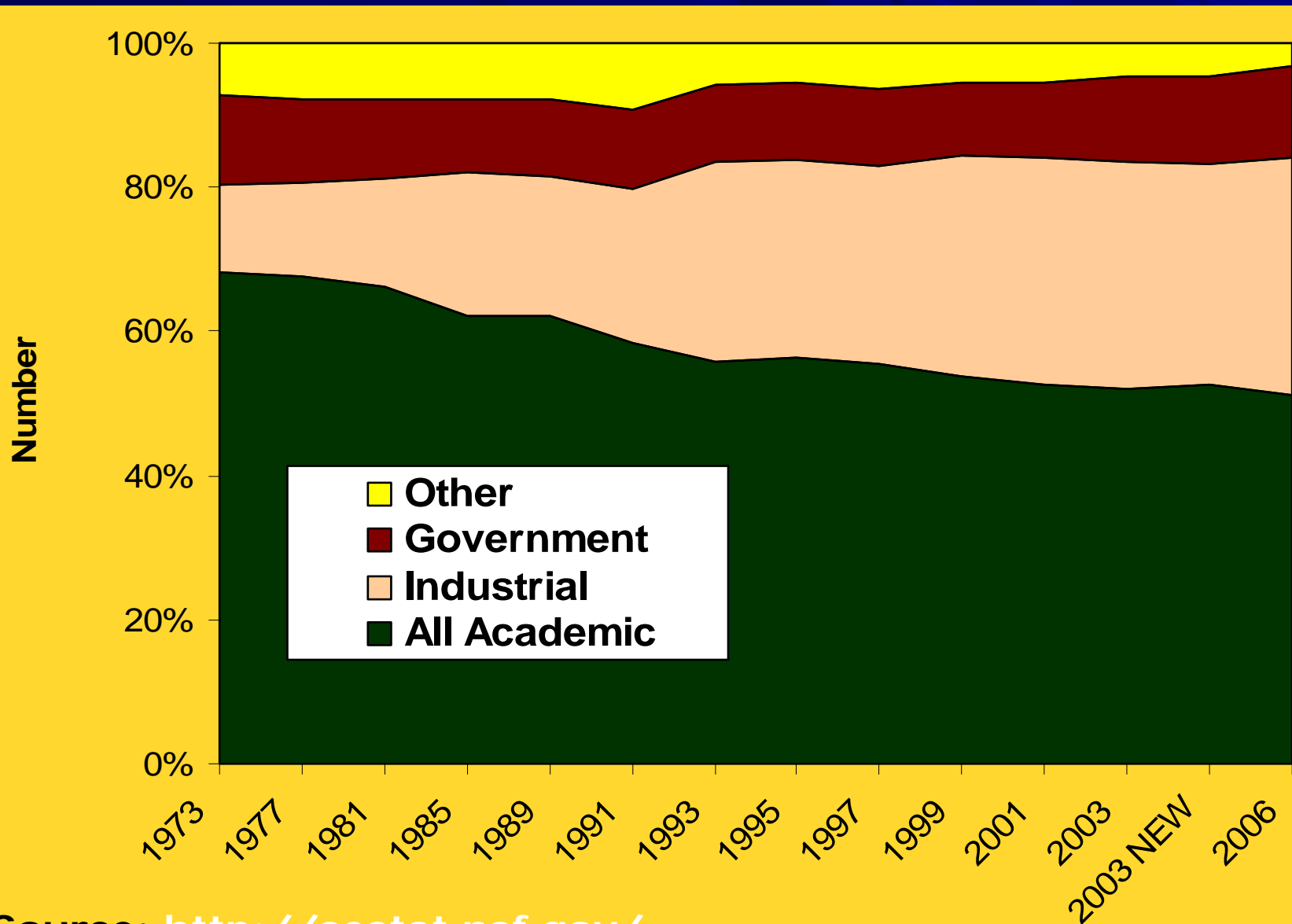
FASEB



Source: <http://www.nsf.gov/statistics/gradpostdoc/>

Distribution of Biomedical Science PhDs by Sector of Employment

FASEB



Source: <http://sestat.nsf.gov/>

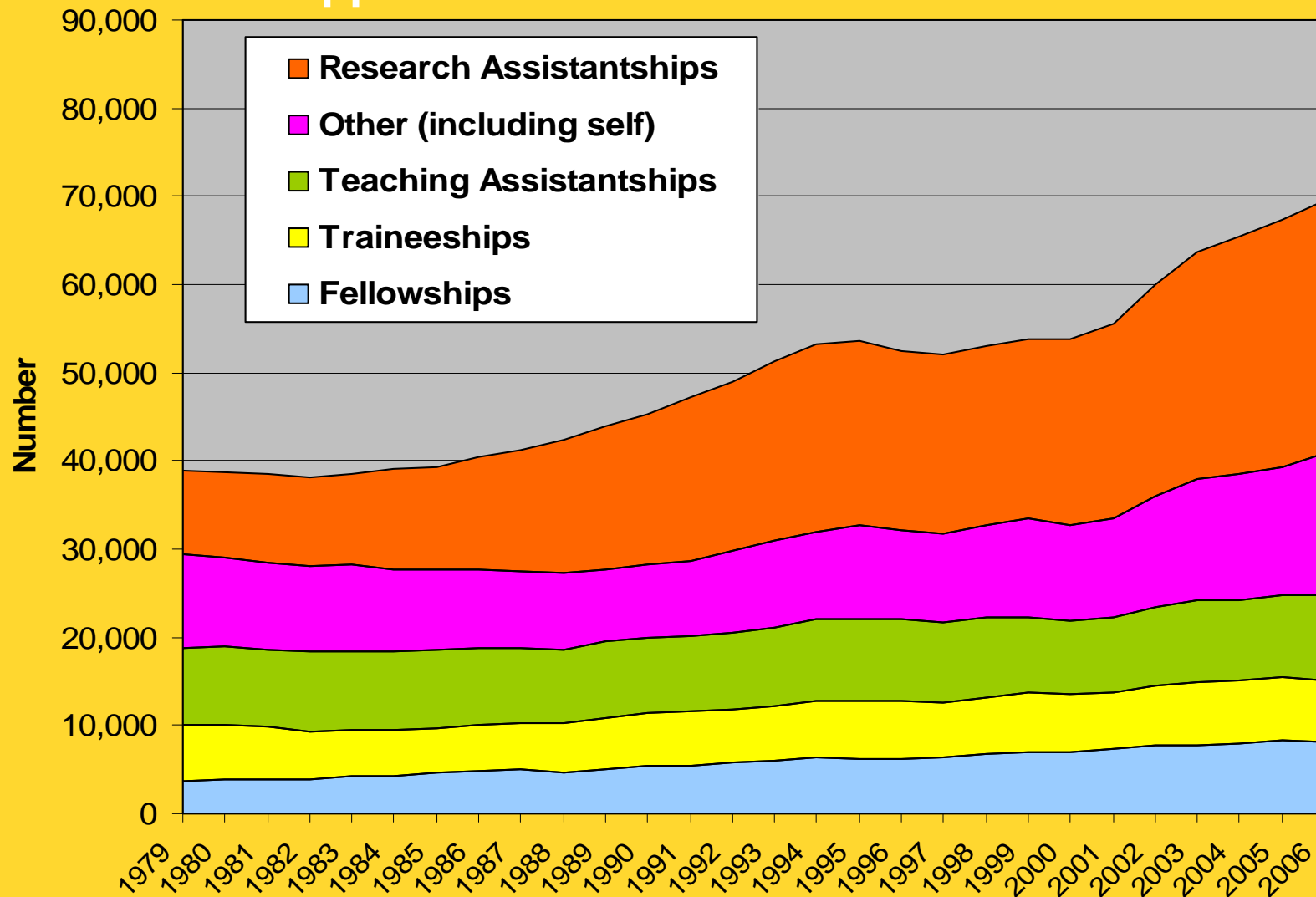
PhD Training programs

- Based in University departments or centers
- Training program may be multidisciplinary
- Program may be funded as unit
- Trainees may also be funded individually
 - From department
 - From PI research grants

Full Time Biological and Medical Sciences Graduate Students in Doctorate Granting Departments by Mechanism of Support

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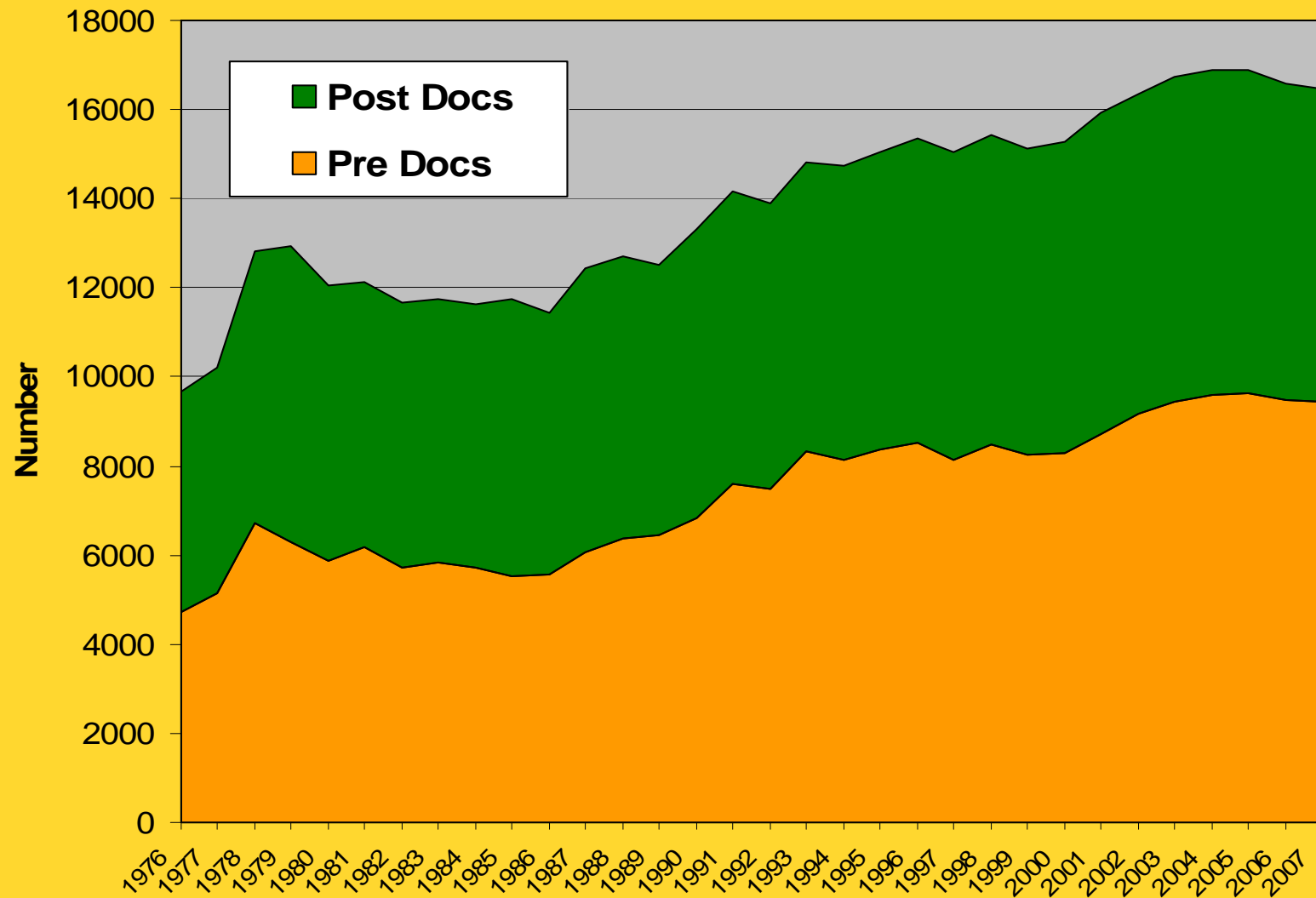
Mechanism of Support



Source: <http://www.nsf.gov/statistics/gradpostdoc/>

Pre-Doctoral and Post-Doctoral Positions on NIH Training Grants and Fellowships

FASEB



Source: <http://grants1.nih.gov/grants/award/award.htm>

Genetics/Genomics Training

- Highly dependent on NIH budget
- Dependent on NIH priorities
- Dependent on peer review structure

Genetics and Genomics Research Workforce Issues

Molecular scientists

- Training costs

- Career trajectories

Bioinformatics scientists

- Recruitment

- Training resources at centers

Medical Services

- Laboratory

- Patient services

Genetics and Genomics Translation and Clinical

Workload issues

Patient care

Clinical Laboratory

Basic Research

Clinical Research

Teaching

Administration

ABMG Clinical Subgroups

MD Clinical Geneticist

PhD Medical Geneticist

Clinical Biochemical Geneticist

Clinical Molecular Geneticist

Clinical Cytogeneticist

ABGC Genetic Counselor

Board Certified Geneticists

- 2342 people earned 2766 certificates

- By subgroup

MD Clinical	1253
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PhD Medical	155
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Biochem	261
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Cytogenetics	618
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Clin Molecular	480
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Other MD Specialties

■ Internal Medicine	110
■ Ob/Gyn	139
■ Pathology	50
■ Pediatrics	736
■ Psych/Neurology	33
■ Medical Genetics	TBD

NEEDS

- More people
- More recruitment
- More support for training
- More support for investigators

- More advocacy

ASHG will continue to advocate

Thank you and the NIH for this opportunity

Joann A. Boughman, PhD
jboughman@ashg.org