Graduate student enrollment trends

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Ratio of natural sciences and engineering first university degrees to 24-year-old population

The US was #3 in 1975 but is #14 in 1999.

Source: SEI 2002 NSB 02-01
Natural sciences and engineering
doctoral degrees

NOTE: Europe includes France, Germany, and the United Kingdom. Asia includes China, India, Japan, South Korea, and Taiwan.

Source: SEI 2002  NSB 02-01
Earned doctorates

Source: Science and Engineering Doctorate Awards: 2001  NSF 03-300
Federal R&D funding, by budget function

NOTE: The 1998 increase in general science and decrease in energy resulted from a reclassification.

Source: SEI 2002 NSB 02-01
Fraction of doctorates US citizen

Source: Science and Engineering Doctorate Awards: 2001 NSF 03-300
Surveys of UCAR member institutions
1999, 2001 and 2003

Covers the 8-year period 1995 - 2002.

Fairly simple:
  admission, acceptance and entry rates
  GRE scores
  rating of importance

Roughly 60% response rate, but fluctuating
Application rates as % of eight-year mean

![Graph showing application rates as % of eight-year mean.](image)
Fraction of applicants admitted and entering.
Numbers of applicants, by school size
Numbers of students starting degree programs, by school size
Size distributions of schools in the survey.

- Small schools produce 1/2 of graduates.
Results:

Sharp (8% per year) decrease found in applications over the first 5 years. This seems to be the measure of greatest sensitivity to student interest in a field.

Decline in quality would seem to follow as a result of the decreased pool of candidates, but the GRE scores do not demonstrate it.

Enrollment rates are more stable (controlled by faculty size and funding).

Moderate to serious concern about enrollments was expressed, mostly from the smaller schools.

Last 2 years show reversal.
CORE - Ocean Science Educators Retreat (OSER) 1998:

“… 11 % decrease in applications …”
“… GRE percentiles indicate … no apparent decrease in quality… “
1992: 2837
1998: 2233

1992: 1838
1998: 1347
1992: 450
1998: 340

1992: 250
1998: 152

The n value for each chart is the sum of students reported for each discipline and may not be identical to the grand total of students who enrolled. Year indicated is year of enrollment, fall semester.
1996 Alumni Survey:

“… valuable information on subjects such as funding mechanisms, graduate experiences and postgraduate careers.”
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How useful are such surveys?

Monitoring of application and enrollment trends is helpful in the same sense as knowing history is.

Individual schools can gage their positions with respect to the community as a whole.

It creates a degree of alertness about the issue.

It can be done without much strain.

It is one of the few definite activities possible.

There are few alternatives.

Predictions are unreliable.
“Forecast errors may proceed from many sources. Models may be based on incorrect assumptions about overall structure, included variables, lag structure, and error sources. Data used for estimation may be flawed … Further, unanticipated events …. [Virtually] all models of demand and supply have been flawed by at least one (and in many cases, all) of these problems.”

Recommendations for improvement.
Thoughts:

First, simple position: graduate education is an investment in the future.

But, some PhDs are needed just to maintain the status quo: college teachers, routine operations, etc., plus the replacement of retirees.

More importantly, even our status quo is based on continuous development, due to (over)(mis)use of resources. This places the burden of need on discoveries, and hence on the investment in more PhDs than needed for the status quo. And, we should add to that the obligation to improve the lives of many.

Graduate education is an indispensable part of the future.
By far, the most important activity is recruitment, with inclusion of women and minorities.

Curricula and all aspects of programs to change with needs, with respect to the balance between fundamental knowledge and application skills, between breath and specialization, between theory and observation, …

Long-term trend of increasing length of time to degree should be halted or reversed.

Graduate education can’t function in isolation from education at all levels.
Emphasize and publicize the quality of the programs, their intellectual excitement and their possible contributions to global well-being.

Changes are likely in the contents of graduate programs and, perhaps, the way graduate students are funded.