

# Why Caltech Astro should remove the PGRE as an admissions requirement

## 1 PGRE scores show an extremely weak correlation with success in research/teaching.

- Levesque et al. (2015) (arXiv:1512.03709):
  - The PGRE score distribution of astro prize postdoc fellows shows no minimum percentile score (Figure 1, left).
  - In fact, any percentile cutoff would have eliminated prize fellows (e.g., a 10th-percentile cutoff would have eliminated 4 fellows).
  - Also, PGRE scores show no correlation with # of first-author papers published before, during, or exiting grad school (Figure 1, right).

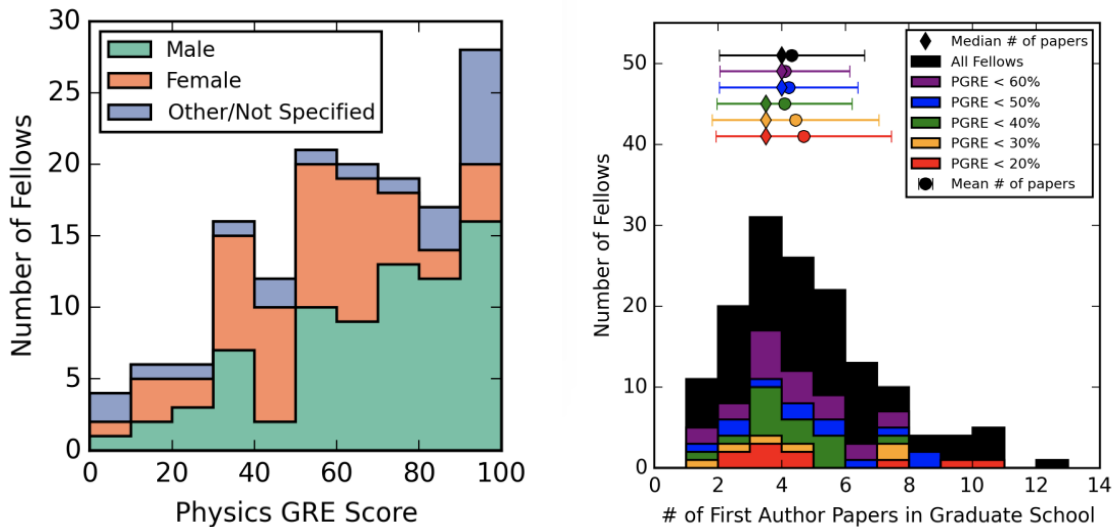


Figure 1: **Left:** Number of astronomy prize postdoctoral fellows from 2010-2015 vs their PGRE score from Levesque et al. 2015. Note that about 29% of fellows have scores that fall below the 50th percentile. Also note that 42% of female fellows have scores that fall below the 50th percentile. **Right:** Number of first author papers written by fellows in graduate school, with the colored histograms showing the same for fellows below the specified PGRE cutoff, also from Levesque et al. 2015. Note that the histogram shape and the average number of publications is not sensitive to PGRE score.

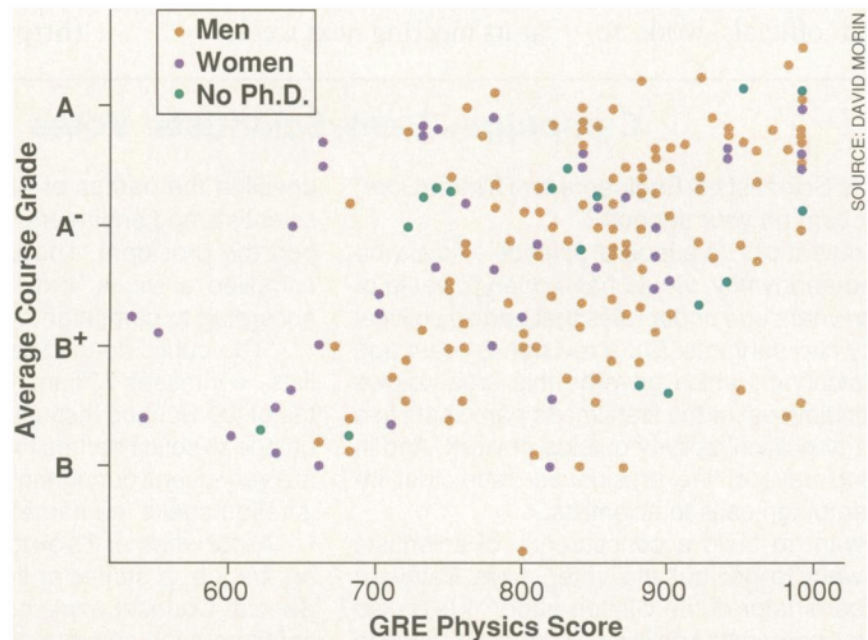


Figure 2: ETS data published in Glanz (1996) showing very little evidence of a correlation between PGRE score and average course grades in the first year for astronomy graduate students at Harvard.

- Furthermore, the PGRE appears to be essentially uncorrelated with first-year course grades.
  - <http://science.sciencemag.org/content/sci/274/5288/710.full.pdf>
  - ETS data shows  $R=0.27$ ; see Figure 2.
  - An (unpublished) analysis by David Morin showed that PGRE scores were largely uncorrelated with other factors (e.g., time to completion, assessments by professors).
- Using an estimator that is neither correlated with first author publications nor first year grades will on average *decrease* the expected research productivity of admitted students, because it dilutes other, more useful estimators.
- Yet Caltech Astro still says GRE scores are important on the admissions FAQ page
  - The full statement: *“Despite the limitations of standardized exams, your GRE scores (General and preferably Physics) are important. Especially for students from less well-known schools and foreign countries, they provide an important normalizing factor.”*
  - (Note that the statement says “preferably Physics” when the Physics GRE is, in fact, required by the department and not merely preferred.)

## 2 Taking the PGRE is a direct financial barrier to applicants.

- Direct costs:
  - \$150 per test (note that many students take it multiple times)
  - \$27 to send each official score report beyond the initial 4 (assuming students know where to send their first 4 reports when they take the test)
  - additional fees for late registration
  - cost of traveling to test center
  - (Note that it also costs \$195 to take general GRE, but this is a university requirement.)
- Note that ETS has a Fee Reduction Program that covers 50% of exam costs, but it applies to a single test and has very strict eligibility requirements (including US citizenship).
- There are also indirect costs of studying:
  - While ETS does provide past tests for free, the book *Conquering the Physics GRE* by Kahn & Anderson is the most popular study guide. This costs ~\$30, and most libraries don't have it.
  - Some students have part-time jobs or other extenuating circumstances that give them less time to study.

## 3 The PGRE is most strongly correlated with race and gender.

- See the reports on the ETS website: <https://www.ets.org/gre/research/fairness>
  - On average, women score 80 points lower than men, and black people score 200 points lower than white people; see data compiled by C. Miller in Figure 3.
  - **In short: the PGRE is a stronger predictive measure of race and gender than actual scientific success!**

## 4 There are a restricted number of PGRE test sites for international applicants.

- There is often only one test site per country, and many of these offer only 1 or 2 test dates each application cycle.
- Caltech Astro informally allows certain international applicants (including at least one current graduate student) to waive the requirement, but see the statement from the admissions FAQ: *“Especially for students from less well-known schools and foreign countries, [GRE scores] provide an important normalizing factor.”*

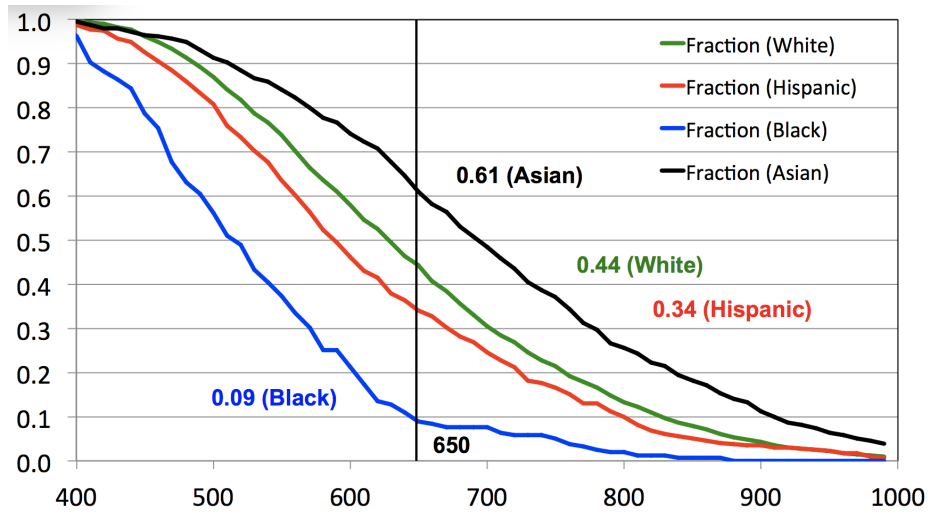


Figure 3: Figure from 2014 APS Bridge Program presentation by Theodore Hodapp (<http://www.apsbridgeprogram.org/resources/140213-stc.pdf>) showing the impact of using a PGRE cutoff on URMs. When analyzing this figure, keep in mind that other research suggests that PGRE scores do not correlate with performance in graduate school.

- Furthermore, the PGRE requires a huge investment of money and time compared to application processes in other countries, making Caltech Astro a less welcoming prospect to international students.