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Physics Intentions and the GRE

In the early 1980s, three coauthors and I published a letter (PHYSICS TODAY, April 1984, page 15) stating that the Graduate Record Examination (GRE) aptitude tests showed that those students taking the tests and indicating physics as their intended area of study had the highest combined quantitative and verbal scores of the 98 disciplines listed. In view of evolving trends in graduate education, it seemed of interest to reexamine the quality of students planning to go to graduate school in physics, as measured by the GRE aptitude tests.

The data given here appear in the GRE *Guide to the Use of Scores*, available online at ftp://ftp.ets.org/pub/gre/992362.pdf, and are based on exams taken between 1 October 1997 and 30 September 2000. Test takers were grouped into 50 broad fields by intended graduate major, and mean scores are reported for each of the three aptitude tests, verbal, quantitative, and analytical.

For the physics and astronomy category, the mean score ranked first in quantitative aptitude, first in analytical, and tied for sixth in verbal (students who listed philosophy as their intended course of study ranked first in verbal aptitude). When the means are aggregated, students intending to study physics and astronomy easily rank first among the 50 categories.

Physics graduate programs are still getting good students—so good, in fact, that the aptitude tests are of limited value in predicting first-year grades in graduate school, the one outcome for which complete data are published. The correlation of first-year graduate grades with the aggregate aptitude score is only 0.20. Moreover, the best correlation is with the verbal score, which is a little surprising until one notices that the standard deviation is largest for this test. Overall, the scores are so uniformly high that they provide little discrimination.

The situation is somewhat different with the subject matter test: The correlation with first-year graduate grades is 0.27, about the same as for undergraduate grades, where the correlation is 0.28.

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Turn Down the Lights

While PHYSICS TODAY's April 2002 cover photo of Earth at night is impressive, I would urge readers to note that the lights seen in this image represent billions of dollars per year of energy wasted on upward-directed outdoor lighting. That issue of the magazine, devoted to the energy situation, appears to address only the need for increased energy production, with conservation barely mentioned. Ernest Moniz and Melanie Kenderdine do point out that efficiency improvements "represent the most effective opportunity for meeting energy and environmental goals in the near to intermediate term" (page 45). How effective is it to use light fixtures that waste up to a third of their light by directing it upward?

Physics can help with efforts to increase energy reserves; it can also be applied to conservation. The quality of outdoor lighting techniques and fixtures is generally poor worldwide, the US included. Proper outdoor lighting, with fixtures that direct no light upward and that provide nonglaring illumination at appropriate brightness levels, can provide safe nighttime spaces while conserving energy and preserving the wonders of the starry skies.

Part of California's response to its recent energy crisis (see http://www.energy.ca.gov/outdoor_lighting/index.html) was the creation of an innovative project to examine the nature of existing outdoor lighting. The initial results are not surprising: Most facilities are poorly lighted and often at unnecessarily high levels.[1] Such lighting does little to help with safety or security, or to improve the nighttime ambiance of our communities. It is obtrusive to many and wastes a lot of energy. By reducing