Does the undergraduate curriculum prepare for graduate school? Charles H. Holbrow, C. A. Dana Professor Emeritus, Colgate University and Visiting Professor of Physics, Massachusetts Institute of Technology

Should it? Is the highest purpose of the undergraduate physics curriculum to prepare students for graduate school? It is in many colleges and universities, and physics faculty everywhere take great pride in the number and success of their students in physics graduate school. Although this emphasis may not always serve students, the physics profession, or society well, for our discussion I take the answer as “yes.”

Prepared for what? For GREs? To take high-level coursework from Jackson, Goldstein, Huang, Cohen-Tannoudji? To be an apprentice intensely focused on a particular research problem? To teach? Directors of physics graduate education in major research universities give different answers. I will present some extreme examples.

Prepared how? With calculus, differential equations, orthogonal polynomials, complex variables, group theory, linear algebra, statistics? By computer experience with numerical analysis, simulation, programming, use of packages like Matlab or Mathematica? By practical experience with electronics, signals and noise, feedback, error analysis, optical instruments, high vacuum, digital interfacing, etc.? By rigorous coursework in E&M, classical, statistical, and quantum mechanics as from textbooks by Purcell, Griffiths, Marion, French, Huang, Merzbacher? By undergraduate research experience? By writing scientific papers? By giving seminars? Both graduate and undergraduate programs seek to add specialized courses to better reflect the sub-fields of physics; both want to include more about computing in their curricula.

What is the right mix of these curricular elements? Why? What is missing? What needs more emphasis? Less? What’s preventing such changes in your program?