PHYSICS

Students Master Physics Concepts with NeXT and *Mathematica*

Duke University

Until NeXT and *Mathematica* came along, many students never thought of physics as fun,º says Richard Palmer, professor of physics at Duke University. ªWith NeXT machines, they're having a very positive learning experience.º

Since the fall of 1991, Palmer and other members of Duke's Physics Department have been implementing NeXT technology and *Mathematica* in more than 10 courses, including Introduction to Quantum Mechanics, Thermal Physics, Modern Physics, and Solid-State Physics. Students use NeXT workstations in Duke's *Mathematica* Lab for Physics to complete homework assignments, work on research projects, and review class materials.

ªWe're all impressed by NeXT's ease of use and its graphical interface,º says Palmer. ªI just give students a handout about the machine and an account on the network, and they learn how to use the machine themselves. We couldn't do that in an X-Windows environment.º

For his Mathematical Methods in Physical Sciences II course, Palmer has developed a series of *Mathematica* Notebooks on complex algebra, elementary functions of a complex variable, Legendre functions, and Bessel functions. The Notebooks include text, ®gures, and exercises. Each semester, Palmer prepares six to eight Notebook assignments and announces their availability to students via e-mail.

Although Palmer prepares Notebooks for students to work through, he notes that other instructors prefer to present students with general instructions for an assignment and then have them translate the information into the *Mathematica* Notebook format themselves. In some classesÐQuantum Mechanics, for exampleÐstudents are asked to write their own NotebooksÐthe best of which are used by faculty in future classes.

ªPedagogically, NeXT works wonderfully,º Palmer says. ªStudents are mastering concepts much better with

Mathematica because they're able to play with hundreds of variations of the equations we give them. Right away, on the computer, they can tell if their solution works or not. Plus we're able to give them more realistic problems. Before, we were faced with ®nding problems that were simple enough to solve on the blackboard.º

He concludes, ªNeXT is without comparison in terms of price and performance. Because the machines come with bundled software, we were able to set up our lab at a reasonably low cost. Macintosh is the only other platform available that runs *Mathematica* Notebooks, but it just doesn't have the performance features of the NeXT.º

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