Open University: A Pioneer Presses On

After more than 30 years and 2 million satisfied customers, the U.K.'s Open University still leads the way in providing students with a quality science education at a distance

CAMBRIDGE, U.K.—Every time that Judith Lawton sees the indelible potassium dichromate stain on the freezer door, it reminds her "of all the effort I put in" to earn a general science degree from Britain's Open University (OU). The 53-year-old Lawton works for the local tax authority. But her addictlike compulsion to learn about science carried her through 6 years of mixing solutions in her sink, examining fossils, dissecting pig hearts, and using a broomstick to approximate the distance to the moon. And OU was more than happy to be her supplier.

"At the end of the [academic] year, you feel relief that the pressure is off; you start thinking about gardening and spending more time with your family," says Lawton, who received her degree last fall and is thinking of going further. "But it's not long before you start to get withdrawal symptoms and begin wondering when the next shipment of course material will arrive."

Founded in 1969, the Open University has provided a made-to-fit education to some 2 million students. Despite having no entry requirements and no student campus, it ranks in the top third of British institutions based on level of research activity and—according to a survey last year in *The Daily Telegraph*—10th overall in the quality and scope of its teaching and research. "No other facet of the British educational system has been so successful" at delivering a quality education to so many students interested in returning to school, says Harold Kroto, a Nobel laureate and chemist at the University of Sussex in Brighton.

Science is one of six faculties—the others being technology, education, mathematics and computing, arts, and social sciences. With some 25,000 students a year, the faculty caters to more science students than any other U.K. university. The average, part-time student spends $5700 to take a degree that lasts a minimum of 6 years. A comparable degree at a normal university could run $30,000 or more over 3 to 4 years.

Study comes via correspondence texts, radio and TV programs, multimedia material, home experimentation, occasional group tutorials, and weeklong summer schools at other universities around the country. A few courses have a small Web component, and two computer courses are taught online. The OU provides "a robust combination of the technological and the human," says John Daniel, a former vice chancellor now working at the United Nations Educational, Scientific, and Cultural Organization in Paris. The mix is enriched with online conferencing and a network of 300 local study centers for phone and group tutoring. The school's administrative headquarters are at Milton Keynes University, an hour's drive north of London.

The University of the Air, as the OU was known in its embryonic stages, was the brainchild of former Prime Minister Harold Wilson. "The existing system of higher education was very elitist and riddled with gaps in provision," says Steve Swithenby, the school's dean of science. Although Wilson envisaged adults studying at home via a consortium of existing universities, pent-up demand and the BBC's desire to expand its educational broadcasting led to a new institution.

Bright future. OU scientists are based at the institution's research campus and headquarters in Milton Keynes.

OU had a rocky ride in its formative years, say faculty members. "We had our enemies," says Mike Bullivant, an OU chemist at Milton Keynes, notably a cynical press and hostile academics with grave doubts about the efficacy of distance education. "People laughed when we said we were going to teach science," says Daniel.

The twin challenges facing OU officials were a diverse student body, including those whose high school education did not prepare them for university, and their far-flung geographic locations. OU's response was to build a curriculum that begins with a broad overview of the scientific method. "The OU proved that you could take difficult scientific concepts and explain them so that a student without any background in science could learn and apply them," says Geoff Peters, the OU's acting vice chancellor. It also allows students to pick and choose courses from many disciplines, in contrast to the narrow path followed at a bricks-and-mortar institution (see table on p. 1622).

Academics concur that it's tough to teach science at a distance. "Our students do have less lab experience," Bullivant admits. To overcome that handicap, the school has developed a highly sophisticated set of home kits. A typical kit in geology, for example, includes fossils, rock and mineral sections, and a polarizing microscope with which to examine them, along with geological maps and a hand lens. OU researchers have even found ways to augment the experience by asking students to collect geographical data. "We decided to take advantage of the fact our students were spread across the country," says Steven Rose, who directs neuroscience at OU.

Over the years, students have measured everything from the levels of sulfur dioxide in the air to local moth diversity in their neighborhood. The data have generated scientific publications and have been aired on television, says Rose. There are limits to home experimentation, however. "In chemistry we used to send out huge lab kits, but we can no longer do this due to health and safety legislation," says Bullivant.

The home kits are slowly being replaced by virtual experimentation, Bullivant says, mainly in the form of videos and CD-ROMs. And although a typical laboratory experience might include watching computer-generated simulations of magma flow or a video demonstrating the reactions of the alkali metals, these are not just passive experiences. "Students are expected to make observations,

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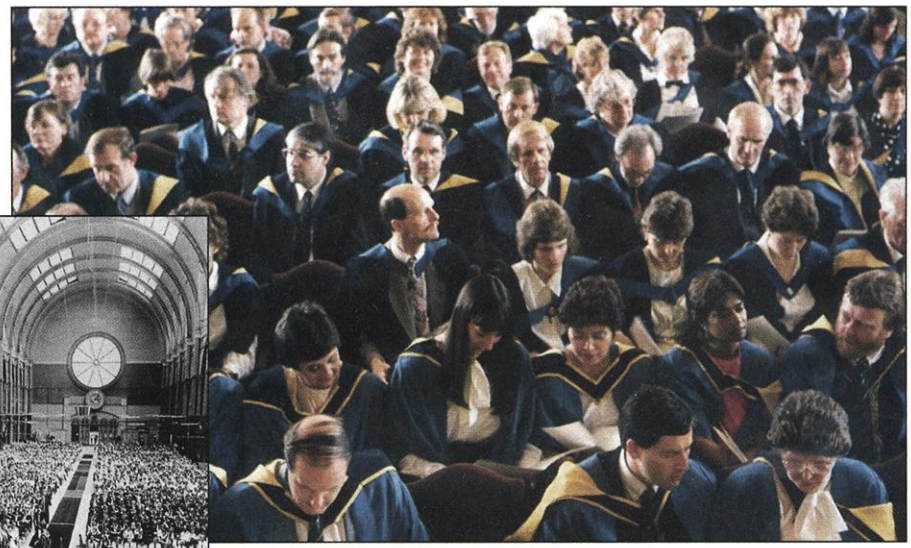
take measurements off the screen, and produce lab reports," says Bullivant.

The majority of OU students are between ages 25 and 45, although students as old as 96 have enrolled for courses. Most already hold jobs, and although there are no good data on how many move into scientific fields, evidence abounds that they use their degrees to move up the corporate ladder. Members of the armed forces, nurses, teachers, and prisoners are overrepresented in the student pool, and OU's annual intake of 6000 or so disabled students is more than any other institution of higher education in Europe, says Bullivant. OU provides such students with audio or Braille versions of printed material and transcripts of broadcast material, as well as sign language interpreters, lip speakers, and note takers.



Past present. The school's first graduating class in 1973 *(left)* began a tradition that continues today at locations across Europe.

The OU's reach extends far beyond the English Channel with 24,000 overseas students, the bulk of them in Europe. In 1999 OU officials set up the United States Open University, a smaller, independent sister institution with courses that are tailored to the U.S. market. It does not yet have a science faculty. "Science is not the place to start, as it is very resource intensive," says Peters.

The university has benefited enormously from its unique relationship over the years with the BBC. "We were pretty difficult to avoid in the early days, when there were only three [TV channels]," says Peters. And officials have nurtured those ties carefully to adapt to the changing times. "As far as science is concerned, the TV material is now used as our shop window, to attract potential students," says Bullivant. "Now, it's far easier and cheaper for us to send programming out on video." One of the OU's recent offerings was a program called *Rough Science*—soon to be broadcast in the United States—where academics, including Bullivant, were dumped on a barren Mediterranean island and asked to complete a series of science-based challenges such as making soap from the natural resources at hand (*Science*, 22 June, p. 2247).

The decision to embrace research is another factor in the OU's success. "A university education requires exposing people to where science is achieved," says Kroto. "Science is not just knowledge but also a set of approaches to uncover new knowledge. This can't be taught by someone who doesn't do research."

Rose says he wouldn't have accepted a post at the new university without the opportunity and funding to start up his own lab, maintain his research, and employ students and technicians. "Research had to be an integral part of the OU," he recalls. "We needed practicing scientists to prove we were at the forefront." OU scientists spend roughly the same amount of time teaching and doing research as their colleagues in traditional universities.

Daniel says that OU's future definitely includes Web-based material, but not as a substitute for its traditional tools. "Students often don't have the [necessary] quality of computer or Internet connection," he says, citing figures showing that fewer than half of U.K. homes have PCs, and some of those lack Internet access. Even so, the school is investing time and money in tailoring its offerings to the Web and hopes to become a leader in online instruction, too. Daniel also believes that technology must be accompanied by the human element. "New providers [of distance education] often forget that a lot of the purpose of adult education is to create intellectual stimulation," says Daniel.

That's certainly the case for Lawton, who plans to pursue a master's degree from OU in communicating science. She says that her courses were filled with "mind-blowing experiences" such as probing a lily pollen grain under the microscope and seeing its "truly wonderful intricate nature." OU officials have fed that "rush" for more than 3 decades, and they see no signs of a slackening demand. **–JOHN PICKRELL**

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WHAT'S IN A DEGREE?

These courses would provide a student like Judith Lawton with a natural sciences degree. Every course runs for 1 year unless otherwise noted. A total of 380 points is needed for a degree.

Course	Level (points)	Cost (in pounds)
Discovering Science	Level 1 (60)	£405
Practicing Science*	Level 1 (10)	260
Biology: Uniformity and Diversity	Level 2 (60)	415
Living Processes	Level 3 (30)	210
Environment	Level 2 (60)	415
Organic Chemistry	Level 3 (30)	490
Physical Chemistry	Level 3 (30)	490
The Physical World	Level 2 (60)	415
Physics by Experiment*	Level 2 (10)	290
Space-Time and Cosmology	Level 3 (30)	210

* 1-week residential lab.