nature materials Vol 2 No 1 January 2003 www.nature.com/naturematerials

A matter of survival?

Most materials science departments in the US and UK have their roots in nineteenth century metallurgy and/or mining departments. If they are to flourish and justify their existence in years to come they will need to shake off their traditional image as engineering departments and adapt to new industrial and societal needs.

The decline of traditional materials industries (such as metallurgy and aerospace) in the past twenty years has already brought about changes for materials education and research. The current direction of interdisciplinary materials research and declining numbers of undergraduate applicants suggest that many materials departments urgently need to find original ways to prepare their students to enter a growing range of industries (notably biotechnology and micro/nano-electronics) that did not even exist when most of their faculty entered the field. Meanwhile, other academics departments, notably physics, chemistry and chemical and mechanical engineering, are also facing waning undergraduate enrolment. Because these departments increasingly tend to view materials science and engineering as a subset of their own field, they all end up competing for the same students, thereby threatening their own existence. If materials science is to survive as an independent strain of university teaching, materials faculties need to gain a better understanding of how to deal with these external pressures.

As discussed during the MRS fall meeting last month* this trend may be partly due to the current infatuation with the 'sexy' world of information and biological sciences and technologies, but that does not explain it all. New ways of attracting students to materials science through curricular innovation and restructuring the undergraduate experience have been proposed. These include innovative pedagogical solutions such as a wider use of the internet and interdisciplinary examples taken from nanotechnology. These short-term initiatives are certainly welcomed, but a long-term vision is perhaps needed.

MATERIALS DEPARTMENTS, SUCH AS THAT AT IMPERIAL COLLEGE IN LONDON, ARE FIRST CLASS RESEARCH INSTITUTIONS AND EDUCATION CENTRES. IS THE DECLINING NUMBER OF UNDERGRADUATE APPLICANTS JEOPARDIZING THEIR FUTURE?

One can argue that the need to educate students not only across all materials classes (such as ceramics, metals and polymers) but also across other traditional disciplines (physics, chemistry, and even biology) is increasingly putting pressure on the materials science curriculum. One solution to this problem maybe that, although the field should remain a multidiscipline, it should be thought and taught as a coherent and single discipline.

PHOTO: DEPARTMENT OF MATERIALS, IMPERIAL COLLEGE LONDON

What would be the benefits of this approach? First, it would free the faculty from conceptual and pedagogical restraints imposed by viewing the field as an assemblage of materials classes, and provide new directions and freedom for curriculum reform. It would no longer be necessary to teach materials-specific subjects at undergraduate level. For example, instead of courses on polymers or electronic or magnetic materials the subject matter should concentrate instead on the intellectual core of the field (the processing/structure/property/performance paradigm), which addresses all materials classes. Second, it would help in choosing which topics can benefit from collaborative efforts with other disciplines and which do not. Finally, it would reduce some of the confusion surrounding the multiplicity of degrees with specific materials labels (such as metallurgy or polymers).

Whatever the future of these departments, materials research as such will undoubtedly continue to prosper. After all, Japan and continental European countries such as France and Germany — despite having no dedicated materials departments in their universities — demonstrate great vitality in materials research through strong research institutes in specialized areas of materials. What is at stake here is materials education, and the need to strengthen the visibility of the field in the mind of the general public to equal the traditionally coherent disciplines such as physics and chemistry.

Therefore, if the majority of these departments are to survive as independent academic units, it is crucial for them to concentrate on education and recruit faculty members with broad interests, creativity and charisma who will be capable of attracting the brightest students and bring excitement to young scientists.

*Materials Research Society Fall Meeting, Boston, Massachusetts, 2–6 December 2002.