

Biosciences

Sampling the smorgasbord

Contemporary biology is exciting and challenging. New organisms are being discovered, cell life and death are being explored, unique molecules are being synthesized.

But the cutting-edge of science requires strong foundations. So when you face your selection of courses at university, you need to begin with basic concepts and knowledge relevant to the changing biosciences.

It is natural for science to change with time. Boundaries between traditional disciplines become blurred as common technologies emerge. Scientists working on organisms in the 1970s moved to cell biology in the 80s and molecular biology in the 90s. This transition has been spectacular. More than ever, students must understand molecular processes that underpin life sciences, biomedical research and biotechnological applications.

Even our approach to biology has even changed. Early descriptive studies identified organisms; experimental and analytical studies then examined smaller components, while recently, integrative studies have attempted to reconstruct the 'big picture'. Many believe we are entering a new descriptive phase - but aimed at molecules.

Molecular biology has become fundamental to much of science. Microbes are being manipulated, genes are being sequenced, and organisms are being cloned. Indeed, many genome projects are nearing completion, thereby signalling the dawn of proteomics - studies on gene products.

Protein studies are set to dominate the next decade and students will require state-of-the-art molecular knowledge and computer skills. Universities have responded by creating relevant molecular biology courses supported by computer laboratories.

While technological advances have generated greater complexities in science than ever before, they have also provided valuable tools for science education. Information technology is opening up the classrooms, allowing a shift from fixed classes to flexible delivery and distance education.

There is generally good continuity between the science curricula of primary and secondary schools, especially for the 'enabling' sciences (chemistry, physics, mathematics) and natural sciences. However, many university students enrolling in science have not formally studied biology.

The solution has been to create a biology smorgasbord: to offer broad interdisciplinary courses to first year students so they can sample everything.

This strategy has four advantages: it gives students a holistic conception of biology; it establishes a level playing field; it provides them with sufficient information to make informed choices; and it defers their need to choose until later in their degree.

The Bachelor of Science - BSc - is a flexible generalist degree which accommodates many fields of study. Students graduate with named 'majors' and many universities have progressed to named degrees to confer market advantage.

Topical fields of study include biomedical sciences (neuroscience, drug design), molecular biology (DNA and protein technology), computational biology (bioinformatics) and biotechnology (biomaterials, process technology, nanotechnology).

Students should tailor their programs and, indeed, increasing numbers seek double majors or dual degrees to improve employment opportunities. Science has been paired with law, business, economics, arts, education and engineering. Many degrees

also include professional topics such as commercialization, intellectual property, patents and management.

Fields of study must be contemporary and relevant. They should show evidence of regular review to ensure content and enrolments match prospective markets. However, not all disciplines are accessible through an ordinary degree, so students must consider postgraduate options. There is a global trend to postgraduate entry in some professions (for example in medicine and veterinary science).

Education must be regarded as a life-long process to keep apace with recent developments. There is strong demand for continuing education and refresher courses for graduates. Emphasis is placed on expert knowledge, but scientists need more.

Courses must address generic skills required by all scientists, such as critical thought, communication and ethical and social understanding. Graduate attributes should be stated explicitly within programs and students should look to problem-based learning for vocational context, relational thinking and communication skills.

Universities have been criticized for being long on theory and short on practice. But in biology, laboratory sessions are essential to practice descriptive, analytical and interpretive skills. Look for courses with significant practical components.

Finally, students should consider more than course appeal and employment prospects. It is important to build on personal aptitudes and to critically evaluate any restrictions (such as financial and family commitments). Well-meaning advice from relatives and friends is not always correct, so take full advantage of the student counselling and careers advisory services provided by universities.

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