

Forestry in British Higher Education

A tale of decline and regeneration

An expert panel of **James Walmsley, Peter Savill, Jeff Burley, Julian Evans, Russell Horsey, Andrew Leslie, Jan Falck, John Innes, and Jim Waterson** take a close look at the way in which forestry is taught at university level.

As outlined by Burley et al. (2009), academic forestry is not a discipline in its own right like botany or zoology but multidisciplinary, akin to engineering and medicine. Even if it is narrowed to the biology of woody perennials and the art of managing them, it still embraces many other elements of natural sciences, as well as some economic, social and environmental sciences, engineering, policy, management and business studies. Forestry education must therefore introduce scholars to this wide range of disciplines and this can present a number of interesting resourcing challenges for educational institutions, particularly when relatively few students choose to study forestry.

It is hard to underestimate the size of the challenge facing individuals and institutions engaged in forestry education. The timescales involved with forestry are perhaps the greatest challenge at a time when concepts such as 'just in time' and 'instant gratification' are the norms of society. In the case of the UK, this challenge is well set out by Nijnik and Mather (2007), who noted: "the forests we see today across the UK are a product of [the recent] past...established under circumstances that no longer exist and for purposes that are no longer relevant". Given such circumstances, forestry graduates today need to be equipped with a ready grasp of, and the skills and knowledge to, develop complex dynamic forests that can be managed to meet unexpected needs, survive unexpected threats and adapt to ever changing societal expectations.

In education evolution occurs constantly and fashions change. Generally speaking, up to and including the 1950s and 1960s a great deal of forestry teaching emphasis was on

the biological and ecological aspects of forestry, especially botany and silviculture. Management, economics and policy were also significant components of courses. Certain subjects that used to be covered, including law, engineering and surveying, were dropped, while from the 1970s much greater emphasis was put on management and policy though the former emphasis on economics declined in some institutions. Since the early 1990s there has been a considerable loss of educational provision in Britain, with many of the traditional forestry schools, such as Oxford and Edinburgh no longer offering forestry degrees.

There have been substantial developments in the forestry profession since the 1970s. Technologies such as Geographic Information Systems (GIS) and Remote Sensing have emerged whilst concepts such as sustainable forest management, multipurpose trees, continuous cover forestry, agroforestry, environmental forestry, social forestry and urban forestry have been coined. Though not new, all have become subjects worthy of special attention and have modified the subjects taught in courses. More recently still, forestry employers have sought changes to the set of skills and competencies required (e.g. Sample et al., 1999; Bullard et al., 2014) and these continue to develop as society's expectations of forests evolves (e.g. Forestry Commission, 2010). Leslie (2014), for example, believed there are two obvious, big directions for forestry in England: the first is around towns and cities, and the second is related to the low carbon economy and climate change. Few university departments have had the resources to recruit academic staff with the necessary backgrounds to deal with the many additional subjects adequately. Also, the range of material

that forestry practitioners are expected to know and the skills they are expected to have acquired are now so wide that it is virtually impossible to acquire them solely within the span of a 3-year or even 4-year undergraduate degree programme. So, what is needed is a forestry education system that can produce adaptable graduates with the ability to gain new skills independently through their careers, enabling them to respond to new challenges and continually update and improve their knowledge and expertise.

Looking back: nostalgia and the decline of forestry in higher education

It is probably because of the varied and interdisciplinary nature of forestry that its value as an academic subject has been viewed with suspicion by many universities (Innes and Ward, 2007). At the heart of this is the challenge of linking research ambitions (attracting regular funding, producing high impact journal outputs) with teaching a topic that concerns time horizons of decades and centuries. O'Hara and Redelsheimer (2012) showed that in the United States there had been a contraction of forestry programmes at universities with a strong research emphasis, and an expansion at other universities and colleges in programmes with little or no research education. The same trend has been evident in Great Britain.

Taking Oxford as an example, relations between university management and the Forestry Department were somewhat fraught from the start of the 20th century. Virtually throughout the life of the department it suffered from a view held by university authorities that forestry (and agriculture), with their dirty-booted, horny-handed foresters and farmers, were not academic topics worthy of Oxford University qualifications and resources.

Contrastingly, because of the considerable professional emphasis in courses, a belief has now become firmly established in many other universities that forestry education is more appropriately taught at postgraduate (MSc), rather than undergraduate level and recent initiatives, for example, at Harper Adams University continue to reflect this with the launch of their MSc in Forestry Management. This new programme features significant industry professional input and modular block delivery designed to enable study alongside work. Postgraduate forestry student numbers (~60 full-time equivalents) are now equal to undergraduate numbers (~60 full-time) at Bangor University. At Edinburgh University the highly successful postgraduate MSc programmes routinely attract a broad student base, which

comes back to forestry, often with an international focus on poverty alleviation and on the placing of forestry within wider political, social and economic contexts.

In recent years forestry departments have been incorporated into such entities as schools of biological sciences, geography, environmental and natural resources or ecological sciences. Many universities now offer 'forestry' degrees that are amalgams of courses offered by a range of departments. From one perspective this potentially enables the full range of disciplines relating to forestry to be covered. At the same time, this approach runs the risk of a loss of course cohesion and forestry specific context for students, and may potentially leave key forestry-discipline specific skills, such as forest management, mensuration, silviculture and soil science vulnerable if they cannot also be offered to other degree courses.

In Oxford the last undergraduates reading for the 3-year honours degree in Forestry were admitted in 1969, and the degree was replaced by a highly successful and popular degree in 'Agricultural and Forest Sciences'. This endured until 1981 when changes in government funding arrangements to universities reduced contributions to agriculture (including forestry) very significantly, while increasing those to biology. The consequence of this was that the Final Honours Schools of Botany, Zoology and Agricultural and Forest Sciences were merged into Pure and Applied Biology and, in 1988, to Biological Sciences, which has remained until the time of writing in 2015. In both these degrees aspects of the philosophy, science and practice of forest resource management were and are taught as components of very wide-ranging biology courses but, though popular, they comprise minor parts of these courses. This mirrors almost exactly the same trend found at the Faculty of Forest Science at the Swedish University of Agricultural Sciences. There, forestry has suffered a gradual reduction in status as an academic subject. Where once there was a strong Department of Silviculture it is now a small group of teachers in the newly created Department of Forest Ecology and Management.

At Oxford, the 1-year taught MSc course in Forestry (which for most of its 30-year existence was called Forestry and its Relation to Land Use) largely replaced the older Forest Officers' Diploma course in 1971 and effectively provided a fourth year to the 3-year undergraduate courses. Demand for the Diploma and other British forestry education had fallen because most former colonies had by then developed their own programmes. This is especially the case

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in Asia. Though the Oxford MSc course was popular and attracted many outstanding candidates, it began to suffer a decline in the numbers of qualified applicants from the mid-1990s, in common with forestry courses worldwide. This also meant universities were less selective in the applicants they accepted, reflecting a trend of declining interest among school-leavers in pursuing careers in science generally and in the vocational applied subject specifically. Possibly parents discouraged applications from future graduates that they believe might lead to what they saw as 'dirty jobs'. Further, in some developed countries at least, there has been a strong public opinion against the term and the practice of 'forestry'. The term 'woodland' is favoured in Britain, though not in North America, (reflected in the title of various UK charities such as Woodland Heritage, Woodland Trust and Small Woods Association, which seem to appeal far more to the ear than the alternatives: 'Forest Heritage'; 'Forest Trust' and 'Small Forests Association').

There has also been an increasing requirement among some employers, as well as funders, for more emphasis on social sciences in forestry and more recently 'people skills' (Bullard et al., 2014). The Institute of Chartered Foresters Continuing Professional Development survey (ICF, 2010) showed climate change and business skills to be the greatest gap in terms of knowledge of ICF members, echoing an earlier US survey (Sample et al., 1999) of forestry employers, educators, and recent graduates that revealed some discrepancies between what employers want and what university departments could provide.

In British universities today, many departments that teach forestry are funded according to the quality of their output of biological/environmental research; hence many are both ill equipped and unmotivated to respond to demands specific to forestry teaching. In addition, forestry (as with all field-based sciences) attracts relatively small research grants compared with the molecular sciences, and forestry journals have relatively low 'impact factors'. Research income for many universities is vital for the appointment and retention of academic staff so it is scarcely surprising that, as forestry staff leave or retire, there is often a risk that they are replaced by, for example, molecular biologists. Exactly the same trend has occurred at the Faculty of Forest Science in Umeå where the Swedish University of Agricultural Sciences is striving to become 'an international university of excellence'. Molecular researchers take over most positions and applied research has problems in competing for resources.

This problem is compounded by metrics-based

measures of performance such as the number of papers published and the number of times they are cited. Traditional, field-based, forestry research involves long lead times and can be restricted by field seasons, weather and other factors, limiting the numbers of scientific papers that can be produced. Laboratory-based research suffers from fewer such constraints, enabling larger numbers of experiments to be reported. In addition, the shrinking number of forestry researchers globally means that there are fewer and fewer people available to cite forestry research, whereas the opposite is the case in the molecular domain. The number of competent teachers of forestry is declining and the numbers of PhD and post-doctoral researchers in Umeå is now very low. There is no light at the end of this tunnel. By contrast, at the University of British Columbia in Canada, it is student recruitment that drives the recruitment of academic staff. Research income is spent on research, but forestry researchers still have to compete against molecular biologists and others for research funding.

The loss of a core of dedicated, qualified and experienced staff is not something that can be reversed quickly. As foresters, we devote much thought to the sustainability of our forests, but far less to the sustainability of our forestry education system, which is surely a fundamental component of implementing sustainable forest management?

It is impossible to value the true academic worth of the components of a forestry education, and the benefits to a university's international reputation that forestry's world-wide connections and influence can have on governments, international agencies and society. It is ironic that, at a time when recognition of the importance of forests has never been greater, there is a global decline in forestry education (Innes, 2010). Kanowski (2001) provided an excellent, broad review of how forestry and forestry education has changed since the establishment of the first forestry school in Germany in 1789. He noted that forestry education is evolving from the traditional undergraduate/postgraduate on-campus mode to one that is both more flexible and more continuous. Above all, forestry has changed in that it is no longer about trees but about people. Forestry education has evolved largely in response to changing markets and social attitudes and desires. Research and education have contributed relatively little to the evolution. Unless this changes, Kanowski stated, there is a risk that forestry will become marginalised as a profession. Key curriculum decisions could end up being made by individuals or organisations that lack adequate understanding and experience.

The changing nature of forestry teaching in higher education

There have been a number of attempts at defining the necessary skills and directions that forestry should go in the 21st century, ranging from the Sa Pa Workshop Agreement in Vietnam, to employers in the USA and Canada.

IUFRO (2014) in its review of teaching needs concluded that the development of skills, enabling graduates to tackle novel, complex problems, has been widely missing and the focus was on contents of courses instead of generic skills and methodical competence. This view is echoed across many disciplines, especially when the view comes from employers (World Economic Forum, 2015). Other developments include the growing role of universities in continuing education, new approaches to distance education including technology and didactics of e-learning, and the movement towards Open Education Resources (OER). The role that some of these changes will play in British forestry education is uncertain, but with students becoming increasingly mobile, and curricula becoming increasingly international, it seems likely that the current global pattern of forestry education is more dynamic than many people realize (or admit).

The IUFRO report concluded that the development of forest sciences curricula should move towards:

- Focusing on generic and methodological competence instead of contents and descriptive approaches, enabling graduates to tackle novel, complex problems.
- Developing competence to integrate and communicate knowledge across disciplinary borders and to analyze the existing interactions.
- Developing new learning units addressing challenges such as climate change, adaptive ecosystem management, governance systems, gender issues, forests as sources of energy, role of forests and forest products in rural development and poverty alleviation, as well as the assessment of other environmental and social impacts.

The first and third conclusions of IUFRO (2014) somewhat contradict each other, with the first point suggesting that forestry education should adopt the 'problem-based learning' model of education commonly used in medical training, whilst the third point suggests that additional 'content' should be 'taught', harking back to the traditional didactic model of education. This reflects the uncertainty about optimal teaching methods that has been brought

about by an increased understanding of how students learn, and by the opportunities created by the increased use of technology in university teaching. For example, the 'flipped classroom' moves the emphasis on acquiring new material outside of the classroom, with students reading material first and then using the classroom to analyze and discuss what they have learnt.

In any case, changes reflecting some of the IUFRO conclusions are afoot in some forestry education institutions and these offer great hope for reversing the declines of recent decades. The internet makes the world a much smaller place and presents huge opportunities to increase learning opportunities in forestry. The advent of Mass Open Online Courses (MOOCs) represents one approach and it is now possible for anyone, anywhere in the world, to 'study' online (with no tuition fee) at leading academic institutions. For example, in early 2015, the University of British Columbia produced a free course on 'Forests and Livelihoods in Developing Countries' (edX, 2015), providing a 'taster' of university forestry education to a worldwide audience who may then decide to pursue further forestry education opportunities.

Looking forward: evidence for optimism in Britain

Given the significant challenges that forestry education has faced in recent decades, five new members of academic forestry staff have been appointed at Bangor University in recent years (Walmsley, 2013), partly due to the success of the part-time postgraduate forestry distance learning programmes. Among the advantages of distance learning are, for those already employed in forestry, that it is possible to update knowledge in a flexible way, pursue other opportunities without the loss of paid work, and gain additional experience outside the course which relates directly to it. The number of mature professionals from other disciplines who use the distance learning course to change career is surprising. They enable much needed fresh insights, energy and expertise to be brought into the forestry profession. Distance learning also brings a new international forestry education dimension through the new MSc Tropical Forestry programme. The support of the Commonwealth Scholarship Commission since 2011 has enabled dozens of forestry professionals from across the Commonwealth to study forestry at Bangor from a 'distance', with tropical forestry summer schools providing essential opportunities for face-to-face field-based teaching and learning.

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At the same time, Bangor University is currently focusing efforts on enabling its part-time MSc distance learning students to study alongside full-time MSc students. Internet technology enables those who are distant from Bangor to 'attend' lectures in real time, participate in group discussions and activities with fellow students and even record and upload presentations to be shown to staff and students in Bangor. In essence, staff investment and resourcing of traditional, forestry-discipline specific topics such as silviculture can be prioritised due to greater student numbers per course, and high quality forestry teaching can reach a far wider audience of students who are remote from Bangor, than merely the (relatively few) students registered on traditional, full-time, face-to-face courses. At Edinburgh, several new MSc courses have been launched to replace the traditional Forest Ecology and Management and Resource Management degrees, which had been the workhorses of postgraduate forestry and agroforestry teaching for about 30 years. Carbon Management, Ecosystem Services, Ecological Economics, Environmental Sustainability, and Environment and Development have complemented a large suite of MSc courses offered within the School of GeoSciences, with expertise drawn from the complementary degrees of Geography and Earth Sciences. Some of these MSc degrees are offered in collaboration with SRUC (Scotland's Rural College), with Certificate options available also for online distance learning.

The National School of Forestry (Cumbria University) recently moved to a new campus in Ambleside and is recruiting staff, as is the Scottish School of Forestry (University of the Highlands and Islands). In addition, new forestry masters programmes will be launching soon and aim to reflect the changes that employers seek. There are other indications that forestry education is being revived in Britain. The University of Cumbria has had two consecutive years (2013 and 2014 intakes) of excellent recruitment of between 30-40 undergraduates each year in the full-time undergraduate courses and good students rapidly find employment.

During May 2015 in the UK, according to the University and Colleges Admissions Service (UCAS, 2015), some 31 undergraduate courses claiming to contain at least an element of forestry are currently being offered in eleven institutions, and 29 postgraduate courses. The Institute of Chartered Foresters website (ICF, 2015) lists 30 courses, run by nine institutions, for which at least some exemption from their professional exams is available. Of these, 20 are

undergraduate courses, eight postgraduate, and there are two others (HNDs). Only the six BSc (Hons) courses are given the maximum levels of exemption. In reality in the UK there are currently three major players: Bangor, Cumbria and the Scottish School of Forestry (plus those teaching arboriculture). A booklet published by the Norfolk and Suffolk Woodland Working Group (2015) lists 11 providers of Higher Education in forestry and arboriculture, and 18 Further Education providers.

One important fact provides evidence why forestry education should prevail as a degree course; that is, good forestry graduates have no difficulty in securing employment, sometimes even before they have their degree results. This, of course applies to any subject. However, the forestry profession is frequently bemoaning the shortage of high quality forestry graduates.

Looking forward: evidence for optimism overseas

At the Faculty of Forest Sciences at the Swedish University of Agricultural Sciences in Umeå the number of undergraduates choosing a forestry education remains stable and high. A new Professor of Forest Science has been appointed at Oxford University. The newly formed Oxford Centre for Tropical Forestry in the Oxford University Centre for the Environment is an excellent research unit and provides some teaching in social, environmental and policy topics. At the University of British Columbia (UBC) in Canada the gloomy backdrop as it appeared in 2009 has not transpired. Amalgamations or losses of educational capacity continue, but many of those that survive are doing quite well. The UBC has almost 900 undergraduates and 250 graduates in forestry (more than ever before), and numbers at most of the other Canadian forestry schools are picking up. Graduates are having no difficulty finding jobs, and the position of 'forestry manager' has recently, along with 'mining manager', been identified by Canadian Business magazine as the most attractive job in Canada. The situation in the USA differs, with good schools picking up, and poor ones continuing to decline. It seems that the principle of 'survival of the fittest' also applies to forestry schools.

Concluding remarks

There can be no doubt that it has been a difficult time for forestry education in recent years. However, nostalgia and reminiscence are not going to ensure that forest education survives. Instead, those of us involved with forestry

education, as well as members of the profession in general, must seize the huge and growing societal recognition of the importance of forests and use it to our advantage. We can use the internet and related information technology imaginatively and creatively to enable a global audience to participate in learning more about forests and forestry. This will ensure demand for forestry knowledge and expertise is increasingly recognised and valued and helps guarantee the future sustainability of forestry education. It is important to bear in mind that, while the use of internet technologies offers tremendous flexibility in learning, it cannot fully substitute for field skills in a practical discipline like forestry. Perhaps the greatest difficulty facing educators is tackling the potential breadth of skills required by a forester. Educational institutions can not work in isolation and we all need to be promoting the sector and the careers on offer whenever the opportunity arises. However, the problem remains that current trends suggest a future where the diminishing amount of forest science research activity becomes increasingly separated from practice, raising the questions of who will teach in more applied, predominantly teaching universities, who will do the applied research (O'Hara and Redelsheimer, 2012) and how will these two worlds interact?

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