The Future of Forestry Education

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In this seminar, I want to provoke some discussion on the broad issue of "forestry education", not merely talk about the proposed syllabus for undergraduates next year. A seminar implies discussion, so I pose some questions and deliberately try to be provocative. Circumstances made this a very personal view, rather than a scholarly review of the literature.

Stakeholders

Friends in human resource management would have me commence by asking the question: Who are our clients? I do not find this a productive approach, as I dislike the connotation of a financial transaction between an active seller and a passive buyer. Education involves more commitment from both parties; it is marriage rather than prostitution.

A more serious limitation is that the dominant answer may be "the Forest Services". This focus invites the Forest Service chiefs to prescribe the forestry syllabus, and their preference may be for dependable bureaucrats rather than creative thinkers and responsible professionals. One Conservator of Forests remarked that he needed "sturdy stock horses, not flighty thoroughbreds", and I suspect that this remains the paradigm for many forestry courses. It may be appropriate for technical schools, but tertiary institutes should have greater aspirations, encouraging a diverse range vertebrates (Yes! our graduates need backbones). We should be much more than a training school for forest technicians, so I would like to frame the question differently.

Who are the key players in forestry education? Four groups may be recognised:

- Providers, including universities, technical training schools, and professional institutes;
- Participants (not recipients or clients; we need active involvement), including graduate and undergraduate students, forest managers and researchers, planners and policy makers;
- Beneficiaries, including potential employers, the public, and global biodiversity;
- Intermediaries, including the media, primary and secondary schools.

The nature of forestry education, now and in the future, should be determined by the needs and abilities of all these players. It is unlikely that they will all share the same vision, but it is unnecessary to obtain a consensus. Forestry education should be flexible enough to accommodate the wishes of all these players, without prejudicing any. Our mission is not merely to train participants for beneficiaries, but to stimulate all players to gain a better understanding of forests, and to equip them to share and further increase their knowledge. We need diversity amongst the topics and participants in our education systems to challenge existing paradigms, and to promote constructive criticism and innovation.

Forestry Education Today

To create a productive vision for the future, we must first have a good understanding of the current situation. We are in the midst of a revolution in forestry. There is an increasing emphasis on holistic and non-wood aspects reflected in the American term "ecosystem management" (e.g. see Journal of Forestry 92(8), August 1994). Some pressure groups are seeking to divert all timber production from natural forests to plantations. Forest services have been restructured, amalgamated, and may be turned into timber corporations. The "unified national system of higher education" has changed the funding basis for many universities.
Has the paradigm of the "sturdy stock horse" changed in response to this new environment? Would forest services today choose an astute entrepreneur over a hirsute tree-feller or a flamboyant researcher? Can universities deliver graduates in that mould? Should we? For me, the mould is irrelevant; our primary objective should be to encourage creative thought. We must not try to force students into a preconceived mould, but should encourage them to develop in any way which they find fruitful. To do this, we must provide a solid foundation spanning a wide range of topics relevant to forestry, and stimulate students to think critically and independently.

Eric Bachelard recently argued in the Commonwealth Forestry Review (73:94–96) that universities should train foresters to be jacks of all trades but masters of some, and should prepare them for a "continuing process of self-education and re-education". He observed that

"traditionally foresters have been trained to have an appreciation of the basic physical and biological sciences pertaining to forest ecosystems, a knowledge of the sciences, technologies and economies which underpin both wood production and environmental management, and a professional experience of forest policies and economic and management systems. Forest managers ... must have sufficient understanding ... to formulate and supervise the implementation of appropriate management plans; to be able to communicate meaningfully with experts in other disciplines ...; and to be able to determine when that expert advice is required."

He noted that foresters need a "greater appreciation of the social and cultural environment in which they work, a willingness to modify their practices to meet changing community demands, and a greater ability to communicate with the public they serve".

In short, as Jack Westoby repeatedly emphasised (e.g. in Introduction to World Forestry, Blackwell, 1989), that forestry is about people. And about managing forests to serve more people in more generous ways. This requires foresters to be effective communicators, to work productively in multi-disciplinary teams, and to be able to gauge and guide community wishes and expectations. The most important and durable qualities of the forestry course may be the way that broad training in the basic sciences is coupled with communication skills. These qualities are required in all areas of resource management, so it is no surprise to see foresters leading conservation and land management organizations.

The Future of Forestry Education

Can we prepare people for the cultural and work environment they may face in the future? Undergraduates may have an effective working life of 40 years; can we equip them suitably?

Consider some of the changes in forestry during the past 40 years: remember when we used hand-cranked Munro calculating machines, slide rules and logarithm tables, how we harmonized volume lines graphically, when surveys were based on a compass and chain, when telephones had cranks instead of dials or buttons, and when the only wood composite board was masonite. Could the Australian Forestry School have prepared its graduates better if it had anticipated transistors, satellites, optical fibres and medium density fibreboard?

Recall that the prevailing land use ethic was that "the productive wealth of the country ... suffers from the fact that there are too many rather than too few trees" (Royal Commission, Queensland, 1931). Could educators have foreseen the rise of the conservation ethic, and if so, would foresters have handled the transition more professionally? Many foresters seem to have coped rather well with many of the technical advances during the past few decades, but seem to have found social and cultural changes more difficult to deal with. This suggests that while we should keep abreast of technology, we should take particular care to help students prepare for a changing cultural and work environment.
Emerging Technologies

During the next 40 years we may anticipate many exciting technical developments:

- teleconferencing and computer networks will allow us to work and study from home;
- etherial libraries and hypertext documents will simplify information retrieval;
- real-time high-resolution remote sensing will change the function and frequency of field visits;
- quantum computing will enable large-scale physiologically-based models with unprecedented detail and accuracy;
- information systems (including remote sensing, geographic information systems, digital terrain models, dynamic growth models) will be integrated with virtual reality terminals so that users can make magic carpet or "tardis" journeys through forests near and far;
- expert systems will place the world's best brains within easy reach of every resource manager and assist them to diagnose and solve any problem;
- operations research and decision support systems will optimize silviculture and management for any objective we can specify;
- robots will do all the heavy, dirty or dangerous work;
- genetic engineering will create trees that grow faster and straighter, that are pest-resistant, tolerant of difficult sites, and have more interesting commercial properties;
- polymer technology will allow us to make wood of any species strong, durable and attractive – perhaps even from algae.

How can we equip people to deal with technological advances such as these, even if only half these predictions eventuate? We simply cannot provide the technical skills in any significant way. These elements of a course may have a very limited service life; half the content may be redundant in less time than it took to complete the degree (the half-life of an M.D degree has been estimated at 7 years). This means that we must provide on-going in-service training for all professionals to update their technical knowledge. Some components of a degree course are more durable, and we must take special care to provide students with a good foundation in these areas. Thus we need to provide broad coverage in the physical and biological sciences, in the philosophy of science, quantitative skills, communication, and management. One of the strengths of the B.Sc.(For) course is the way it integrates a broad range of elements. Australian foresters (notably the members of the Australian Forestry Council's Research Working Group on Mensuration and Management) have acquired an international reputation in systems design and implementation; we seem to have a flair for the "big picture" in decision support systems, in linking area, inventory and planning data, and in efficiently building "total solutions". We should build on these strengths, as they are qualities that will endure.

Perhaps a more important question is to ask how we can make these emerging technologies a practical reality, and how we can influence their direction and implementation. Are these changes desirable, will they improve our quality of life, are they benevolent to the environment? If we are to participate in these developments and influence their progress, we must have excellent and innovative research. This means attracting high calibre students, providing good facilities and a stimulating environment, and supporting them with active supervision. It requires staff with the inspiration to ask searching questions and the enthusiasm to assist with applied problem solving. We cannot and will not attract good students with guaranteed employment or lucrative salaries, but we may attract them by gaining their interest and respect, and by posing challenging problems for research. Our role is to help them to develop, some into highly specialized technocrats, some into visionary systems modellers, and many into innovative generalists who are mentally prepared for this changing environment.
Social and Environmental Challenges

The next 40 years will also bring many difficult challenges:

- the world's population will double, and human appropriation of resources may increase from 40 to 80 percent of nett primary production;
- global biodiversity will fall at least 10 percent;
- there will be a critical shortage of clean water, food, space and other resources, and an excess of domestic and industrial waste;
- the climate may be chaotic because of anthropogenic emissions of greenhouse gasses and other atmospheric pollutants;
- pollution of land, sea, and air, will stress all plant and animal life.

These problems will not respect national boundaries, but will become everyone's concerns. They may revolutionise forest (and National Park) management, and render our present attempts to protect rare fauna and flora completely irrelevant.

The current tragedy in Rwanda may be a taste of the future; if so, we will be physically incapable of turning away refugees arriving on our northern shores. It will be cheaper, easier and more effective to address these problems at their source. We must look across national boundaries in formulating our research and education strategies, not simply for humanitarian and environmental reasons, but because our lifestyle, standard of living, and unique fauna and flora depend on solving these and related problems abroad. It is important to realize that international activities need not be a nett drain on our resources, but offer many benefits by posing interesting challenges and offering new experiences. One notable example is the way in which the Nepal-Australia Forestry Project has enriched the professional and private lives of many Australian foresters, infusing Australian forestry with new experiences and insights. Overseas experience may be an efficient way to prepare young professionals for the social and cultural changes they will experience during their careers.

We cannot solve all these problems, nor provide all the skills necessary to manage forests under such a scenario. But we can come to understand the forces and processes involved, and build models so that we can demonstrate to politicians and policy makers the implications and consequences of various actions (including inaction). Such models can help to formulate realistic alternatives. This kind of research and advocacy requires scientists who are flamboyant and independent; who read widely, think laterally, communicate fluently; who are adept with numbers and comfortable with computers. How do we stimulate students to rise to the challenge? One way to promote these skills is to progressively replace lecture+examination based learning with research+assignment exercises as students progress through the course. A further step in this direction would be to require all students to complete some independent or team research (such as the current management plan exercise), to be presented as a poster display in a public venue (e.g. a shopping mall) and a public seminar, as well as in a more traditional scientific paper or management plan format.

The Forestry Profession

Some of my colleagues are concerned that forestry is no longer universally recognised as an honourable profession. If that is so, we should not blame our critics, but should criticise ourselves. Some essential elements of professionalism include training, experience, ethics and community respect. We cannot demand the respect of others; we must earn it through responsible leadership and active participation in land use planning and resource use debates. We should not compromise for expediency, but should argue for rational decisions founded on sound ecological, economic and social principles. Foresters should not walk away from potential confrontation, but should be able understand other viewpoints and find harmonious solutions. We work within the socio-cultural
framework of our society, but we must influence it, not merely conform to it. If we show true leadership, we will earn respect, irrespective of whether we are called "foresters" or "resource assessment officers".

Many students are attracted to forestry, not because of the opportunities for communication and consultation, but because of the solitude of the forests. If we are to revive forestry professionalism, we must stimulate these students (and practising foresters) to improve their interpersonal skills, and should change this "lumberjack" preconception of forestry so that we also attract students with other gifts.

Professionals should be able to respond to criticism in a mature way. In the role of journal editor, I have been surprised at the number of reviewers, who, despite the journal's policy of anonymous refereeing, make a special request that their identity is not disclosed because they do not wish a critical review to spoil their friendship with the author. Perhaps we can encourage a more mature attitude to criticism by requiring final year students to formally review each other's assignments.

There seems to be more criticism of the forestry profession in English-speaking countries than in continental Europe. In Denmark, the only undergraduate forestry course enjoys an entry requirement higher than any other subject (including medicine and law), with an intake of 60 students each year. My Department of Economics and Natural Resources at the Royal Veterinary and Agricultural University in Copenhagen comprises three units that work in harmony: Economics, Forestry, and Urban and Rural Planning. We share a second campus with the Danish Forest and Landscape Research Institute. Many of our Candidate of Silviculture graduates are employed by the National Forest and Nature Agency. No insurmountable conflict is seen between economics, forestry, land use planning and nature conservation. This is not because the Forestry Unit is "green": our wood technology team is intimately involved with industry, and most of our staff and students are keen hunters. Rather, it is because foresters have exhibited mature leadership and active participation in public debates over a long period (notably C.D.F. Reventlow, 1748-1827, forester, author of the first Danish yield tables, agrarian and social reformer, statesman and chancellor), and thus have earned wide respect, even amongst green groups. Two of my graduate students were amongst the founders of, and remain active in Nepenthes, a rainforest conservation society, but this does not conflict with our mutual interests in biodiversity and ethnobotany in Latin America. We must recognise that people can respect our ability without agreeing with our philosophy. It is not a question of going "soft on forestry", but one of inspired leadership.

I don't want to convey the idea that the Unit of Forestry in Copenhagen is perfect. It isn't; there is room for improvement, especially in some quantitative areas. But that's important too: you don't have to be perfect to gain respect. Some blemishes don't matter if the foundations are sound and the overall integrity is maintained.

**Earning Respect and Striving for Excellence**

The future of forestry education is inescapably linked with community attitudes toward forestry, so the University must work together with the Institute of Foresters and others to improve the professionalism of foresters and the image of forestry. This will not be easy, especially as the current enthusiasm for privatization forces forest services to change their focus from the "big picture" of ecosystem management towards entrepreneurial timber production. But we must ensure that forest planning and management, and the conduct of logging, maintain the highest standards. Foresters must lead not only the controversial forest planning debates, but also the discussion of broader ecological issues such as the proposed draining of Lake Pedder, the management of fire in forests and around cities, environmental degradation of agricultural and pastoral lands, and land use and management in
the Murray-Darling basin. We must work with the media to make sure that they get the story right, and that they convey it to our clients: the public. This Department can play an important role in equipping students (and forestry professionals) to deal confidently with the media and with confrontation.

Public relations are not enough; we also must re-vitalize this Department. We must have stimulating lectures, challenging tutorials (in the lab and the field), and innovative research. This requires adequate resources. Staff cannot function at their best when they routinely have 8 hours student contact during a 10-hour day (it happens!). Every member of staff should contribute both to teaching and research; anyone who has nothing to contribute should not do it here. Clearly, it is important to strike a happy balance between research and teaching; this balance may vary between individuals, but our best teachers should find some time for their own research, and our best researchers must communicate their ideas and enthusiasm. Research need not be confined to the pursuit of new methodology; it is equally important to compile authoritative reviews, and in doing so, to consolidate existing knowledge and identify gaps and deficiencies. We should not become preoccupied with the "amount" of research and the number of papers; it's quality and innovation that count. And we should take special care not to get bogged down in administration.

Staff and students should be exposed to a wide range of ideas, by reading, participating in conferences, and through an active program of exchanges and visiting lectures. Certainly, this costs money, but I am confident that funds will be available if we excel. We also gain through cooperative research with other universities, institutes and industry; the whole is greater than the sum of the parts. All staff should undertake some consultancies to keep in touch with the "real world"; this is especially important when staff turnover is low and where staff members may serve in the same role for many years. Our disciplinary base can be increased further through job sharing and permanent part-time employment, if this is mutually convenient for staff and the University. Ideas should be shared internally as well as externally, and every member of staff, every graduate and final-year student should give an informal lunch-time seminar each year. The emphasis of these seminars should be the constructive criticism of research in progress, not necessarily on polished presentations. The seminars should be open to the public, and we can judge our performance and relevance from the public participation.

Sharing ideas and information raises the question of intellectual property rights. As researchers, we face a conflict: publish or patent? A new technique to grow or use wood more efficiently could be patented to make a lot of money, or published to save a lot of forest. The latter course of action may be the correct one for an educational institution whose primary function is disseminating information and honing skills, but these decisions are also influenced by finances, research partners, and government policy.

Working in Europe is stimulating because of the high level of international cooperation and constant exposure to different ideas and experiences. The tyranny of distance makes this more difficult in Australia, but that just means we have to work a little harder. We should continue to attract foreign students and researchers to study here, but must not compromise standards. International linkages also open many interesting research possibilities which relate directly to the social and environmental upheavals we may face during the decades ahead, and are thus of domestic as well as international relevance. We should create opportunities for our students and graduates to study and work abroad. We should forge links with selected institutes amongst our near neighbours and trading partners, and initiate cooperative research, staff exchanges and shared specialist courses.

We must find our niche, one which is complementary to, rather than in competition with other institutions, and should develop a special emphasis on natural forests and mixed plantations,
especially in the tropics. This focus should also embrace industrial and community forestry in developing countries. The tropics have about 90% of global biodiversity, and are where trans-national socio-environmental problems will first appear. In four days in the tropics, one million people die, half of them children, many of preventable diseases (wood to boil water!), and two million more children are born. A tropical emphasis offers lots of challenging and relevant problems in all aspects of forestry.

In pursuing a tropical forestry focus, we should co-operate with other Australian institutions, including the Wet Tropics CRC in Cairns. An unique opportunity may exist for us to acquire the extensive series of permanent plots established by the Queensland Forest Service, but now neglected because of a lack of direction and funding. These plots remain of considerable ecological and practical interest for monitoring recovery from logging, even if these rainforests are never again logged. North Queensland and Papua New Guinea form a centre of endemism for mangroves, with 40% of the world's mangrove species. Mangroves are an important resource, now destroyed and degraded in many places because of fish farming. The Queensland mangroves offer interesting research possibilities for foresters, perhaps in collaboration with the Australian Institute of Marine Science in Townsville.

Our near neighbours to the north also offer some unique opportunities. PNG has a very high floral endemism, with about 20% of the world's flora (Johns, pers. comm.), but has a weak forestry sector. We have traditional and personal links with PNG, and should use these to help the PNG forestry sector and our students to develop. Australia is a major donor to the Centre for International Forestry Research (CIFOR), recently established in Bogor, Indonesia, which has a broad mandate for research in the tropics. It provides a stimulating working environment, and offers many interesting possibilities for collaborative research. The Forest Research Institute of Malaysia also seeks collaborative input. Myanmar is opening its borders again and improving its political image, and foresters there need support after many years of comparative isolation. We are constrained only by our imagination.

Conclusion

We must reject the "sturdy stock horse" paradigm and recognise that our role is to help people to equip themselves to research and solve problems – not simply academic research, but also practical problems of land use planning, community consultation and forest management – not only in the framework of public servants and corporate employees, but also as responsible professionals and good citizens. I have emphasized that education involves a commitment between staff and students, and have hinted at how this relationship should change as students develop. In short, staff should help freshers, final-year students should help themselves, and researchers (both staff and students) should help each other.

When we create an environment which is stimulating, relevant and challenging, we will attract students (and staff) of the highest calibre. They will demand flexibility, inspirational courses, and excellent teaching. They will establish an exciting research program if we provide active and supportive supervision. And they will shape the future of forestry education...