As the 21st century approaches, powerful forces are restructuring higher education in the United States. The profession of forestry is also being pushed by change. What are the changes likely to mean for forestry education? It is important for us within the profession to recognize that forestry education and accreditation standards will be redefined largely by the forces affecting higher education from without. That said, what can we do to ensure that forestry professionals will continue to have a voice in forestry education?

Institutions of higher education are undergoing such fundamental structural change that the university of 2020 will be significantly different from the system we have known. Three major forces are interacting to cause this change. First, higher education has moved from being a growth industry to being a mature industry, with all that such an evolution implies. The flattening of the S curve for higher education and its implications were clearly described by Arthur Levine in the Chronicle of Higher Education (Levine 1997). Levine observes that for more than four decades after World War II, higher education grew rapidly. The GI bill, the baby boom, and the increasing percentage of young people who attended college fueled an unparalleled growth in enrollments. This growth certainly affected forestry education: the forestry school at the University of Arkansas was created in 1945; Louisiana Tech and Oklahoma State both began their forestry programs in 1946; Auburn, the University of Missouri, and Stephen F. Austin came on line in 1947. Part of the motivation for creating each of these programs was to respond to the demands of returning veterans and to capture the revenues they could bring to the university. The growth in forestry programs continued through the 1950s and into the 1960s as enrollments rose.

Those engines of growth are quiet now that more than 60 percent of all high school graduates go on to some type of postsecondary education, state legislatures and governors are no longer so eager to spend additional money on higher education to raise this rate a few more percentage points. Other issues have higher priority. In fact, there is currently greater enthusiasm for community colleges, whose programs fill more immediate training needs.

Levine points out that “government treats mature industries that receive considerable federal largess very differently” from industries in a growth phase. It is increasingly questions why the mature industries cost so much and how efficient and effective they are. This, of course, is exactly what is happening in higher education. Levine (1997) writes,

Government is asking questions of higher education that have never been asked before. The overall cost of the enterprise is being scrutinized, and tuition and fees are being attacked loudly and continuously. Financing formulas are being re-examined. Student financial aid is shifting from grants to loans.

When it was a growth industry, higher education could count on additional resources each year to allow it to expand and do new things. But now that it has matured, resources coming from state legislatures will be stable—at best.

The second major force affecting higher education is the end of the cold war. During World War II the nation’s leading universities became partners with the government in the business of defense. The laboratories and faculties of our universities represented a vast intellectual resource that could, and did, contribute materially to the edge that the United States maintained in science and technology. After the war, agencies like the National Science Foundation and the National Institutes of Health were created to pump...
Field skills may soon be taught not in the field but in computer simulation, with costs and benefits to both the university and the student.

Federal dollars into basic scientific research at universities and keep the nation one big technological step ahead of the Soviet Union and its satellites. Universities invested the federal funds in research. The sophisticated scientific instruments they acquired were expensive and had to be maintained. Faculty were sometimes hired more for their ability to attract federal research funds than for their capabilities as teachers. Universities came to depend on research grants, and such funds were the major source of support for many graduate students.

The process worked. For five decades or more, the United States has dominated the area of science and technology. We have coupled university teaching with research to build the most widely respected industry in our nation—higher education. There is no more successful model for higher education anywhere, and people from other countries flock to our universities by the hundreds of thousands.

Now the cold war is over, and the federal government is redefining its relationship with the universities. Rather than serving as a partner and overtly trying to strengthen their ability to conduct research, the federal government is increasingly defining the relationship as contractor-contractee. One example: in 1995 the federal cost accounting standards that had applied to government contractors were extended to include grants to universities. And another: in the balanced budget agreement reached for fiscal year 1998, funding for science and technology is projected to decrease—in absolute terms—over the next five years. All this means there will be less federal money for universities to conduct research, particularly applied research. Most citizens and legislators support a federal role in supporting high-risk, long-term fundamental science, but applied research, they believe, should be funded more by those who benefit from its results.

Those two forces—the maturing of the higher education industry and the reduction in research funding—are shrinking public financial support to universities. In the past, universities have been able to supplement appropriated funds with tuition increases, and annual tuition increases are almost a tradition. In fact, the costs of higher education have increased in recent decades at a rate not much lower than the rate of increase in health care—and we all know about the wrenching changes in medical care prompted by ever-escalating costs.

It will no longer be possible for universities to simply increase tuition to cover costs, however, because of the third major force driving higher education: the entry of private vendors of educational services. Their entry into the educational marketplace is being made easier by the ready availability of electronically based information delivery technologies. For the first time since 1249, when William of Durham founded Oxford University, the academy has a competitor. It is now not only to the university that a person can go for high-quality, relatively low cost education.

According to Stan Davis and Jim Botkin in their provocative book *The Monster under the Bed: How Business Is Mastering the Opportunity of Knowledge for Profit* (Davis and Botkin 1994), “business, more than government, is instituting the changes in education that are required for the emerging knowledge-based economy.” One indicator is the growing number of “corporate universities.” The Arthur Andersen Center for Professional Education, for example, enrolls more than 60,000 students and has a budget comparable to that of the University of Virginia. Motorola University has a budget of $120 million a year, exceeding that of many state universities.

Another direction identified by Davis and Botkin is the potential uses of interactive multimedia for distance learning. If Harvard University, Ted Turner, and Disney collaborated to bring college courses to your home for credit at a reasonable cost, they would be able to hire the best teachers in the nation, back.
them up with the most innovative expository techniques, and spread their costs over hundreds of thousands of subscribers. Why go to your state university? Increasingly, universities will need to focus on providing the highest quality of educational services at less cost. And with resources stable or declining, addition of new programs will force elimination of existing ones. As Levine observes, the conventional wisdom is that universities will need to do more with less, but the reality is that they will need to do less with less.

**Implications for Education**

This is going to be an exciting period for those who are just now beginning their academic careers in forestry. Forestry educators will be pulled in many directions, but it will be the changes in higher education as a whole that will drive most of the changes we will see in forestry education. Professional societies, employers, and beneficiaries of forestry education and research need to be aware of these changes and become much more engaged if they wish to have some influence over future directions.

Three implications will be treated here: those associated with ready availability of electronically based education delivery technologies, those related to the inevitable cost-containment decisions that must be made by universities, and the need for strengthened partnerships between forestry schools and their clients.

Electronic delivery offers interesting opportunities for professional forestry programs. The old model—in which an enormous amount of subject matter had to be crammed into a four-year baccalaureate program or a two-year graduate program—may become obsolete. Forestry schools can now begin to focus on the lifetime learning needs of professionals. It is no longer necessary to be on campus to keep abreast of new technology and benefit from the latest research. For-credit and certificate courses can be delivered electronically and taken at the time and place most convenient to the student, whether he or she is an undergraduate or a seasoned professional in midcareer. Forestry programs will increasingly take advantage of new technological opportunities to meet the educational needs of professional foresters throughout their careers. This trend should benefit the profession and allow forestry schools to expand enrollment without enlarging the physical plant.

Furthermore, many forestry field skills can now be taught in “virtual reality.” Computer simulations and graphics, pioneered for space flight instruction, have become an important teaching tool in many fields, from architecture to surgery. It is easy to think of forestry applications that would eliminate or greatly reduce the need for travel and field laboratories. Front-end developmental costs for such purposes are considerable, but marginal costs per student are low once the software is developed.

We need to approach electronically delivered education with cautious optimism. No technology can replace the talented, nurturing teacher in the classroom or lab. And some subject matter cannot be treated adequately without hands-on experience. But in some applications, electronic technology can deliver better education at less cost.
Cost savings will increasingly affect forestry education as universities scramble to stabilize or reduce costs. Academic forestry programs are expensive—they demand specialized faculty and laboratories; they require field trips to remote locations and expose the university to liability risks; some programs require a summer term, a cost that few other curricula incur—and yet they enroll relatively few students. They are therefore highly vulnerable in the era in which higher education now finds itself.

Those high unit costs are driving many universities to create more generalized programs in natural resources or environmental studies. Such programs are cheaper to administer than traditional forestry curricula, and they seem to be in considerable demand. Enrollment trends in agriculture, forestry, and natural resources, as reported by the Food and Agricultural Education Information System (FAEIS 1997) at Texas A&M University, show that baccalaureate degree enrollment in forest sciences (including forest management, forest engineering, urban forestry, wood science, and several other traditional forestry fields) grew from 5,313 students in 1987 to 7,748 in 1996, a 46 percent increase. By contrast, enrollment in more generalized natural resources programs doubled, from 10,169 to 21,691. University administrators realize two benefits from more general educational offerings. Student credit hours and head counts are likely to increase, and each credit hour will cost less. This ratio of cost per student credit hour is particularly important to university presidents, provosts, and state legislators.

From the professional forestry standpoint, is the trend toward folding forestry into natural resources programs and environmental studies good or bad? It probably depends on your perspective. Students certainly benefit from the wider array of academic options available to them. Employers, too, will be able to select employees with a wider range of skills. But it also means that an increasing number of graduates who have degrees in forestry will not have the basic technical skills and knowledge they need to manage forest resources on the ground. This is what foresters do best—manage forests and related resources for goods and services—and to do it, they need to have a core of scientific and technical knowledge.

It would appear that more technically qualified foresters will be needed in the future, not fewer. As population grows and people’s demands for forest products increase, they are becoming increasingly closed to commercial utilization, the economic value of the resource will rise. At the same time, societal demands for recreation, clean water, clean air, abundant wildlife, old-growth forests, and wild places will also grow.

Attracting the Best

Satisfying those dual needs represents an enormous challenge. Goods and services are required by society, and they must be provided without disrupting the long-term functioning of the environment on which we all depend. This is what contemporary forestry is all about. If foresters are to retain a significant voice in helping society reconcile these needs, they need to be attracted to the profession and given education and training so that they know more about managing forests than anyone else. How will we do this?

In my view, it is time for the universities to sit down with the employers of their graduates—industry and government—and talk. On the table are two issues: how the forestry programs can better meet the needs of employers, and how employers can effectively support the forestry programs. From this dialogue will emerge a partnership in which all parties recognize that we are facing external challenges to forestry education and that it is in our best collective interest to deal with them together.

Forestry school administrators need help in several areas. First, they need to be able to offer attractive scholarships if they are to compete with the many "glamour fields" that exist. Bright students have an amazing range of options and are actively recruited by a variety of educational institutions. Attractive, competitive scholarships could turn a lot of heads toward the profession of forestry.

But scholarships are not enough. Top students also want good summer jobs and well-designed internships so that they can both earn money and learn about their chosen field outside the classroom. They want to use their summers and their internships to assure themselves that forestry is a profession with a future. Employers must provide such opportunities.

Good students also look for challenging jobs and career paths that will enable them to advance to higher levels of responsibility. Employers need to view every newly hired forester as a future leader of the profession and treat him or her accordingly. Young professionals need to be given challenging and rewarding career assignments and personal growth opportunities. And we all need to work together to better market career opportunities.

Finally, university presidents and state legislators need to hear from industry and agency leaders on a regular basis. They need to understand the importance of forestry, and they need to see that organizations outside the university are deeply concerned about forestry education. As they evaluate their portfolio of educational offerings, they need to know that there is a market for forestry graduates—and that industry and government employers are willing to help attract and retain outstanding students. The university-industry-government partnership that would grow from such interaction is essential, I believe, to train people who can manage our increasingly valuable forest resources.

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