

## Executive Summary

### Science and Technology Report Fall 2000

In the United States today, much of the truly long-range, fundamental research underlying our far-ranging advances in technology is performed in universities. University research and university education together produce, directly or indirectly, many of the benefits our citizens enjoy. As a national research university, UVa must contribute in significant ways to the creation of knowledge, using it in turn to create world-class educational programs and improve science and technology literacy programs.

Today, we are best known for our undergraduate programs and for graduate programs in the humanities, law, and business. The most recent rankings published by the authoritative National Research Council reveal a university with doctoral programs in science and engineering ranked in the middle of the pack, with just one—physiology—among the top ten programs in its field. By contrast, four disciplines in the humanities are ranked in the top ten nationally.

For a leading, research university, the disparity in rankings between the humanities and our science and engineering programs is both surprising and disappointing.

Our fundamental problem is that science and engineering have been meagerly supported. Programs in these fields are significantly understaffed relative to other programs here and to the science and engineering programs of our competitors. We lack state-funded faculty lines, the start-up funding to attract outstanding scholars, and the necessary laboratory and classroom space.

Yet, the commission found that the University has a strong, capable faculty with a demonstrable record of making significant breakthroughs despite these constraints. The latest *U.S. News & World Report* rankings gave high marks to our graduate programs in biomedical engineering, materials science, and psychology. Recent awards from outside agencies indicate that the momentum in many areas is accelerating. External reviewers conclude that even where the University has not achieved national prominence, our faculty have been more effective at attracting outside research funds than resource and infrastructure constraints would indicate.

Since other universities are focusing on similar areas, it is urgent that we act strategically and rapidly. By coupling strong science and engineering with our already strong humanities and professional programs, UVa could emerge as one of the strongest universities in the country and be an invaluable resource for the Commonwealth.

The investment needed to achieve genuine excellence cannot be made in all disciplines simultaneously. The highest probability of success lies in making choices that leverage the existing strength of our institution and focus on growth areas that our society has judged to be critical to our future. At the same time, we must make strategic investment continually across all fields of science and engineering in order to nurture the fundamentals.

Consequently, the commission has two categories of recommendations. The first covers three focused, multidisciplinary initiatives to be launched immediately:

- A University-wide information initiative to build excellence in computer and information science and in engineering, as well as to create new approaches to scholarship in the humanities and other disciplines.
- An initiative in Quantum and Nanoscale Science and Engineering that will investigate the behavior of materials, macromolecules, biosystems and devices at the atomic scale.
- Biodifferentiation, in which researchers will study both how cells and organisms acquire and maintain their characteristic form and function as well as the application of such knowledge in preserving human health.

Collectively, these initiatives involve most of the departments of science and engineering, as well as some disciplines elsewhere in the University. At least thirty faculty have current research in each focus area, so we can field a critical mass of faculty with expertise in each area. Because we are already teaching courses related to all of these initiatives and because they are multidisciplinary, spanning not just departments but schools, we anticipate that the initiatives will energize, extend, and enrich our education programs.

The second category of commission recommendations addresses fundamental elements of the science and engineering enterprise where improvement must be made between now and 2020. These recommendations provide a larger and longer-term context, and we must move forward on them in coordination with the first three recommendations.

Recommendations for long-term excellence:

- Provide an endowment to recruit additional excellent faculty and furnish properly equipped laboratory space for them to work.
- Recruit and support higher quality graduate students.
- Provide seed funding to support emerging research directions.
- Create a strengthened central strategic management with coordination both horizontally and vertically in the University.

To move forward in the fashion outlined, we must find new sources of funding—from the University’s Board of Visitors, from the Commonwealth, from individual donors, and from federal agencies, foundations, and industry. Moving science and technology at this University to the first rank will be a difficult and costly enterprise. Our peers and competitors—which include the nation’s most powerful public and private universities—are currently allocating large sums for advances in science, engineering, and medicine, focusing on fields in which they already have an advantage as well as fields in which they have identified strategic opportunities. Our future standing as a university will be determined by the rate at which we gain strength compared to our competitor institutions.