EXECUTIVE SUMMARY

KEYNOTE ADDRESS

Luis M. Proenza
President, University of Akron

- There are seismic rumbles of change, yet scientists are embroiled in a climate of pessimism, believing research cannot be done another way.

- Worldwide, Research & Development is a $410 billion industry, 90% of which is dominated by 7 countries with the U.S. claiming 44%. Of the $180 billion in U.S. market share, 60% is derived from industry. 13% is claimed by academia, and this money is increasingly distributed among a larger number of colleges and universities.

- It is useful for an institution to look carefully at its research "portfolio" and to assess its academic research competitiveness. It is important to look at clusters of strength in the institution and to pinpoint emerging opportunities. Through focus and differentiation institutions gain strength. No university can be truly comprehensive today.

- There is no single model to define a research university.

- The concept of "strategic intent" is valuable because it asks you to state what you want to be in a powerful and ambitious way. See the book *Competing for the Future* by Garn Hamel and C.K. Prahalad.

- There are many models of mergers and coalitions in academia. In the early part of the 20th century, many normal schools became parts of large universities. Just this year, Radcliff merged in to Harvard. In 1969, Indiana University's school of medicine and Purdue's school of engineering, among other programs, formed a consortia based at a single campus in Indianapolis. In Massachusetts, five institutions have formed a consortia so that students from any of the schools may enroll at the other schools for no extra charge.

- In terms of university-industry cooperation, Purdue and Caterpillar have a productive relationship that includes exchange of personnel and training of students. This is accomplished through an overarching agreement that does not require negotiation for individual projects.

- Tim Ferguson in *Forbes,* May 31, 1999 described the nature of the change in the U.S. economy: "[in the past] proximity to water or rail mattered a lot. Today, proximity to a university campus matters a lot."

- We can expect research universities to lead efforts that involve a "cluster made out of brainpower." For example, Georgia began positioning itself as the economic New South in the late 1960's when Governor Busbee added 400 faculty positions at just one university, followed by R & D investments under Governor Harris in 1984 which resulted in the Georgia Research Alliance under Governor Miller. In just six years, the Alliance has attracted 22 eminent scholars to Georgia; accelerated growth in intellectual properties; encouraged business-friendly technology transfer systems; and between 1990 and 1997 increased sponsored research at Georgia's universities from $400 million to more than $700 million.

RESPONSE TO THE KEYNOTE ADDRESS

Robert E. Barnhill
Vice Chancellor for Research and Public Service
University of Kansas

- Strategic intent goes beyond strategic planning; it extends to what is barely possible, such as Kennedy's vision of our landing on the moon.

- Research enhancement can lift the entire institution. As an example, the University of Arizona on the eve of Sputnik had only 2 doctoral programs in arts and sciences and less than $1 million in separately budgeted research. Today it ranks in the top 10 public universities in research funding. In 1959, President Harvill provided leadership and focus by directing research toward areas in which Arizona possessed some natural advantage. In two years, the centers for astronomy and anthropology arose and in 1966 became the first departments to receive national recognition in reputational rankings.

- Lester Thurow, a professor at MIT, has said that "a successful knowledge-based economy requires large public investments in education, infrastructure, and research and development." He also stresses that the rates of return on Research and Development are far greater in the public arena, with benefits accrued for the whole society.

- A principal reason that academic performance measures are important is that we will become what we decide to measure. We should select and promote measures that reflect the values we believe are important.

- At the June 1999 NASULGC CRPGE forum, a view emerged that rankings are valid for perhaps the top 20 universities, but for universities in the middle, relatively small changes in the data or the criteria can produce dramatic differences in the rankings.

- Graham and Diamond in their book *The Rise of American Research Universities* suggest that reputational rankings are an artifact of the past. In the Knowledge Age there are no adequate peer reviews for the multitude of research universities where interdisciplinary work is flourishing. They suggest two main categories (federal research obligations & journal publications) with three sub-categories (publications in top-rated sciences & top-rated social science journals and top awards in the humanities). They suggest a per faculty capita approach, as opposed to the National Research Council graduate study reputational rankings that use aggregate numbers and therefore favor large departments. At the June NASULGC forum Graham also suggested these criteria: journal citation density, top-journal approach, research funding and outcome measures for doctoral graduates such as first jobs taken after graduation.

- The National Science Foundation counts only science and engineering in its report. In compiling its data, Kansas added the excluded disciplines and expenditures from training grants. These adjusted totals will be used by Kansas to measure research performance in the future.

PANEL OF RESEARCHERS

Bikram S. Gill
Wheat Genetics Resource Center
Kansas State University

George S. Wilson
Chemistry/Pharmaceutical Chemistry
University of Kansas

- The secrets of collaboration distilled from studies of successful teams are: select the right people; have a clear mission; provide adequate resources; communicate accomplishments; inculcate a strong belief in the project and the urgency to complete it before anyone else. In graduate education, the advantages are: access to unique experts and resources; an opportunity for students to try their wings; access to different perspectives on a research problem; experience in managing collaboration; exposure to different research environments; and experience communicating and problem solving. Barriers to success can involve: who is in control; who gets the credit; intellectual property issues; conflicts in management style; ineffective communication; lack of definition of the experimental plan.

- An example of collaboration is the Wheat Genetics Resource Center which was established at Kansas State University (K-State) in the 1980's. Its purpose is to conserve genetic resources of wheat, promoting its utilization in wheat improvement through basic and applied research, and it also sponsors the training of students and visiting scientists. This is a successful center because it is investigator-driven; it nurtures grassroots participation and shared vision with producers, consumers, administrators and legislators.

- A proposed collaborative project could be developed by K-State and the University of Kansas (KU) to conserve native prairie in one of the last remnants of contiguous prairie in the nation. This could be called the Prairie Genetics Conservation Center. It could draw on the Konza Prairie/Agronomy group at K-State for ecological and range management research, the Wheat Genetics Resource Center, and the KU scientists for conservation and genetics research. This center could work to conserve and enhance prairie genetics here and abroad.

PANEL OF VICE CHANCELLORS FOR RESEARCH

Jack O. Burns	**P. B. Swan**	**R. W. Trewyn**
Vice Provost	Vice Provost	Vice Provost
University of Missouri	Iowa State University	K-State University

- By following the model by which American businesses have transformed successfully in the 1990's, universities will also successfully adapt and change. Centers and institutes create flexibility in a "vertical" institution. Universities must listen to the employers of students—an often overlooked "customer" of education. Employers want students who can solve real-world problems in teams.

- Kansas State University has a new graduate certificate program that is geared toward the part-time student and the student who wants the flexibility of coursework in an additional area, but is concurrently enrolled full-time in another degree program. The military graduate student recruitment program capitalizes on K-State's strengths in food safety, environmental remediation, etc.—military concerns in the next century. The University has also removed impediments to the transfer of technology from university research labs to the private sector, and has developed procedures that allow faculty to participate in federal grant awards that fund innovative business start-ups.

- The University of Missouri is focusing on its regional strengths and opportunities to excel through a four-year funding package allocated by the General Assembly of Missouri. The goals of Mission Enhancement are to: increase research productivity and extramural funding; achieve national prominence and improve program rankings in selected academic areas; improve graduate program quality; enhance service to the state of Missouri; and improve undergraduate program quality with enhanced undergraduate research experiences and exposure to more senior faculty in the classroom. In the first full year, 125 new faculty positions have been approved and four broad areas of academic enhancement have been chosen: Life Sciences, Connections, Quality of Life, and Global Information Access. Global Information Access will include creation of a new multi-disciplinary program in electronic commerce that involves the faculty from business, law, journalism, political science and apparel management.

- The Heartland Research Consortium is an example of multi-institutional collaboration with a focused strategy. It involves 10 Midwestern research universities that will launch an international conference on Genetically-Modified Organisms in fall 2000 with co-sponsorship by the American Association for the Advancement of Science. Strategic alliances between universities in the heartland enable everyone to achieve a competitive advantage by leveraging resources.

- Public universities must make their knowledge and expertise available; when new knowledge leads to a potentially useful product or to a better manufacturing process, it is developed and protected as intellectual property so it can be commercialized and made available to the public. Universities invest in intellectual property programs to: facilitate collaboration, meet federal requirements (Bayh-Dole Act), protect the value of the research and the rights of the inventors, and protect the interests of public investors in the university. Only a few universities make money and this is momentary. The best time to agree on the basis for management is when the contract is being written on the research, even if the outcome of the research is uncertain.

PANEL OF RESEARCHERS

Roberta Johnson	**Marilyn Stokstad**	**Don Steeples**
Hall Center for Humanities	Art History	Geophysics
University of Kansas	University of Kansas	University of Kansas

- Cross-disciplinary marriage rarely occurs between equals. It may be an elephant and rabbit stew. Rather than advocate blendings, flavorings could make a valuable difference in the humanities scholar's project or the way he/she conducts career-long research. Interactions between people from different fields is worth promoting. The Hall Center for the Humanities provides a venue for faculty from across campus and for off-campus people to come together to share current research and to dialogue. It is a challenge for humanities faculty to meet scientists and medical professionals, especially when the work is carried out in Kansas City. A Four-State Institute for Ethics could address ethical issues in medicine and other areas of human endeavor and could lead to major break-throughs on issues of contemporary debate.

- Scholars know how to share information rapidly with those who want to know, but the important question is how to communicate with a wider audience. We cannot function without public support. Because the academic community relies on in-group-speak for scholarly communication, and media-types for external communication, public response wanes. Combining images and words is effective for rapid, accurate dissemination of information. Visual images are long lasting. Bright and creative people in the arts and humanities can be communicators for the university.

- There are many ways of doing science. Jack Oliver defined two valuable methods: science by synthesis and science by serendipity. He states that "no one style of doing science is superior or should be exclusive." Funding from the National Science Foundation is difficult to obtain unless a proposal has an explicit, testable hypothesis. Yet, when scientists follow the scientific method, they may become married to the hypothesis, making it difficult to admit a failed experiment or causing them to follow a research track far longer than it is valuable. Endowed research funding can enable scientists to explore high-risk research that may result in valuable breakthroughs.

ELIMINATING THE SCHOLARLY COMMUNICATION CRISIS

David E. Shulenburger
Provost, University of Kansas

- We have experienced ten years of annual compounded increases in the price of scholarly journals in excess of 10%, especially in science, technology and medicine. To purchase the same proportion of published serials and monographs as a decade ago, the University of Kansas acquisitions budget would have had to increase by 250%. Instead, it increased only about 50%. Because this situation reduces the availability of information to scholars, it threatens to reduce the universities' contribution to both basic and applied research.

- We must find a way to make information permanently accessible to scholars and the public in a useful fashion. Solutions must deal with ultimate ownership of scholarly communication, i.e., copyright, and only in that instance will we have found a solution.

- I propose that when a manuscript is prepared by a U.S. faculty member and is accepted for publication by a scholarly journal, a portion of the copyright of that manuscript shall be retained for inclusion in a single, publicly accessible repository, after a specified time following publication in the journal. Only the exclusive right to journal publication of the manuscript would pass to the journal and the author would retain the right to have the manuscript included in the National Electronic Article Repository (NEAR) 90 days after it appears in the journal. NEAR would index manuscripts by author, title, subject and name of the journal and see to it that articles are permanently archived. NEAR could be funded by universities through "page charges" per article included, by federal appropriation, by a small charge levied on each user upon accessing articles, or by a combination of these methods. Since all scholarly journal articles would pass into the public domain in 90 days, individuals, libraries, agencies and businesses would choose to subscribe only to those journals where timely access justified the cost. The amount by which prices fall will vary inversely with the rate at which the value of the information contained in the journal deteriorates over time.

PANEL OF DEANS AND CHAIRS

Roger A. Sunde
Chair, Nutritional Sciences
University of Missouri

Marc A. Johnson
Dean of Agriculture
Kansas State University

Sally Frost Mason
Dean of Liberal Arts
University of Kansas

Andrew J. Blanchard
Director of Research, Engineering
University of Missouri

- Universities cannot rely solely on direct allocations of state and federal resources for growth. In states with smaller university scientific infrastructural investments, collaboration may be essential to create critical mass and to be competitive nationally. We must recognize that other institutions are better at some things while our own is better at others, and when we join forces, both prosper.

- Kansas State University participates in the Great Plains Cereals Biotechnology Consortium with the University of Nebraska, Oklahoma State and the Nobel Foundation in Oklahoma. Together, these institutions have 80 faculty who competitively seek grants as one entity. This has enabled the development of relationships overseas and has strengthened research programs that may be able to reduce the $700 million annual loss of potential grain yield in Kansas, Oklahoma and Nebraska—an issue that is fundamental to the world's food supply.

- Research centers can reach across departments, colleges, universities, states, and nations to gather together talented faculty. Centers are designed to be less bureaucratic and tend to enhance faculty fulfillment while avoiding the question of changing departmental structures. Substantial seed money results in quick organization and a quick product, and enables the preliminary work for building excellent proposals.

- The University of Kansas has received several Department of Education Title VI grants for National Resource Centers (NRC's). Three NRC's have been in existence for over a decade: Russian and East European Studies, Latin American Studies, and East Asian Studies. Humanists and social scientists at these centers have created an excellent collaborative environment where faculty participate in genuine multi-disciplinary work and are rewarded with promotion, tenure, merit salary, travel, etc.

- Deans can be instrumental in facilitating multi-disciplinary efforts by ensuring that the college-level promotion and tenure committee gives full

credit for the work done by faculty who are appointed jointly. A dean is also instrumental in committing new faculty lines, start-up monies and matching dollars for major equipment and infrastructure.

- The Plant Biotechnology Center at K-State is an example of collaboration. It was established with 18 scientists and $250,000 in seed money. The Center now has attracted scientists from many departments and colleges. Even though K-State had a long relationship with the International Rice Research Institute, once the Plant Biotechnology Center was established, IRRI proposed a formal memorandum of understanding to solidify the relationship and enable placement of one IRRI scientist at K-State as an adjunct faculty and one of K-State's faculty at IRRI as an adjunct scientist.

- The team-based approach to multi-disciplinary research is viable and worth the effort. At the University of Missouri it was used to take advantage of the explosion of new molecular biology knowledge and new biotechnology tools with the result that "Food for the 21st Century" is making the University more competitive.

- Robbins and Finley describe in their book why teams don't work. Teams may be created for the wrong reasons. It works well if there is a short-term, solvable problem requiring effort from several diverse components of the organization. The organization may not committed to the team idea. It takes vision and courage by the administration to set and support goals and vision. The reward structure for team members must make them feel safe to do their team jobs; performance expectations and reward must be aligned with the goals. A big concern is the expansion of non-productive paperwork, meetings and reports intruding on the time that team members have for team-based responsibilities. Reduction of activities that do not contribute to productivity of an institution is a way to empower multi-disciplinary teams. The #1 reason teams fail is when they are not given the tools to do the task.

- It does not benefit academia to be isolated from the world especially when the value of information is driven not by the individuals who create its content, but rather by those who market the content. Academics must respond to a changed market. The new academic culture will succeed by its exceptional ability to recognize market needs and provide innovative solutions to market-driven problems through a customized approach. It will also be effective in taking on a brokering role, creating an interface between the private side, government, and various academic sectors, accessing a broad variety of complex capabilities and thinking processes that characteristically are not integrated.

PANEL OF RESEARCHERS / ADMINISTRATORS

Kim A. Wilcox	**Charlotte R. Bronson**	**Bruce Harmon**
Executive Director	Plant Pathology	Ames Laboratory
Kansas Board of Regents	Iowa State University	Iowa State University

- The Regents, Kansas legislators, and the public at large, need a context in which to appreciate the value of research. Undergraduate education is focused on giving students baseballs—facts—without demonstrating the thrill of the catch. Faculty spend far too much time arguing about and putting in place the information that all students in a discipline must have, rather than making sure students understand the heart of research.

- Faculty are asked to perform services for the greater good of the university, including projects that link universities in research. This often involves a great deal of work with little credit. For example, a faculty member may write the grant, disburse the funds to everyone in the multi-university project, arrange meetings and organize the effort to write the paper—and then be listed as the 18th author. To encourage cross-university linkages, administrators must think of ways to reward faculty, or at the very least, not penalize them. For example, the administration might provide clerical assistance; award half a research assistantship for each year of leadership; allot a temporary increase in salary, or even increase the base pay for more significant assignments.

- Iowa State and the University of Illinois are working together on genomics research on soybeans. This is encouraged by the soybean promotion boards in the two states because teams representing more than one state can better compete for federal funding, and cooperation between the states decreases unnecessary duplication.

- The opportunities are great. For example, we now have all the knowledge and computing power to couple fundamental atomic level knowledge with larger length scale simulations and to evaluate materials properties to aid in engineering designs—but this requires teamwork to achieve major breakthroughs in science. Getting scientists together in teams is like herding cats. Big, relevant ideas are critical for a large cooperative project to succeed and actually, money, while helpful, is not the only solution.

PANEL OF CHANCELLORS

Richard L. Wallace
University of Missouri - Columbia

Robert Hemenway
University of Kansas

- There are many avenues for raising funds for research, some more successful than others. Increasing state appropriations and raising tuition have not been options in Kansas. Increasing private giving has been a strong point at the University of Kansas, which has the 4th largest endowment among public universities. KU has also been successful in gaining federal earmarks and in building university-industry partnerships. Recently KU reorganized the administration to provide an infrastructure across the campus that will enable young faculty to capture more federal grants and contracts.

- The defining characteristic of the next decade will be partnerships. We must collaborate across disciplinary, institutional, state and national boundaries to maximize our opportunities. Effective teamwork requires breaking down communication barriers that are part of traditional administrative structures.

- Two possibilities for cross-university alliances could be: a Kansas State–KU partnership to deliver healthcare to the elderly; and a partnership between KU and the University of Missouri as a biology and genetics institute is established in Kansas City.

- Mission enhancement at the University of Missouri has strengthened interdisciplinary research. The wisdom of an integrated approach to life sciences research has become clear over the years and MU has responded by building two programs: Food for the 21st Century and Molecular Biology. These were started with state support and have since garnered significant federal and other outside support.

- MU is engaged in a unique partnership that combines public and private universities, as well as a for-profit and a non-profit corporation. The Donald Danforth Plant Science Center is intended to be a world class contributor to the field of plant science.

- Human intellectual capital is our single most valuable currency.

- This is one of the most productive environments for research in many years because people are open to new ideas and new ways of doing things.