

EXECUTIVE SUMMARY

Science at a Time of National Emergency

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Mabel L. Rice, Editor

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KEYNOTE ADDRESS

Martin Apple

President and CEO, Council of Scientific Society Presidents

- The United States is facing several major national emergencies today. Science and universities will be important to solving most of them. University leaders must think outside of the box and show bold leadership.
- Universities are on the cusp of multiple intersecting trends, the uneasy coexistence of successive societal eras and generations. Universities must restore their role as big picture innovators, and develop a twenty-first century social contract with society, industry, and virtual education.
- Scientists are the constituency of the future. The grand challenges for the future include: converting the nation and the world into entirely sustainable systems; developing the human potential to learn; building healthier lives through prevention rather than treatment; stimulating economic engines that prosper without further population growth and environmental damage; developing affordable, sustainable energy autonomy; understanding and developing beneficial human behavior.
- Unlinked tax cuts, not recession or defense buildups, account for most of the burgeoning federal deficits of the last half century. Escalating deficit will constrain science to a “no growth” quiet erosion over the next decade, unless we act now in unison to change that trend.
- Federal funding of graduate student positions has already declined in several scientific disciplines, and the U.S. has lost its edge in the race to build a faster, more efficient supercomputer.
- We need a new defense strategy and paradigm.
- How can science provide a competitive advantage against networks of fanatic murderers? The Council of Scientific Society Presidents has suggested using scientific experts across the country in SWAT-teams (scientifically weighted and analyzed tactics). SWAT-teams could serve as a unique part-time National Guard that matches the agility of our

- opponents by their very nature as dispersed, rapid learning groups with advanced knowledge.
- Secrecy and science are direct antitheses. New federal security regulations may not only change the way universities do business, but in fact erode the quality of science in the long run.
 - Case studies: food security and high consequence pathogens. Do we need a new national center for food system security?

RESEARCH AT KU: MOVING AHEAD!

Robert E. Barnhill

Vice Chancellor for Research and Public Service
and President of the KU Center for Research
University of Kansas

- KU has risen from 93rd to 78th among universities that successfully capture federal research and development dollars for their science and engineering programs. This jump in ranking is the second largest among comprehensive universities in the top 100.
- The National Institutes of Health (NIH) budget has doubled over the past five years and is now five times the National Science Foundation (NSF) budget. Funding in life science research at KU is a significant part of its total federal funding, representing 64%. In fact, KU's rate of increase in federally sponsored life science research was the highest in the country among the top 50 comprehensive public universities.
- Women and minorities are under-represented in science and engineering across the nation. To attract minority cultures, we should develop new educational programs and reach more students.
- Much of the needed science to fight terrorism may already exist and just remains to be suitably implemented.
- Faculty want to contribute to the anti-terrorism effort.
- KU sponsored a "bio-defense" workshop with the Midwest Research Institute on the topic of vaccines, biosensors and public health. This effort is ongoing.

FIRST PANEL OF RESEACHERS

Jerome E. Dobson, Research Professor, Kansas Applied Remote Sensing Program, University of Kansas

Mark R. Ackermann, Professor of Veterinary Pathology, Iowa State University

Steven Hinrichs, Professor, Pathology and Microbiology, and Director, Nebraska Public Health Lab, University of Nebraska Medical Center

Curtis L. Kastner, Director, Food Science Institute, Kansas State University

Dennis R. Alexander, Center for Electro-Optics, University of Nebraska - Lincoln

- The team I headed at the Oak Ridge National Laboratory developed a global population database at a spatial resolution fine enough to identify populations actually or potentially impacted by terrorism, technological

- accidents, regional conflicts and natural disasters. Population estimates are essential for mission planning to determine: how many emergency personnel to send, how much temporary shelter to provide, and what quantities of emergency supplies are needed. LandScan represents a quantum leap in precision, made possible by the public availability of global databases in the late 1990's, recent advances in geographic information systems (GIS), and traditional geographic analysis techniques.
- Traditionally, animal health issues are directly tied to agriculture, yet we know that research on animal diseases can provide answers for human medicine, and today, animal health may be an issue when preparing for bioterrorism.
 - It would be beneficial to create an institute within the National Institutes of Health that focuses on animal health. This would encourage development of animal models of human disease, and bioterrorism research could proceed on issues such as: animal diseases we wish to keep out of the U.S., and emerging animal disease throughout the world.
 - The medical centers and public universities represented at this conference are prepared to undertake the challenges of biosecurity preparedness. In the realm of diagnostic modalities, for example, they have expertise in developing algorithms and mathematical models for determining the efficacy of syndromic surveillance information. (Syndromic surveillance detects a pattern or spike in the number of diseases presented by patients in the emergency room or doctor's office.) These universities could also make use of the statewide information services located at the county extension offices and at the health education centers that train medical students and residents.
 - A Midwest consortium of universities and medical centers could rapidly investigate and determine the pathogenesis of various diseases and develop appropriate vaccines.
 - The U.S. food production and processing industries are vulnerable and must be protected. Disruption of the food supply and loss of consumer confidence would have a devastating impact on public health, social order and economic markets.
 - Food safety research and technologies can be used to address bioterrorism issues even though they were not developed with intentional contamination in mind. These resources are available at Kansas State University.
 - Lasers generating ultrashort light pulses are now available to researchers. Recent technological advances in ultrafast technologies have resulted in generation of light packets consisting of only a few cycles of the electric and magnetic fields. It is possible to detect chemical and biological warfare agents by using femtosecond lasers for performing FLIBS and second order harmonic generation.

FIRST PANEL OF RESEARCH ADMINISTRATORS

James R. Bloedel, Vice Provost for Research and Advanced Studies, and
Dean of the Graduate College, Iowa State University

James A. Guikema, Associate Dean of the Graduate School, and Associate Vice
Provost for Graduate Research, Kansas State University

- Universities are challenged by the new security regulations imposed after 9-11. Compliance requires considerable expense. If laboratories use agents such as E. coli or anthrax, the university must install various security features that could include card or key controlled access, a perimeter fence, and an armed guard. Personnel must undergo background checks and certain foreign nationals are precluded from access to information that has traditionally been shared in laboratories.
- Because of the national crisis, universities have new funding opportunities. Homeland security issues are especially well suited to the mission of land-grant universities. Iowa State University is seeking proposals from its faculty, and intends to capitalize on its strengths in: information assurance; applications that combine quantitative expertise in engineering and agriculture; and applications involving the Virtual Reality Applications Center and the Center of Scientific Forensics.
- Over 20% of the Ph.D. scientists and engineers in U.S. academic employment are foreign-born; in engineering and computer sciences, this figure tops 30%. Since 9-11, it may be more difficult for international students to obtain visas to permit their study in the U.S.
- As of Fall 2002, the Immigration and Naturalization Service (INS) is requiring that universities maintain and update information about international students via the Student and Exchange Visitor Information System (SEVIS). SEVIS shifts the burden of tracking students to universities, and triples the number of data items that a student must report.
- Graduate education and research has become a global enterprise. Kansas State University shares its expertise in grassland biology with sub-Saharan Africa through an NSF program – and this is only one example. A decade ago, only 10% of all publications by U.S. researchers involved international collaboration, but as of 1999, this increased to more than 20%.

SECOND PANEL OF RESEARCH ADMINISTRATORS

Catherine E. Woteki, Dean of Agriculture, Iowa State University

Thomas Rosenquist, Vice Chancellor for Research, University of Nebraska
Medical Center

- We could use our scientific might to solve problems at the heart of global instability. Limited access to sufficient food for health may be one of the roots of terrorism. We have the scientific knowledge to significantly increase food production.

- Land grant universities are well equipped to disseminate knowledge and lend aid because their mission includes research, teaching, *and* extension. The free exchange of scientific information may be jeopardized, however, by new security regulations.
- Scientists in academia, the private sector, and government should be actively engaged in policy debates, and should support international research and development in addition to homeland defense and military preparation.
- We are now witnessing simultaneously a significant increase in research funding and a demand for reallocation of effort because of terrorism. Most senior researchers have experienced one or the other of these phenomena in the past, but not the two combined. The national emergency today is different and it presents us with both danger and opportunity.
- The state universities at this conference can produce critical masses of scientists to compete for federal funding with the coastal giants – but they must overcome parochialism, political boundaries and concerns about who will get the credit for success.

PLANNING FOR RESPONSE TO BIOTERRORISM

Donald F. Hagen

Executive Vice Chancellor

University of Kansas Medical Center (KUMC)

- We don't know how to respond in a national emergency. Where do we send the public with their questions? How will hospitals handle infections like smallpox, or mass casualties? Who is in charge? We must begin to assess the threats and work on response alternatives. We must determine the role of the federal government and the state. What kind of leadership can we provide within our region?
- America must take a new look at its public health system. Communities must become better educated, and health providers must get to know each other if they are to function as a team in a crisis. KUMC is working with the Department of Health and Environment to provide distance education so local personnel can identify smallpox, for example. We are also trying to establish better communication between public health professionals and practicing doctors in Kansas.
- It is important to address the causes of terrorism – find homes for the homeless, educate the poorest of the poor and feed the hungry. We must also consider how our foreign policy is interpreted around the world.

SECOND PANEL OF RESEARCHERS

Eric M. Vernberg, Professor of Clinical Child Psychology, University of Kansas

Denis Medeiros, Professor of Human Nutrition, Kansas State University

Michael Meagher, Professor of Chemical Engineering, and Director,
Biological Process Development Facility, University of Nebraska – Lincoln

- The conceptual models we now have for explaining and predicting the psychological effects of terrorism are quite advanced and well validated. Yet we lack the infrastructure, organization and communication systems to apply our scientific knowledge at the national level to help our citizens cope. Only one-third of the children with pronounced psychiatric symptoms in the Manhattan public schools saw a counselor, psychologist, or other mental health provider in the six months following the September 11th attack.
- It is shortsighted to invest a huge amount of our national resources in single-issue systems at the expense of investments in psychological health. Intellectual leaders must be involved in the public debate about resource allocation.
- Nutrition as a science was galvanized by a previous national crisis – World War II – because we discovered that a number of men were undernourished and could not be drafted. The RDA (Recommended Dietary Allowances) was published for the first time in 1943. We often find that a crisis can be instrumental for an emerging field of study.
- There is a huge agricultural base in Kansas, Nebraska and Iowa and investment in nutrition research has been upward and steady. The challenge is sustaining momentum while other needs outweigh the priorities we established prior to our recent national emergency.
- The Department of Defense (DoD) has been developing countermeasures against bioterrorism agents for many years, but it has focused on the soldier in combat situations. To use these applications for civilians, we must increase production capabilities by 100-fold and include a wider spectrum of society in the clinical testing.
- Vaccines or therapeutic molecules against biological agents are of little monetary value to the pharmaceutical and biopharmaceutical industry. And the pipeline is so full that the industry lacks the resources to produce the drugs already approved for market and those in clinical trials.
- The universities can play a role in assisting the civilian bioterrorism program headed by NIAID, the DoD bioterrorism program, and small biotechnology companies. Universities can provide access to expensive facilities and expertise. They can also train engineering and science students in an FDA-regulated environment. The Biological Process Development Facility (BPDF) at the University of Nebraska - Lincoln has successfully helped companies and the government bring biopharmaceutical molecules to clinical testing.

STATEWIDE ADVOCACY

Kim Wilcox, President and CEO, Kansas Board of Regents
Janet Murguia, Executive Vice Chancellor for University Relations,
University of Kansas

- It is important to bring people from the academic world into the state higher education office, and to maintain a campus culture with its unique values.
- Universities don't prioritize reporting and communications. This puts them at a disadvantage within state government. The higher education officer in the state must devote significant time to this task.
- In the 2002 legislative session, the University of Kansas developed this strategy: present a united front with the other Regents schools and with K-12 education; communicate directly with key legislators; and promote a grass roots campaign.
- The state of Kansas receives a good return for its investment because higher education is a partner in creating a better destiny for everyone.

REACTION AND CONFERENCE SUMMARY

David E. Shulenburger
Executive Vice Chancellor and Provost
University of Kansas – Lawrence campus

- It is important to assess whether this is the time to build capacity at our universities in response to the national security crisis. In the past, we have put lots of money into projects that were soon abandoned as the situation changed. Perhaps it is better to organize the resources we currently have, rather than make significant additions to them.
- The mission of the university is research and teaching. When we consider how to respond to the national crisis, we must keep this mission in mind, else we risk losing support from our citizens. Is it our job to solve specific problems now, or to train experts for the future?
- For universities to address bioterrorism in a comprehensive way, they must go to several federal agencies to secure funding – the NSF, NIH, USDA, etc. Since there is no multi-grant system, perhaps direct funding is the best strategy for pursuing research on bioterrorism.