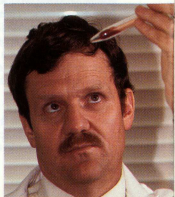


# GOOD GENES IN MISSOURI'S FUTURE

Text by CAROL AGAIN    Photos by LARRY BOEHM





**I** **MAGINE** the 21st century. Genetically caused diseases, from birth defects to arthritis, become maladies of the past as scientists replace defective genes with normal cells. Farmers no longer buy fertilizer because crops are genetically programmed to get nourishment from nitrogen in the air. Finite supplies of petroleum, natural gas and coal are supplanted by new forms of energy created from living organisms. The common denominator of these potential discoveries: molecular biology, the science of understanding genetics.

"I am convinced that researchers in life sciences have begun what history will record as the biological revolution," says Chancellor Barbara S. Uehling. "Many people suspect it will be as significant and have a greater impact on humanity than the Industrial Revolution."

The Board of Curators evidently shares her conviction. In September, molecular biology was one of three programs on the Columbia Campus chosen to achieve national and worldwide eminence in both instructional and research programs by 1995. Only eight programs in the four-campus system have been tagged for eminence, an objective of the curators' long-range plan.

**JOURNALISM** and Food for the 21st Century, a multidisciplinary research program involving agriculture, home economics and veterinary medicine, also are slated for eminence at UMC. Journalism, of course, holds the distinction of being the first professional school in its field in the world. Food production likewise is synonymous with Missouri.

Though a relative newcomer to Campus, molecular biology also asserts a unique comparative advantage at UMC, Uehling says, which is manifested in the scope of instructional programs for both undergraduate and graduate training in the biological sciences. Mizzou is one of seven institutions nationwide that has on a single campus biological expertise within colleges of Medicine, Arts and Science, Agriculture, Home Economics and Veterinary Medicine. "Together with the College of Engineering, these divisions

◊ **DR. ABRAHAM EISENSTARK**, professor of biological sciences, is studying cell damage caused by near-ultraviolet radiation, a natural component of sunlight. "The scenario is that we may lose as much as 15 percent of the ozone layer because of technological developments such as aerosol sprays. The ozone is the filter of the sun, and with its depletion, the earth will receive much more near ultraviolet radiation. The main question is, what will be the affect on cells?"

◊ **A NATIONAL DISEASE ERADICATION** program for pseudorabies, a swine infection, could be the ultimate outcome of research conducted by Dr. David Thawley, associate professor of veterinary microbiology. Thawley uses a new test to identify latent carrier animals.

give UMC the nucleus to become a major participant in advancing biological science," she says.

Analysts predict that biotechnology, the application of molecular biology, eventually will be of considerable importance to those industries that account for 70 percent of the United States' gross national product. Already the new field has soared to a \$2.5 billion industry. Even before molecular biology was slated for eminence, biologically related research at Mizzou claimed the majority of the Campus' total annual external research funding of \$20 million.

**WITH THE EMINENCE** designation, Uehling says, Mizzou's molecular biologists are primed to forge a competitive edge in Missouri's enterprises related to health care, agriculture, energy and environmental improvement.

Until recently, biologically related research typically was conducted in small laboratories scattered at institutions across the country. But advances in biological research, and biotechnology in particular, demand a more integrated system. Equipment for one modern laboratory can cost more than \$1 million, and requires the services of highly trained operators. Studies that rely on biological materials need several investigators to generate and test these substances. Large investigative centers also create a network for sharing new information and

technologies. "A trend toward what some call 'big science' is gaining momentum," says Dr. David Thawley, associate professor of veterinary microbiology.

In 1982, for example, a group of Mizzou faculty from the division of biological sciences, and the departments of biochemistry, microbiology and pharmacology in the School of Medicine, pooled resources to establish an interdisciplinary program of molecular biology. A Campus advisory committee on molecular biology was formed this year, with members from four schools and colleges.

Initially, Mizzou's plan to spotlight molecular biology will focus on research in four areas: development and aging, disease resistance, biological energy conversion and environmental improvement.

The research could hold particular significance for Missouri, where the proportion of residents over age 65 ranks fifth nationally. Disease damage to Missouri soybeans and corn is estimated at more than \$20 million each year.

The research program promises benefits beyond Missouri's borders, too. It is possible that scientists could create microorganisms capable of cleaning up oil spills and other pollutants, or use gene replacements to combat the 1,600 diseases traced to defects in a single gene.

A first step in the eminence blueprint for molecular biology is adding 33 full-time

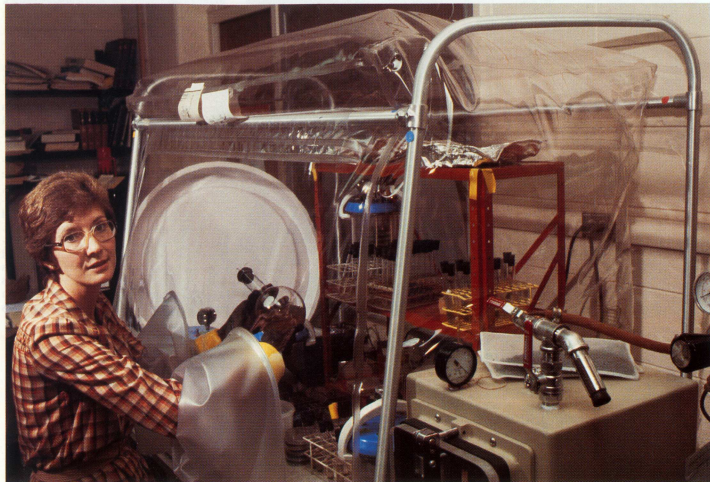
faculty during the next five years, doubling the number of UMC faculty currently in that field.

Specialized equipment centers for monoclonal antibody production, nucleic acid chemistry and protein chemistry also are to be established, and existing equipment maintained or replaced as necessary. The cost of lifting molecular biology to eminence by 1995 is estimated at \$6.14 million.

What will this investment buy? "In achieving eminence, molecular biology will become a program by which the most recent biological technologies can be used to address important issues related to health care, environmental improvement, energy and agriculture," Uehling says. "Academic programs to train undergraduate, graduate and postgraduate students for positions in the field of biotechnology also will be enhanced."

In addition, the program will provide a statewide resource center for industry and other educational institutions, and will create a statewide continuing education resource in molecular biology.

**"IF MISSOURI** is to remain nationally competitive in respect to its industry and the quality of life for its citizens, the state must support at least one center of expertise in molecular biology," Uehling says. "Such a resource is necessary to lay the foundation of Missouri's future economic growth." □



# Long-Range Plan Sets Priorities

**WITH EIGHT PROGRAMS** targeted for eminence, the University in September concluded the latest round of setting priorities for all programs on the four campuses. The exercise satisfies an objective in the Board of Curators' long-range plan, which states, "The University is committed to offering programs of high quality and to attaining special recognition in selected fields."

The eminence programs are to achieve national and worldwide fame in both instructional and research programs by 1995, the time frame set in "Toward Excellence: The Next Decade of the University of Missouri," the report approved by curators last year.

"All the programs (in the eminence category) have a very practical orientation," says President C. Peter Magrath, who recommended program priorities to curators after studying results of program reviews conducted on each campus. "Even those that involve considerable amounts of basic research are designed to produce results that can be applied to solving people's problems in agriculture, medicine, business, industry and many

other fields of human endeavor."

Tagged for eminence are Mizzou's programs in journalism, Food for the 21st Century and molecular biology; chemistry at UMSL; intelligent industrial systems, and materials engineering and science at UMR; telecommunications and computer science program at UMKC, and UM Extension's commercial agriculture program. According to the long-range plan, two additional programs may be selected for eminence at a later date.

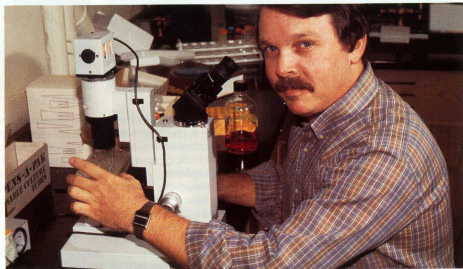
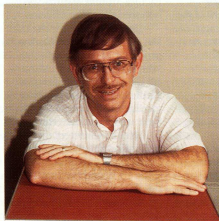
Of course, the eminence programs will not become the University's sole focus. In February 1985, as part of the long-range plan, all programs were assigned to one of four funding categories. Some 68 areas were chosen for enhancement, including on the Columbia Campus biologically related sciences, business and public administration, computer science, Department of Medicine, engineering graduate research programs, Food for the 21st Century, history, journalism, mathematics, psychology and veterinary medicine. Eminence programs were chosen from among enhancement areas on all campuses.

Most programs were slated for maintenance. "These programs are considered to be essential programs that will be maintained and, I hope, improved in the years ahead as we attract additional resources," Magrath says. As circumstances change, he adds, maintenance programs could become enhancement candidates.

Among the 14 programs to be eliminated are seven Mizzou degree programs that have conferred only a handful of diplomas in the past decade. Savings of \$346,500 from program eliminations on all four campuses will be redirected to higher priorities.

Program reductions at Mizzou constitute just 4.3 percent of the total budgets of affected programs, and will not affect tenured faculty nor result in the closing of departments. Throughout the University, funding for 43 programs is to be reduced, generating an expected savings of \$9.8 million over the next three years. In addition, substantial increases in state support, private gifts and grants will be necessary to meet long-range objectives.

◇ "THE MORE WE UNDERSTAND the relationship between plants and nitrogen, the more we can improve on those biological relationships," says Dr. Judy Wall, associate professor of biochemistry who studies nitrogen fixation, a possible alternative to commercial fertilizer. Wall also studies sulfate-reducing bacteria whose metabolism in the soil is affected by acid rain.



◇ IN HIS RESEARCH, Dr. Kim Wise, associate professor of microbiology, studies highly specific monoclonal antibodies that are derived from individuals with autoimmune disorders. "This research helps us to understand autoimmune diseases in people and how to circumvent them, and also generates useful diagnostic tools for rheumatology patients." Wise collaborates with Dr. Gordon Sharp, professor of medicine and director of UMC's Arthritis Center.



◇ DR. LOUIS SHERMAN, professor and director of the Division of Biological Sciences, studies photosynthesis, the process by which green plants use sunlight for energy. "I'd like to design a membrane structure that would be able to use light energy with high efficiency, so that the same amount of sunlight would result in more plant growth. That will keep me busy for 15 to 20 years."