

THE ISSUE

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Why Should the State Invest in University Research?

Research... The term evokes images of laboratories, scientists in white lab coats and test tubes. It brings to mind the possibilities of new discoveries and inventions that can make life longer, richer and easier. Although everyone understands the importance of research at a conceptual level, policymakers may ask: Why should the state invest in research?

There are three primary reasons why the state should continue to invest in research:

- ◆ The state's investment leverages larger federal and industrial research grants;
- ◆ As the primary teaching mode for training graduate students, research is a critically important part of workforce development for high-value jobs;
- ◆ Research provides the foundation for a high proportion of the innovations that lead to new commercial products, and new jobs.

This brief will look at the reasons the state should continue to invest in research. In addition, the paper will provide information about how funding is used for a typical laboratory, and it will highlight a few of the exciting

research projects currently being carried out at Ohio's universities.

The State's Investment Leverages Federal and Industrial Research Dollars

The state's investment in research represents a small but important share of total dollars spent on research and development at Ohio's universities. The big money for research is at the federal level - primarily involving funding provided by the National Science Foundation and the National Institutes of Health. According to the National Science Foundation, almost \$1 billion (\$992 million) was spent on research and development activities at Ohio's

doctorate granting institutions during FY 2001.

The money that Ohio invests in research is important in leveraging funding at the federal level. In particular, Research Challenge has had a dramatic impact on the amount of federal dollars that have come to Ohio for research (leveraging ratio = \$10 in federal support for every \$1 invested by the State of Ohio since FY 1986). The chart below shows how money for academic research has been increasing since the advent of several Regents' research initiatives in the mid 1980's. Universities are able to use the money provided through Research Challenge as start-up grants for young researchers, or to enhance and hone research proposals.

The General Assembly's investment in Research Challenge enables research proposals from Ohio faculty members to be more competitive for federal grants. For example, the University of Cincinnati used \$120,000 in funding it received from the state through Research Challenge to provide start-up funds for one of its assistant professors, Daniel B. Oerther, Ph.D. Using the state's start-up investment, Dr. Oerther has been able to bring in over \$550,000 in federal grants from the National Science Foundation and the U.S. EPA.

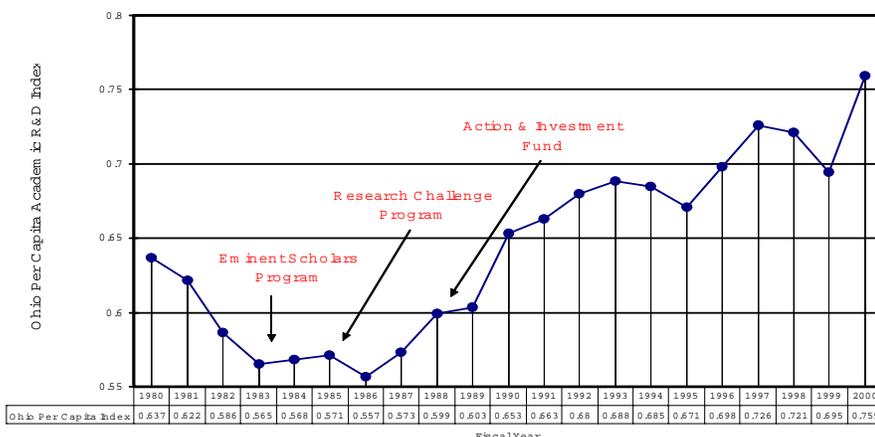
Using Research Challenge Funding to Leverage Federal Research Dollars

Daniel B. Oerther, Ph.D.
Assistant Professor, Civil and Environmental Engineering
Joined Faculty of the University of Cincinnati in September 2000

Research Challenge Start-up Funding: \$120,000
External Research Funding from: National Science Foundation
U.S. Environmental Protection Agency

Total Value of External Funding: \$682,593

Ohio Per Capita Academic R&D Index:
FY 1980-2000



Dr. Oerther's research is in the emerging interdisciplinary field of environmental biotechnology. Specifically, he works to understand microorganisms that are the catalysts in municipal sewage treatment plants. He also studies infectious microorganisms that threaten public health by contaminating drinking water. Dr. Oerther hopes to improve the cost-effective treatment of municipal sewage (a \$20 billion annual industry in the U.S.) as well as to make drinking water safer.

Research Trains Graduate Students

Universities are heavily involved in carrying out research because it is the primary teaching method for training graduate students. While classroom instruction is the primary teaching mode in the education of undergraduate students, research activities, including laboratory, computer, and library work, become the primary teaching method for graduate students. Research activities make up the principal mechanism for educating graduate students within their chosen disciplines and are a critically important part of the curriculum, especially in the sciences and mathematics, in even the smallest colleges and universities.

Research Produces New Products

Approximately 35,400 individuals are employed in university research activities throughout Ohio. These knowledge workers have the ability to analyze the information their experiments generate, and then use that knowledge to pose additional new questions, and again seek answers to these questions. This cyclic process eventually produces new knowledge that can be used to produce new innovations and also new commercial products, ultimately producing new jobs.

Examples of Current Research Projects

PHOTOSCIENCE

There are many exciting research projects currently underway throughout Ohio's universities. One such project is at the Wright Photosciences Center at Bowling Green State University (BGSU). The Center, established in 1985, houses the only Ph.D. program in the

Example of a Budget for a Laboratory at one of Ohio's Research Universities

Item of Expense	Amount
Faculty Salary Support	\$80,000
Research Personnel, including Graduate Students and Post-Doctoral Associates	\$100,000
Laboratory Equipment	\$500,000
Equipment Maintenance and Lab Supplies	\$100,000
Total	\$780,000

photosciences within the United States.

What is photoscience? It studies the interaction of light with matter and the practical applications of that basic knowledge, such as digital imaging. Researchers at BGSU are working with OptiCast, Inc. in Findlay, Ohio and Spectra Group Ltd. of Maumee, Ohio on a project that could greatly reduce the price of a pair of glasses. Using the new technique, an optometrist could use refracted light to shape lenses in his or her office. People who wear glasses could have their glasses made and ready to wear in less than 30 minutes. This could be done at a fraction of the cost and more quickly than current grinding methods.

LIQUID CRYSTALS

Another interesting project is at Kent State University's Liquid Crystal Institute. Traditionally, liquid crystal display devices have been constructed by placing liquid crystal between two glass plates. A less costly way to create high-resolution images with liquid crystals involves using Liquid Crystal on Silicon (LCOS) devices. These devices use a silicon surface for the back of the display. Researchers at Kent State University are also working on the development of sophisticated optical and electronic devices on flexible plastics. If these devices can be manufactured on flexible plastic substrates, major product advances and significant reductions in cost are possible.

How is Funding for Research Used?

Most policymakers know that research requires funding. But they might not know how money for research is being spent and what it is buying. Funding for research is primarily used to fund the people, equipment, instruments and supplies

needed in scientific experiments at Ohio's universities. The following table provides an example of a typical budget for a new laboratory at one of Ohio's research universities. As the chart shows, the majority of the funds pay for the equipment in the lab. Additional funds pay for the researcher's salary, provide support for graduate students and post-doctoral researchers, and pay for the on-going operation of the lab.

The amounts needed to pay for a research laboratory are significant. However, as demonstrated earlier, the payback in terms of federal dollars for research can be as much as ten times the amount of the initial investment.

This short paper has attempted to answer the question "Why should the state invest in university research?" The paper demonstrated that the state's investment helps secure larger federal and industrial research dollars. It also described the importance of research in training graduate students, and showed that research can produce technical innovations that will lead to new products that can be brought to the market by Ohio business and industry. The brief also provided a practical example of how funding for a typical laboratory is used, and examples of some of the exciting research projects at Ohio's universities. As Ohio competes with other states in a Knowledge Economy, it is important to realize that research is an investment in the future of our state. The integration of research with education is a vital aspect of this investment.

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