

**Arkansas Science &  
Technology Authority**



**Annual Report  
FY 1990**

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### On the cover:

**Top:** This photograph presents a three-dimensional cross section of the human brain stem. The 3-D image allows scientists to locate, count and measure specific abnormal coils which indicate schizophrenia. The image resulted from study of this disorder at the Arkansas Neurobiology Center at the University of Arkansas for Medical Sciences, one of three EPSCoR centers of excellence receiving part of a \$1.16 million match from ASTA in March 1990. See page 12.

**Center:** How can two cows be sisters as well as mother and daughter? With embryo manipulation performed in the study of cattle's susceptibility to fly-transmitted diseases, the cow becomes not only the biological sister of the calf, but the birthing mother. See pages 6 and 7.

**Bottom:** Getting your mail to you quicker is the purpose of this wide-area bar code reader, a product of Artek Systems, Inc., the most recent investment of the ASTA Seed Capital Investment Program. This machine reads address bar codes on mass mailings at a rate of 10 per second. See page 14.

## Arkansas Science & Technology Authority



Annual Report  
FY 1990

## Board of Directors

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Goodwin, Hamilton & Moore  
Paragould, Term ends 1993

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Permanent appointment

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ASTA President

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ASTA Vice President Research

\*Term on the board ended during the fiscal year

## Letter from the Chairman

June 30, 1990

The Honorable Bill Clinton and  
Members of the 78th General Assembly  
State Capitol  
Little Rock, Arkansas 72201

Dear Governor Clinton and Legislators:

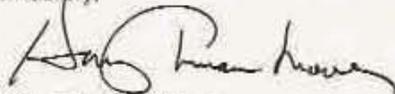
The board of directors and staff of the Arkansas Science & Technology Authority are proud to report in this 1990 Annual Report our progress in technology-based economic development during the past fiscal year. ASTA's year is reported with the theme, *Growing for Arkansas' future*, which highlights program growth and resulting economic benefits, notable program successes and plans for the next biennium.

Since its establishment in 1983, ASTA has operated as if on a pilot project basis and has produced important successes on a limited budget. As a result of our 1990 Planning Session, a plan for the next biennium outlines action needed to bring ASTA to full-scale operations to improve Arkansas' future through science and technology.

This year saw major efforts to add private and federal dollars to support research and contribute to the economic development of our state, especially through a \$1.16 million National Science Foundation grant, a \$1 million ASTA-coordinated feasibility study of a National Biotechnology Cooperative in Arkansas, the Small Business Innovation Research Assistance Program, the Applied Research Grant Program and the Seed Capital Investment Program.

ASTA believes its activities of the last seven years have laid a strong foundation for its mission of bringing the benefits of science and technology to the people of Arkansas. We look forward to expanding future economic growth on this foundation.

Sincerely,



Harry Truman Moore  
Chairman of the Board



Harry Truman Moore  
Chairman of the Board

## ASTA evolves to meet Arkansas' needs



The Arkansas Science & Technology Authority was created in 1983 (Act 859), with the mission of gaining the benefits of science and advanced technology for the people of Arkansas.

ASTA began its first activities in 1984 with planning and an inventory and information effort. This work became a part of Gov. Bill Clinton's economic development package enacted by the General Assembly.

ASTA's original legislation was amended in 1985 (Act 409) and four programs were added to provide financial assistance to technology-based industries and to support basic and applied research at Arkansas colleges and universities.

The four programs added were:

- The **Seed Capital Investment Program**, which helps new Arkansas-based, technology-related companies with start-up financing.
- The **Business Incubator Program**, which enhances economic development by increasing the chances for survival of small, technology-based businesses by providing them a "sheltered" environment.
- The **Technology Transfer Program**, which encourages the transfer of technology from state and federal laboratories to private industry.
- The **Basic and Applied Research Grant Programs**, which competitively award grants to establish and support basic and applied research in science and engineering at Arkansas colleges and universities.

A fifth program was added in 1985:

- The **Research and Development Tax Credit** (Act 740), which encourages private industry to invest in scientific work in the state.
- Programs added since 1985 include:
- The **Small Business Innovation Research (SBIR) Assistance Program** (Act 210 of 1987), which helps small

businesses identify and apply for funds under the federal SBIR Program, which offers competitive grants to small businesses for research and development of innovative technology.

- The **Centers for Applied Technology Program** (Act 803 of 1989), designed to fund university-based research centers for technological excellence. With a \$1.16 million match from the National Science Foundation, this program has funded three research centers through the Arkansas Experimental Program to Stimulate Competitive Research (EPSCoR).

- The **Technology Development Program** (Act 271 of 1989), established to assist inventors, scientists and small businesses which have good ideas, but lack resources to develop them. Although legislatively approved, this program has not received funding.

### Plans for next biennium

After evaluation of programs at a 1990 Planning Session, the ASTA board of directors made the following proposals for the 1990 legislative session:

- Increase funding for the Seed Capital Investment Program to \$1.8 million annually
- Redesign the Incubator Program as the Business Innovation System
- Increase funding for research grant programs
- Secure separate funding for the EPSCoR and Centers for Applied Technology programs
- Fund the Technology Development Program
- Develop a Science and Engineering Infrastructure Grant Program to improve research and development facilities at universities and colleges
- Establish an Eminent Scientist and Engineer Program.

## Planting seeds for economic growth

The following are highlights of ASTA's activities and events which laid a foundation for technology-based economic growth in Arkansas during fiscal year 1990:

**September 21, 1989:** The first of four regional forums, hosted by ASTA and the University of Arkansas at Little Rock, is held at Arkansas State University to inform small businesses about the Small Business Innovation Research Program. The other forums are held at Arkansas Tech University, the University of Arkansas, Fayetteville and Southern Arkansas University.

**September 29:** ASTA is awarded a \$1 million cost-sharing federal contract by the U.S. Food and Drug Administration to study the feasibility of a National Biotechnology Cooperative demonstration project at the National Center for Toxicological Research in Jefferson.

**October 2:** The Industrial Renaissance Center, an incubator sponsored by the University of Arkansas at Monticello, opens.

**October 30:** Arkansas business leaders and legislators attend a media briefing and project presentation at the Capitol on the National Biotechnology Cooperative demonstration project.

**November 14:** The first of three regional forums is held in San Francisco to discover the biotechnology industry's ideas on a National Biotechnology Cooperative. The two other forums are held in Washington, D.C., and Little Rock.

**November 16 & 17:** ASTA and UALR host a Small Business Innovation Research Program conference/workshop in Little Rock with Dr. David and Virginia Colvin of Triangle Research and Development Corp., Research Triangle Park, North Carolina.

**December 7:** The first of two meetings in Little Rock introduces state leaders in government, education and private business to the concept of the Arkansas Industrial Network, an effort to link state manufacturers and increase their competitiveness on a national and international level. A second meeting is held April 19.

**December 8:** The ASTA board of trustees awards \$240,000 from the Business

Incubator Program to a seventh incubator, the Institute for Innovative Business Development, sponsored by the University of Arkansas at Pine Bluff.

**January 17, 1990:** ASTA is named coordinator of the Arkansas Industrial Network pilot project. The Southern Technology Council and the Metalworking Connection are assisting with the organization of the manufacturing network.

**January 18 & 19:** The first meeting of the Arkansas Business Incubator Managers Association is held at Jacksonville.

**March 1:** The National Science Foundation awards \$1.16 million to Arkansas' Experimental Program to Stimulate Competitive Research to fund three centers of excellence in the state.

**March 29:** ASTA's board of directors and staff attend a planning session to decide the future direction and focus of programs. ASTA's proposals for the next biennium, based on the session's discussion, are later adopted by the board.

**May 17:** At a joint meeting, the boards of directors of ASTA, the Arkansas Industrial Development Commission and the Arkansas Development Finance Authority recognize the importance of education and training in their missions of state economic development. The directors of ASTA and AIDC later jointly resolve to seek support for funding of education and training with an appropriate level of state monies. A DFA's board approves a similar resolution.

**June 7:** Artek Systems, Inc., pays off a loan from the ASTA Seed Capital Investment Program, marking the successful completion of the company's first phase of production of wide-area bar code readers for the United States Postal Service.

**June 14:** An Arkansas Industrial Network meeting is held in Little Rock to solicit support from regional representatives for the organization of manufacturing networks.

**June 20:** The final report of the *National Biotechnology Cooperative Feasibility Study and Master Plan* is submitted to the U.S. Food and Drug Administration and the National Center for Toxicological Research,

## Grants nurture advancement of sciences

Some of ASTA's greatest successes have come from its two research grant programs which competitively award funds to scientists at Arkansas colleges and universities for research in basic and applied science.

The programs are designed to help the economy by improving the state's capacity for research, while seeding the growth of technology-based industry.

Since their establishment in 1985, the programs have awarded \$2,446,444.57 to 51 basic and 27 applied research projects.

Included in those awards are 10 basic and applied projects funded under ASTA's Center for Energy-Related Research. The energy-related research program was established in the 1989 fiscal year and received \$300,000 from the state's Petroleum Violation Escrow Fund.

The Applied Research Grant Program has attracted \$666,724.94 from private businesses in contributions of funds and equipment for Arkansas research. This program requires a one-to-one industry match to fund research which could result in a commercially viable product or process. Arkansas businesses with 50 or fewer employees are given an opportunity to participate by contributing one dollar for every two awarded by ASTA.

The Basic Research Grant Program is designed to support fundamental research in science and engineering. ASTA awards funding for up to 60 percent of project costs, and sponsoring universities and colleges provide 40 percent in cash or services.

These grant programs also serve as a source of participants for other ASTA programs. A successful basic research project may lead to an applied research project, which in turn

could result in a product for commercialization. A new technology-based business, formed to manufacture and market this product, might then seek financial assistance from the Seed Capital Investment Program and get start-up support from an incubator established through the Business Incubator Program.

Still in the first steps of this economic development chain, the following research projects are three of ASTA's most recent successes.

The three projects are working to answer those questions:

### ■ **What causes some people to be allergic to soy protein?**

If that question could be answered, not only would those allergic to soy protein be free to eat food containing soy products, but more commercial food producers would consider using soy protein.

This would result in an increased demand for one of our state's largest crops.

A strong first step in answering this question has been taken by Wesley Burks, M.D., an assistant professor at the University of Arkansas for Medical Sciences. He has completed an initial study of soy protein allergies, using a \$23,075 applied research grant. Ross Laboratories provided matching funds.

Dr. Burks and a team of researchers successfully identified soy protein's allergy-causing components. This discovery led to a \$410,000 follow-on grant from the National Institutes of Health to study modification of soy protein to eliminate these allergy-causing components and to further investigate the human immune system's reactions to these allergens.

### ■ **Why do some cattle attract fewer disease-carrying flies?**

C. Dayton Steelman, Ph.D., and A. Hayden Brown, Ph.D., both professors at the University of Arkansas, Fayetteville,

are investigating this question by using embryo manipulation and transfer technology.

They received a \$26,920 applied research grant, which was matched by embryo transplant services provided by Granada Genetics, Inc.

Early study results indicate that cattle's resistance to flies is an inherited trait. Once the responsible factors are identified, cattle farmers can use this information to breed resistant animals and reduce losses caused by fly transmitted diseases.

Using embryo transfer, embryos produced from a fly-resistant male and female can be transferred to a different female for birth.

This allows researchers to increase the number of calves produced in a year by the same fly-resistant pair, significantly decreasing the time needed to determine both heredity's role and the factors responsible in resistance.

By careful selection of the cows receiving the embryos, Drs. Steelman and Brown are also determining the importance of the birth mother's role in the fly-resistance of the calf.

■ **Why does exposure to elevated oxygen during hospitalization cause blindness in some premature infants?**

In recent years, treatment of premature infants has greatly improved and survival of "preemies" has increased. However, a greater survival rate has also increased the number of cases of retinopathy of prematurity - a disease that results in blindness.

During their treatment, premature babies with underdeveloped lungs are commonly treated with elevated oxygen. Unfortunately, this treatment can cause retardation of the retina's blood vessels. After the infant is returned to room air, the vessels grow abnormally, often causing detachment of the retina.

John S. Penn, Ph.D., a professor of Ophthalmology at the University of Arkansas for Medical Sciences, and his fellow scientists, aided by a \$40,000

basic research grant, are developing an animal model to further investigate this disease.

Their work also includes identifying drugs which may prevent retinal vessel retardation caused by exposure to elevated oxygen.

This project will have great economic benefit, both in the private sector, with commercialization of treatments, and in the public sector, with a reduction in the cost of medical care and support of those affected by retinopathy.

**Plans for next biennium**

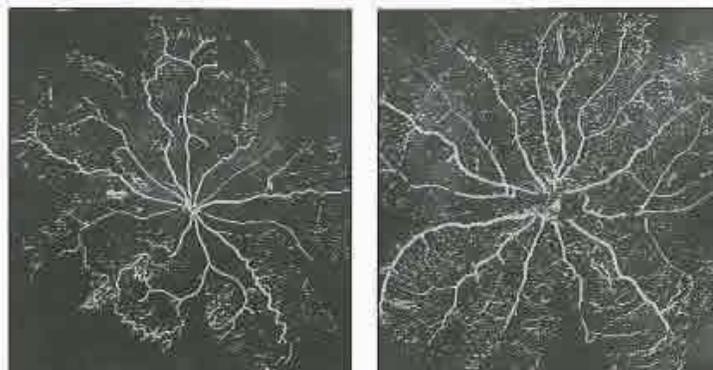
Because of the programs' limited funding, ASTA has missed opportunities to fund exceptional research projects with strong economic development potential.

The ASTA board of directors has named the research programs as its single highest priority, and has proposed that their state funding be increased to \$1.8 million a year.

The board also proposed that two new programs be established under ASTA's research division:

- A Science and Engineering Infrastructure Grant Program to improve research facilities at colleges and universities
- An Eminent Scientist and Engineer Program to support up to 30 research positions annually.

*An ASTA basic research grant is funding an investigation of blindness in premature infants caused by elevated oxygen used in their medical care. Below is a computer-generated illustration of the retina of a rat raised in elevated oxygen (left), and one of a rat raised in room air - notice the retardation of retinal vessels which causes the blinding disease.*



## \$586,707 awarded to 16 research projects

ASTA research grant programs funneled a total of \$586,706.56 to 16 research projects at six Arkansas universities and colleges in the 1990 fiscal year.

State funding of \$514,363.62 was awarded; required industry matches totaled \$72,342.94.

### Applied research projects

ASTA's Applied Research Grant Program awarded a total of \$56,100.94 to two applied research projects this fiscal year. These projects received \$57,705.94 in matching funds from industry co-sponsors.

■ **Determination of the Inheritance of Factors Contributing to Beef Cattle Resistance to Arthropods**, C. Dayton Steelman, Ph.D., and A. Hayden Brown, Ph.D., University of Arkansas, Fayetteville, \$26,920. Granada Genetics, Inc., provided a \$28,525 match. These researchers are investigating the inherited resistance some cattle have to arthropods (flies) which can cause disease and result in economic loss in production.

■ **Allergenicity of Rice Protein**, A. Wesley Burks, M.D., University of Arkansas for Medical Sciences, \$29,180.94. Matching funds of \$29,180.94 were contributed by Ross Laboratories. Identification of allergens in rice and the reactions the allergens elicit is the goal of this project. The results will assist development of a rice protein which could replace soy and milk-based proteins in infant formulas.

### Energy-related research projects

The ASTA Energy Related Grant Program awarded two grants totaling \$63,469.68.

■ **Design and Implementation of an Expert System for Proposal Preparation for Automated Building Controls**,

Sandra C. Parker, Ph.D., UAF, \$27,342. Energy Techniques, Inc., matched the grant with \$14,637. Dr. Parker is developing a software package for businesses which will aid in recommending specific changes to buildings and equipment for more efficient energy use.

■ **Deposition of Semiconductor-Grade Metal Selenide and Telluride Films (e.g.  $CuInSe_2$  and  $CdTe$ ) for Subsequent Solar Cell Applications by Novel Low Cost Intermediate Temperature (200-500C) and Atmospheric Pressure Solid and Liquid Phase Chemical and Electrochemical Techniques**, Robert D. Engelken, Ph.D., Arkansas State University, \$36,127.68. This project is developing a new process for producing electricity-generating solar cells. This new process would eliminate use of hazardous gas in solar-cell production and reduce production costs.

### Basic research projects

A dozen basic research projects were awarded \$394,793 through the ASTA Basic Research Grant Program in fiscal year 1990.

■ **An Evaluation of Different Adaptive Control Design Methods of Vector Controlled AC Drives**, Juan C. Balda, Ph.D., UAF, \$54,305. Dr. Balda is analyzing new and advanced electric motor design methods to determine which is the most efficient.

■ **Determination of Cimetidine in Pharmaceutical Preparations by Capillary Zone Electrophoresis**, Arthur Hoyt Jr., Ph.D., University of Central Arkansas, \$19,846. This project will explore an analytical method for determining the amount of the anti-ulcer drug, cimetidine, in pharmaceutical preparations.

■ **Molecular Structure Determination Facility**, A. Wallace Cordes, Ph.D., UAF,

\$12,559. Dr. Cordes is establishing a statewide service to determine the structure of molecules for basic research in organic and inorganic chemistry.

■ **Molecular Modeling and Computer Graphics of Biomacromolecules**, Cesar M. Compadre, Ph.D., UAMS, \$29,197. This project is using computer analysis to test the use of specific enzymes in the treatment of tumors, heart attacks and inflammations.

■ **Application of Rare-Earth Oxide Electrodes for the Electro-Chemical Destruction of PCBs**, Roger M. Hawk, Ph.D., University of Arkansas at Little Rock, \$24,813. This project is developing electrodes from special elements to more effectively break down PCBs by using electrochemical methods.

■ **Refractometer Development to Measure Partial Catalytic Hydrogenation of Soybean Oil**, Alois J. Adams, Ph.D., and Robert A. Sims, Ph.D., UALR, \$25,958. These researchers are developing a method using optical fibers that will continuously measure changes in the consistency and composition of soybean oil during the hydrogenation process.

■ **Fluidized Granular Bed Gas Filtration with Electrostatic Enhancements and Magnetic Stabilization**, Malay K. Mazumder, Ph.D., UALR, \$25,902. Dr. Mazumder is using new developments in imaging technology to enhance the capabilities of a new type of air filter.

■ **Doped PECVD SIPOS Films and Their Hetero- and Isotype Junction Devices**, Simon S. Ang, Ph.D., UAF, \$42,632. This project is studying the properties of oxygen-enhanced polycrystalline silicon films, a semiconductor material which may have new applications.

■ **Retinopathy of Prematurity**, John S. Penn, Ph.D., UAMS, \$40,000. Dr. Penn is developing an animal model to study oxygen-related retinal damage and blindness in premature infants.

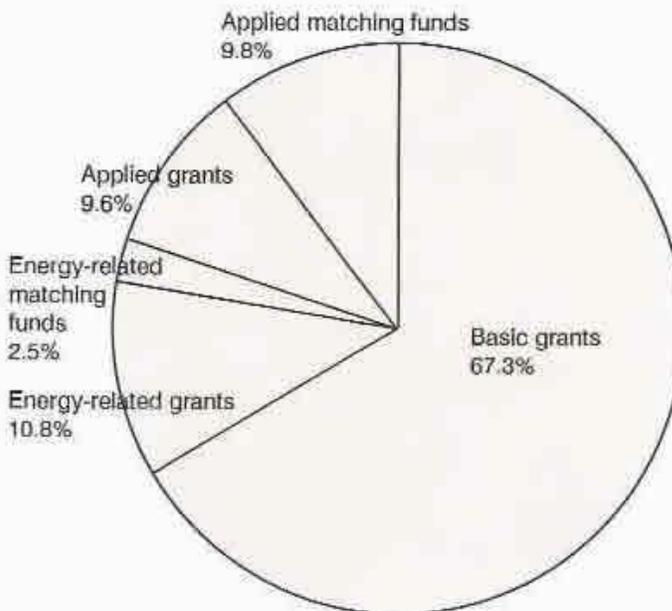
■ **Quantum Statistics of Non-Classical**

**States**, Reeta Vyas, Ph.D., UAF, \$39,794. This project is theoretical research of statistical properties of non-classical electromagnetic fields in non-linear optical processes.

■ **A User Interface Management System for Computer-Based Instruments**, Gary A. Anderson, Ph.D., UALR, \$37,425. Dr. Anderson is creating pre-written software modules which will allow manufacturers to develop computer software for specific computer-based instrument applications more quickly and economically.

■ **Effect of Dietary Pectin on Serum Cholesterol Distribution in Type 1 Diabetics**, Komalam Jairaj, Ph.D., University of Arkansas at Pine Bluff, \$42,362. This project is testing the effect of dietary pectin on cholesterol levels in Type 1 diabetics.

Distribution of research funding FY 1990



## Total ASTA research grants awarded FY 1990

Grant program	Co-sponsor match	ASTA grant
Basic research grants	N/A	\$394,793.00
Applied research grants	\$57,705.94	56,100.94
Energy-related grants	14,637.00	63,469.68
<b>TOTAL funds awarded</b>	<b>\$72,342.94</b>	<b>\$514,363.62</b>

## Applied research grants awarded FY 1990

Project	Investigator/University	Industry co-sponsor	Co-sponsor match	ASTA grant
Beef cattle resistance to arthropods	C. Dayton Steelman, Ph.D. A. Hayden Brown, Ph.D. UAF	Granada Genetics, Inc.	\$28,525.00	\$26,920.00
Allergenicity of rice proteins	A. Wesley Burkes, M.D. UAMS	Ross Laboratories	29,180.94	29,180.94
<b>TOTAL funds awarded</b>			<b>\$57,705.94</b>	<b>\$56,100.94</b>

## Energy-related grants awarded FY 1990

Project	Investigator/University	Industry co-sponsor	Co-sponsor match	ASTA grant
Automated building controls	Sandra C. Parker, Ph.D. UAF	Energy Techniques, Inc.	\$14,637.00	\$27,342.00
Metal film/solar cells	Robert D. Engolken, Ph.D. ASU	N/A		36,127.68
<b>TOTAL funds awarded</b>			<b>\$14,637.00</b>	<b>\$63,469.68</b>

## Basic research grants awarded FY 1990

Project	Investigators/University	ASTA grant
Vector controlled AC drives	Juan C. Balda, Ph.D. UAF	\$54,305.00
Cimetidine/capillary zone electrophoresis	Arthur Hoyt, Jr., Ph.D. UCA	19,846.00
Molecular structure determination facility	A. Wallace Cordes, Ph.D. UAF	12,559.00
Biomacromolecules	Cesar M. Compadre, Ph.D. UAMS	29,197.00
PCB destruction	Roger M. Hawk, Ph.D. UALR	24,813.00
Refractometer development/ soybean oil	Alois J. Adams, Ph.D. Robert A. Sims, Ph.D. UALR	25,958.00
Fluidized gas filtration	Malay K. Mazumder, Ph.D. UALR	25,902.00
Doped PECVD SIPOS films	Simon S. Ang, Ph.D. UAF	42,632.00
Animal model retinopathy	John S. Penn, Ph.D. UAMS	40,000.00
Quantum statics of non-classical states	Reeta Vyas, Ph.D. UAF	39,794.00
User interface management/ instruments	Gary A. Anderson, Ph.D. UALR	37,425.00
Dietary pectin/serum cholesterol/type I diabetics	Komalam Jairaj, Ph.D. UAPB	42,362.00
<b>TOTAL funds awarded</b>		<b>\$394,793.00</b>

ASU: Arkansas State University  
 UAF: University of Arkansas, Fayetteville  
 UALR: University of Arkansas at Little Rock

UAMS: University of Arkansas for Medical Sciences  
 UAPB: University of Arkansas at Pine Bluff  
 UCA: University of Central Arkansas

## EPSCoR helps state strengthen research

A \$1.16 million match was approved by ASTA in March 1990 to help fund three "Centers of Excellence."

The ASTA funds matched monies granted by the National Science Foundation's Experimental Program to Stimulate Competitive Research (EPSCoR).

The grants will be used for two-year funding of the following centers:

- **Center for Protein Dynamics**, headed by Roger E. Koeppe II, Ph.D., at the University of Arkansas, Fayetteville
- **Arkansas Neurobiology Center**, headed by Edgar Garcia-Rill, Ph.D., at the University of Arkansas for Medical Sciences
- **Center for Cellular and Molecular Studies on Biological Aging**, headed by Samuel Goldstein, Ph.D., at UAMS.

The continued funding of these centers will allow their fields of research to grow to the point where they are able to compete on a national basis for federal funding.

Increased support from federal sources is the most effective way to increase research in the state.

"It is of paramount importance to get federal agencies like this to provide funding to make Arkansas research competitive on a national level," Dave Straub, M.D., Ph.D., Arkansas EPSCoR project director, said at the time of the award.

"This will pay dividends for years to come. It's exactly the opportunity we needed for our scientists to become competitive."

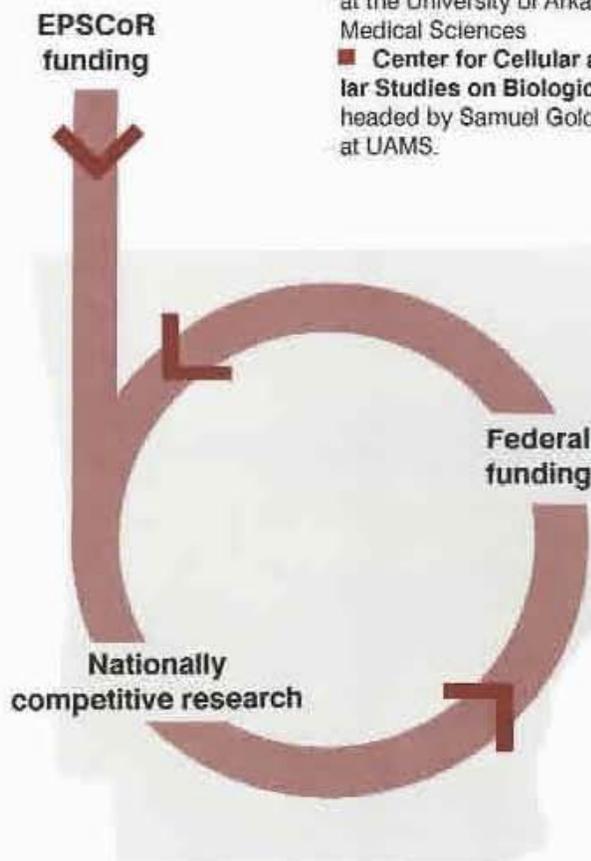
The EPSCoR program has allowed the Fayetteville center to bring together investigators from five different branches of chemistry to work on problems both analytically and experimentally.

The neurobiology center is working to develop a major, nationally competitive effort to attack complex neurobiological research problems on a large scale.

The biological aging center is believed to have both immediate and future benefits in the study of the aging process.

ASTA is currently working to secure future matching funds for the EPSCoR centers.

*EPSCoR helps states like Arkansas, which receive comparatively few federal research dollars, increase their chances to successfully compete for federal research funding. EPSCoR gives a state the financial foundation on which to build a critical mass of researchers. In return, their research allows the state to become nationally competitive in receiving federal research grants. A cycle can then develop in which federal dollars boost the quality of competitive research and even more federal dollars can be attracted.*



## Report plants seed for establishing NBC

The development of a National Biotechnology Cooperative demonstration project at the National Center for Toxicological Research at Jefferson is feasible, according to a report submitted to the U.S. Food and Drug Administration.

The report, the first in a series for the *National Biotechnology Cooperative Feasibility Study and Master Plan*, is the product of a \$1 million cost-sharing contract awarded to ASTA in September 1989.

The proposed NBC would link the resources of industry, government and universities to speed the commercialization of biotechnology products and processes.

The concept, first presented in 1988, resulted from concerns raised by a trend of developments in the biotechnology industry, such as decreased availability of financing, complexity of the regulatory environment and international competition.

Biotechnology has since been identified as a critical technology for the United States. This technology is necessary to maintain economic leadership in global markets.

The findings in the report are based on an industry wide survey, along with interviews and three industry forums held in San Francisco, Washington, D.C., and Little Rock.

The survey, sent to 2,200 biotechnology companies, venture capitalists and investment bankers, had an overall response rate of 14 percent. Distribution of respondents by market segment was relatively even.

The features attracting the greatest interest from respondents were:

- Regulatory assistance
- Centralized scientific services
- Technology transfer assistance

According to the report, firms would consider moving staff to the

NBC at NCTR for collaborative research, joint ventures, such as product development and research, help with FDA approvals and large animal trials.

Support for the NBC comes primarily from biotech firms with six to 150 employees and located on the East Coast and in middle America.

The current structure of the biotech industry is dominated by human health care firms, but also includes agricultural biotech firms, suppliers, and others involved in areas such as bioremediation, food processing and energy.

To conduct the feasibility study, ASTA sub-contracted with Ernst & Young's San Francisco-based High Technology Practice, whose clients include a majority of U.S. biotechnology companies.

The architectural master plan is being developed by Cromwell Truemper Levy Thompson Woodsmall, Inc., a Little Rock architectural and engineering firm, also under sub-contract to ASTA.

Completion of ASTA's contract, addressing management, marketing and operational issues for the NBC, is scheduled for September 1991.

*This architectural sketch illustrates the location of the NBC facility at the National Center for Toxicological Research, currently located at Jefferson, Arkansas.*



## Seed Capital Program sprouts successes

The Seed Capital Investment Program was able to plant its most successful financial deal in its history this fiscal year. Established in 1985, the program helps technology-related businesses with start-up financing.

The program invested \$175,000 in **Artek Systems, Inc.**, a Fayetteville manufacturer of wide-area bar code readers, and has seen the business' growth surpass all expectations.

Artek's bar code reader, used to read the address codes on mass mailings, is unique because it reads the code anywhere on an envelope and processes 10 pieces of mail per second. The United States Postal Service realized the time-saving benefits of the reader and awarded the company a \$900,000, 40-unit contract. The USPS, pleased with the performance of the readers, ordered an additional 23 units to complete conversion of its postal facilities in Tampa, Florida.

The company is also developing a prototype bar code reader for use with magazines and larger envelopes.

The Seed Capital Investment Program has helped other companies experience similar achievements.

■ **Arkansas Technologies, Inc. (ARTECH)** - This Clarksville manufacturer received a \$150,000 ASTA loan the program's first investment - and has grown to employ 40 Arkansans.

ARTECH designs and builds high technology production equipment which helps existing manufacturers increase flexibility and productivity. A large percentage of their business is with out-of-state customers.

■ **Emerging Technologies** - This Little Rock company was awarded a \$200,000 loan in 1989 and has captured 60 percent of the national sporting goods market for laser sighting devices.

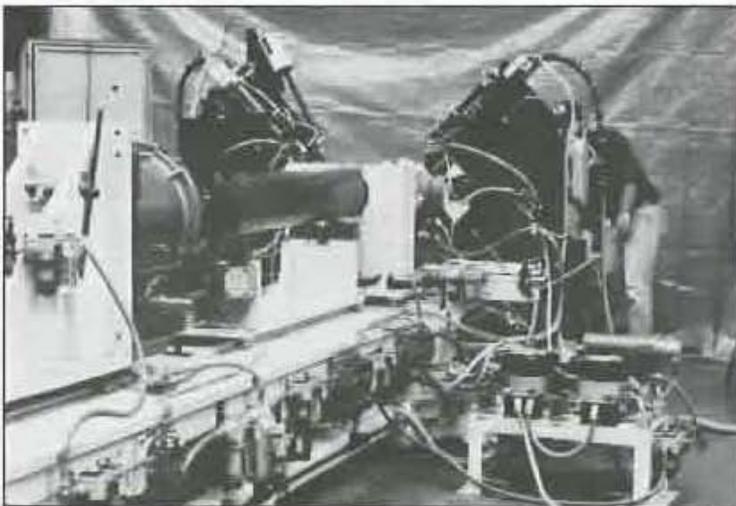
The company is also fast approaching a #2 ranking in national sales for a laser pointer used in audio-visual presentations. Its plans for 1991 include introduction of a laser product for the construction/hardware industry.

According to the company, it employs 50 people and directly affects and creates jobs in 20 to 30 other Arkansas companies, including advertising, labeling and machining.

### Plans for next biennium

ASTA's plans for the Seed Capital Investment Program for the next biennium include a request for a \$2 million increase in the \$1.8 million Seed Capital Investment Fund.

The increase is needed because a more aggressive approach to program marketing is being taken, and more available funds are needed to generate a new goal of three to five investments a year.



*Arkansas Technologies (ARTECH) of Clarksville is one of ASTA's most successful seed capital investments. In the photo to the left, an ARTECH employee tests a missile loading system.*

## Seed Capital Investment Fund FY 1990

Beginning balance, money market accounts		\$284,413.89
Interest and principal earned		
Interest, money market accounts	\$11,550.66	
Interest, CD accounts	110,692.29	
Interest Seed Capital accounts	12,254.22	
Principal, Seed Capital accounts	<u>140,488.11</u>	
Total principal and interest earned		274,985.28
Certificates of deposit purchased		(5,000.00)
Fund expenses		(16.00)
Less FY1990 investments		<u>(290,414.54)</u>
Ending balance, money market accounts		\$263,968.63
Investments receivable		381,816.19
Certificates of deposit		<u>1,600,000.00</u>
<b>Total Seed Capital Investment Funds balance</b>		<b>\$2,245,784.82</b>

## Seed Capital Investment history

Company, location and FY year funded	Company's product	ASTA funds	Bank funds	Federal funds	Company equity	# of jobs
Arkansas Technologies, Inc. Clarksville, 1987	High-technology production equipment which increases flexibility and productivity of existing manufacturing operations	\$150,000	\$200,000	\$200,000	\$100,000	40
Micoil Conway, 1988	Thin-film inductor coils for the electronics industry manufactured with innovative laser techniques	150,000	100,000	200,000	250,000	7
Nthography Fayetteville, 1988	Low-altitude, remote-controlled photography devices	125,000	60,000		165,000	4
Emerging Technologies Little Rock, 1990	Sporting-good sights and audio-visual pointers based on the world's smallest laser	200,000	450,000		600,000	50
Artek Systems, Inc. Fayetteville, 1990	Wide-area bar code readers currently being phased in by the United States Postal Service to speed mail sorting	175,000	175,000	900,000	100,000	15
<b>TOTALS</b>		<b>\$800,000</b>	<b>\$985,000</b>	<b>\$1,300,000</b>	<b>\$1,215,000</b>	<b>116</b>

## Program expands with seventh incubator

The Business Incubator Program produced its seventh incubator this fiscal year - the Institute for Innovative Business Development, sponsored by the University of Arkansas at Pine Bluff.

The Incubator Program began in 1985 to set up centers to assist technology based start-up companies through their difficult first years of existence.

The incubators, each sponsored by a university or college, provide space, shared office services, and management and technical assistance for businesses to increase their chances for survival.

As of June, incubators were assisting 43 companies which employed a total of 155 Arkansans.

The program has helped a number of new businesses prosper this fiscal year. Two of the most successful were:

■ Gorton Hydraulics, Inc., of the East Arkansas Business Incubator System, which became a tenant in 1989 and has filled the area's need for custom hydraulic cylinders and hydraulic system repair which had previously been available only out of state. The company is firmly established in the market and expects to graduate from the incubator by the end of the year.

■ Artek Systems, Inc., a manufacturer of wide-area bar code readers that speed the mail sorting process, which became a Genesis tenant this winter. After completion of a \$900,000, 40-unit contract with the United States Postal Service, the USPS requested another 23 units.

Also this fiscal year:

■ The Industrial Renaissance Center, sponsored by the University of Arkansas at Monticello, opened October 2 and in June was assisting 11 clients.

■ The Arkansas Business Incubator Managers Association was founded in January to organize the state's incubator managers and to provide a vehicle for sharing and developing strategies for economic development. It also represents Arkansas in the National Business Incubator Association.



### Business incubators funded

1. Genesis, Fayetteville (University of Arkansas, Fayetteville)
2. The Business Center, Magnolia (Southern Arkansas University)
3. North Arkansas Business Incubator System, Salem (North Arkansas Community College)
4. East Arkansas Business Incubator System, Jonesboro (Arkansas State University)
5. Industrial Renaissance Center, Monticello (UA at Monticello)
6. Institute for Innovative Business Development, Pine Bluff (UAPB)
7. The Little Rock Technology Center, Little Rock (UALR)

### Plans for next biennium

The establishment of the Pine Bluff incubator signals the maturation of the Incubator Program, according to the ASTA board of directors.

The ASTA board mandated during the 1990 Planning Session that the program be revised to foster cooperation among the state and federal small business assistance programs.

The revised program - the Business Innovation System - will be a comprehensive economic development effort based at incubators.

## Networks taking root with guidance of STC

This winter, ASTA began coordinating an Arkansas Industrial Network, in cooperation with the Southern Technology Council.

This pilot project is expected to increase national and international competitiveness of Arkansas' small and medium manufacturers.

The project is funded by a two-phase grant from the Winthrop Rockefeller Foundation. Phase I is expected to cost \$71,440 and is

training the network leadership and developing network organization.

Southern Arkansas University and Henderson State University have been instrumental in this project, providing a model with their Metalworking Connection, a network of south Arkansas manufacturers.

Advantages of networks come from economies of scale and scope. Arkansas is one of six southern states establishing a network with STC assistance.

## FY 1989 SBIR awards grow to \$1 million

Arkansas small businesses received more than \$1 million in federal funds through Small Business Innovation Research (SBIR) awards in FY 1989\*.

ASTA promotes this federal program and helps these businesses apply for awards offered by 11 federal research and development agencies.

The SBIR program stimulates technological innovation by giving companies with fewer than 500 employees an opportunity to conduct research which is likely to develop new products, pro-

cesses or services of interest to the federal government.

These awards also give small companies a better chance to compete against larger firms.

Since ASTA began its SBIR assistance program in 1987, six different Arkansas companies have received 11 awards totaling almost \$2 million.

The SBIR awards for FY 1989 almost double the \$552,467 granted to three projects in FY 1988.

\* SBIR awards are listed according to the federal government fiscal year which ends September 30.

Company	Project	Awarding agency	Amount of award
Engineering Resources Fayetteville	Biological production of methanol from methane	DOE	\$495,465
Engineering Resources Fayetteville	Biological production of hydrogen	DOE	50,000
ETC Engineers, Inc. Little Rock	Study and evaluation of fibre-reinforced dowel bars for use in highways	DOT	49,747
Marine Specialty, Inc. East Camden	Underwater signaling device	Navy	500,000
<b>TOTAL SBIR awards for FY 1989*</b>			<b>\$1,095,212</b>

Key: DOE - U.S. Department of Energy; DOT - U.S. Department of Transportation; Navy - U.S. Navy

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