# Arkansas Science & Technology Authority

Annual Report
for FY 1988

Governor Bill Clinton

Dr. John W. Ahlen, ASTA president

# ASTA board of directors

**The Hon. Max Howell**, Arkansas Senate, Jacksonville. Ex-officio member. Term ends: 1989.

**The Hon. John Lipton**, Arkansas House of Representatives, Warren. Ex-officio member. Term ends: 1989.

**William H. Bowen**, chief executive officer and chairman of the board, First Commercial Bank, N.A., and First Commercial Corporation, Little Rock. Term ends: 1992.

**Dr. Joycelyn Elders**, director, Arkansas Health Department, Little Rock. Term ends: 1989.

**Dr. Ronald W. Hart**, director, National Center for Toxicological Research, Jefferson. Term ends: 1990. *(Resigned: June 1988.)*

**Dr. Paul Marion**, director, Department of Higher Education, Little Rock. Statutory member.

**Harry Truman Moore**, lawyer, Goodwin, Hamilton & Moore, Paragould. Term ends: 1989. *(Secretary of Board)*

**Dr. Joe F. Nix**, professor, Department of Chemistry, Ouachita Baptist University, Arkadelphia. Term ends: 1991. *(Vice Chairman of Board)*

**Louis L. Ramsay Jr.**, lawyer, Ramsay, Cox, Pine Bluff. Term ends: 1992.

**Dr. Winfred L. Thompson**, president, University of Central Arkansas, Conway. Term ends: 1990. *(Chairman of Board)*

**John Troutt**, publishing editor, **Jonesboro Sun**, Jonesboro. Term ends: 1992.

**Jerry Webster**, president, Webster Corporation, Little Rock. Term ends: 1991.

**Dr. William Willingham**, professor, Department of Natural Sciences, University of Arkansas at Pine Bluff. Term ends: 1989

## Board committees

**Executive Committee:** Dr. Winfred L. Thompson (chairman), William H. Bowen, Harry Truman Moore, Dr. Joe F. Nix and Louis L. Ramsay Jr.

**Research Committee:** Dr. Ronald Hart (chairman), Dr. Joycelyn Elders, Dr. Joe Nix and Dr. Joe Gentry (staff).

**Investment Committee:** Harry Truman Moore (chairman), William H. Bowen, Louis L. Ramsay Jr., Jerry Webster and James T. Benham (staff).

**Planning Committee:** Dr. Paul Marion (chairman), Dr. William Willingham, John Troutt and Alice Rumph Smith (staff).

*On the front cover... Computer-generated photo of a sulfur fluoride molecule by Dr. William G. Harter, professor of physics at the University of Arkansas at Fayetteville. Dr. Harter illustrates molecular motion to his students with computer animation software he developed with an ASTA basic research grant.*

June 30, 1988

**Winfred L. Thompson**
**Chairman of the Board**

Governor Bill Clinton and
Members of the 76th General Assembly
State Capitol Building
Little Rock, Arkansas 72201

Dear Governor Clinton and Legislators:

We are proud to report measurable and impressive results from your successful experiment in economic development -- the programs of the Arkansas Science & Technology Authority.

The three years since our first programs were implemented have provided encouragement and incentive for a variety of valuable entrepreneurial efforts that help to transform ideas into real jobs for our fellow Arkansans. Here are some of the results:

**Basic and Applied Research Grants Programs** -- Industry sources estimate that the 14 applied research projects alone have the potential to create up to 1,931 new jobs and save some 2,535 existing jobs while adding more than $225.7 million annually to the economy. Since 1986, when these programs were first funded, the Authority has invested $1,284,428 in 38 basic and applied research projects. These have resulted in about $2.5 million in follow-on grants from other sources (mostly federal) and another $554,000 in pending grants. In addition, the research has inspired at least 43 articles in scientific journals and five chapters in books, while exposing Arkansas students to innovative research in emerging areas of knowledge and technology.

**Business Incubator Program** -- The Authority's incubators and their 14 tenant firms employ 81 people. It is estimated that tenant businesses and employees of the Fayetteville facility are already contributing more to the state in taxes than the annual cost of the incubator to the state. This incubator, which opened in November 1986, employs 42 people. The Authority has committed more than $1.8 million to its network of five incubators. Four are now open.

**Seed Capital Investment Program** -- The three technology-based businesses in which the Authority has invested seed capital have already created 44 jobs. Our $425,000 in these new businesses leveraged $1,325,000 from other sources. It is doubtful that they would have come into existence without ASTA's willingness to bear a part of the financial risk.

We commend to your careful study our annual report for Fiscal Year 1988. We're proud of what has been accomplished for the people of Arkansas through this program and feel confident you will share in that pride.

Sincerely,

Winfred L. Thompson
Chairman of the Board
Arkansas Science & Technology Authority

# The Authority: A short profile

*Tenants of Genesis, the University of Arkansas at Fayetteville's business incubator, utilize the university's equipment and staff expertise. Shown here is Phyllis Dillard, a research assistant employed by the university's Biomass Research Center, where the biotech portion of the incubator is located. (Photo courtesy of Mike Donat, Interactive Technology, Inc.)*

## ASTA assists technology-based business

ASTA helps enhance the survival of young technology-based companies through these four programs:

The **Business Incubator Program** provides fledgling businesses with rental space, support services and access to university or college staff and equipment.

The **Seed Capital Investment Program** makes loans, royalty agreements or other investments to share in the startup costs of promising ventures.

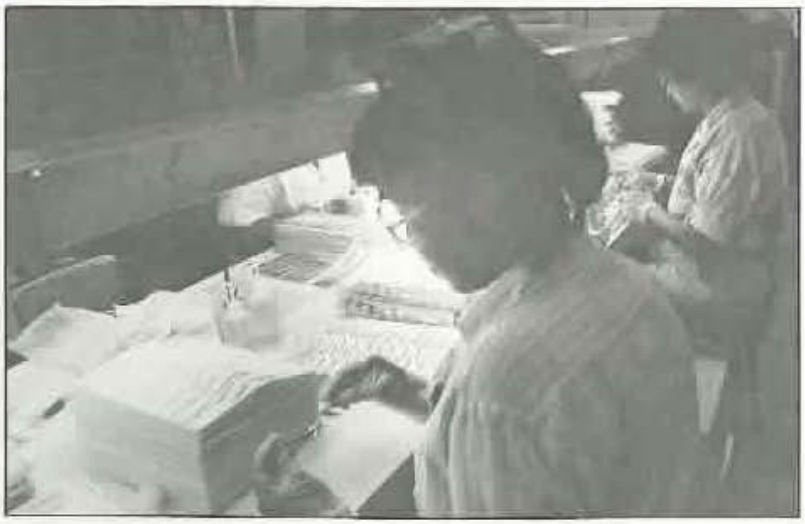
The **Small Business Innovation Research (SBIR) Assistance Program** helps firms apply for federal SBIR grants.

The **Technology Transfer Program** helps companies find appropriate training, technical or business assistance.

## ASTA funds basic and applied research

ASTA funds innovative research at Arkansas colleges and universities through its two competitive basic and applied research grants programs.

The **Basic Research Grants Program** assists scientists who are conducting fundamental research, while the **Applied Research Grants Program** works with Arkansas industry in funding research proposals with commercial potential. The projects are judged for both scientific merit and economic appropriateness.



*ASTA and Timex Corporation funded cooperative applied research between Timex and a research team from the University of Arkansas at Little Rock's Graduate Institute of Technology on ways to improve a gold-coating process. Here, Timex employees inspect some gold-coated watchbands. (Staff photo)*

# Highlights of FY 1988

*Dr. James Young, chancellor of the University of Arkansas at Little Rock, takes the scissors to a ceremonial ribbon marking the opening of UALR's incubator in downtown Little Rock. Incubator manager Liz Abernathy and Governor Clinton assist him with the ribbon. (Staff photo)*

**September 11, 1987**

The ASTA board elected officers and toured the National Center for Toxicological Research near Pine Bluff.

**October 29, 1987**

Micoil Corporation of Conway, recipient of a $150,000 ASTA seed capital loan, celebrated its opening. Micoil uses laser technology to produce tiny, high-quality electrical components.

**October 30, 1987**

The Little Rock Technology Center, the business incubator sponsored by the University of Arkansas at Little Rock (UALR) and financed by ASTA and the city of Little Rock, celebrated its opening with ribbon cutting ceremonies and an open house. Cohosts of the event included the Technology Center, Inc., which owns the newly renovated building; Pryde, Roberts & Co., which manages the incubator for UALR, ASTA and the UALR Small Business Development Center.

**December 3-4, 1987**

The ASTA board of directors met in a two-day planning session at Little Rock and later, during its business session, approved a resolution commending the Arkansas Business Council for the Council's efforts to improve the quality of education in Arkansas.

**January 22, 1988**

The ASTA board of directors toured Arkansas State University's East Arkansas Business Incubator System (EABIS), one of ASTA's business incubators, in the Jonesboro Industrial Park. The incubator opened in March 1988.

After the tour, the board approved resolutions making development of the Arkansas Science & Technology Corridor a priority project and calling for implementation of a federal science research coordinating office, which would work to secure additional federal research and development funding for Arkansas.

**February 28, 1988**

The Arkansas Educational Television Network (AETN) aired a special featuring six Arkansas scientists who participated in a National Science Foundation (NSF) program to encourage competitive research in Arkansas and other target states.

ASTA research assistant Marion Staab, who works with an NSF study to follow up on the program, assisted AETN in preparing the documentary. Dr. John Ahlen, ASTA president, was among those AETN interviewed.

**March 4, 1988**

The ASTA board authorized the investment of $125,000 in Nthography, a Fayetteville incubator tenant. The company manufactures miniblimps, telescopic tripods and camera systems for low-altitude photography.

**May and June 1988**

ASTA staff assisted several of the 11 economically distressed counties targeted by Governor Clinton's Rural Development Action Program in drafting economic development plans.

# How just one research project builds the Arkansas economy

The value of research programs to economic development is complex and often difficult to articulate. However, ASTA now has a story to tell that simply and clearly makes the point. The story starts with a spinach research project and ends with a can of spinach. Tying them together are a string of jobs -- an estimated 3,200 -- and a lot of money -- $6 million a year.

Beneficiaries include Western Arkansas spinach farmers, canners, truck drivers and grocery store employees. Indirectly, everyone benefits, because success in the spinach industry leads to the growth of state tax revenues.

The story begins with researchers at the University of Arkansas Agricultural Experiment Station at Kibler (near Alma), who in 1970 began working on ways to breed spinach that would be resistant to disease and environmental stress. The research proceeded slowly -- research tends to go slowly -- until 1986, when a new spinach variety showed amazing potential for resistance to major spinach diseases and wet field conditions.

Meanwhile, disease and wet fields were rapidly devastating the Arkansas River Valley's spinach industry. Spinach farmers watched the quality of their fresh-market spinach disintegrate, and even their canning varieties became harder to produce in sufficient quantities because of high crop losses.

Allen Canning Co. of Siloam Springs, one of the world's largest spinach processors, was having to look farther afield to find sufficient high-grade spinach to supply its canning operation at Alma. All this was happening while consumer demand for spinach was expanding.

The researchers approached ASTA and Allen Canning Co. for help in funding accelerated research on the new variety. They felt they could do three years of research in just one year. Allen Canning and ASTA agreed to jointly fund the research, and one year later, the researchers produced their first new spinach variety and christened it *Fall green*.

*Disease and wet field conditions had destroyed the area's fresh spinach market and were severely damaging its processing acreages.*

*Fall green* has polygenic (multi-gened) resistance to 10 major spinach diseases; it also survives wet field conditions better than the previous varieties. Seed companies are eager to get their ration of the seed, which promises to deliver *tons* more high-quality spinach to grocery store shelves. Meanwhile, the researchers expect to have spring and winter varieties, cousins of *Fall green*, available soon.

*Spinach research may be worth 3,200 jobs and $6 million a year to the Arkansas River Valley.*

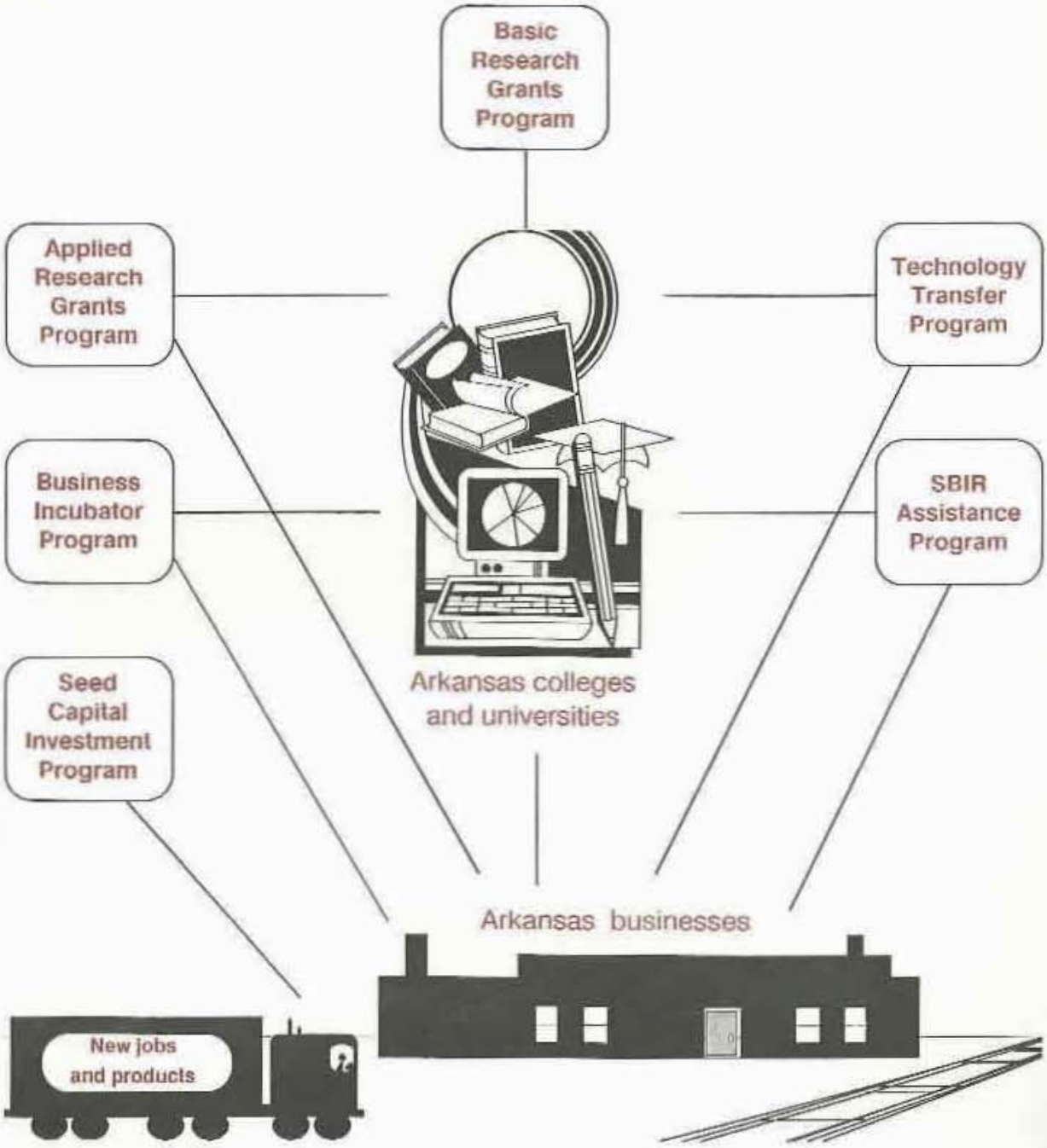
Pete Allen, president of Allen Canning Co., has estimated the value of the new varieties to the Arkansas Valley spinach industry at $6 million a year. If, as the researchers have predicted, the additional funding from Allen Canning Co. and ASTA has accelerated their research by three years at an estimated value of $6 million a year, the ASTA/Allen grants will be worth an additional $18 million return to the region's economy.

Compare this to the $5.1 million that Arkansas taxpayers have invested in ASTA and its more than 40 technology-development projects since its creation in 1983. The economic return on the taxpayers' investment in ASTA and its projects is more than 350 percent on just the spinach project alone!

*At top is pictured a can of Allen's premium-grade Popeye® Spinach. (Photo by Renee Jeffery)*

*Spinach is big business in Alma (Crawford County), which claims the title "Spinach Capital of the World." At left, Pete Allen of Allen Canning Co. presides over the unveiling of a statue of Popeye®, after whom Allen Canning Co has named its premium-grade spinach. (Photo courtesy of Carrol Copeland and the* ***Southwest Times Record****) Above, new fall variety (right) shows its advantages over other commercial varieties. (Photo courtesy of Dr. Monroe Goode, UAF) Below, large trucks prepare to haul away tons of newly harvested spinach. (Photo courtesy of Allen Canning Co.)*

# How ASTA's programs tie into the economy



# FY 1988 research awards

## Basic Research Grants Awarded in FY 1988

| Project descriptions, researchers and schools | Grants |
|---|---|
| Study of biophysical topics using nuclear magnetic resonance spectroscopy, James F. Hinton, UAF | $94,500 |
| Development of catfish with supergrowth and special spawning characteristics, Ernest Peck, Jr. and James W. Hardin, UAMS | 36,870 |
| Development of computer graphics and animation software to illustrate molecular motion, William G. Harter, UAF | 8,950 |
| Use of cactus moth to control prickly pear infestations in North Central Arkansas pasturelands, C.E. Carlton and T.J. Kring, UAF | 13,595 |
| Use of aerosol technology to deposit silicon coatings, Roger M. Hawk, Robert Bond and Kamesh Gadepally, UALR | 49,903 |
| Use of laser technology to study the motion of nonspherical aerosol particles in fluids, Darrell Keith Hutchins and Doug Wilson, UALR | 34,438 |
| **Total FY 1988 Basic Research Grants:** | **$238,256** |

## Applied Research Grants Awarded in FY 1988

| Project descriptions, researchers and schools | Grants |
|---|---|
| Development of instruments to allow better control of an industrial coating process, Alois J. Adams, Don Wold and Reagan Cole, UALR | $11,000 |
| Evaluation of a growth regulator for nitrogen management of cotton, J. Scott McConnell, UAM | 10,052 |
| Development of high-quality gun shot, W. Schmidt, M. Langston, H. Shreshta and T. Landers, UAF | 35,466 |
| Development of additional disease-resistant spinach varieties, Monroe J. Goode and Teddy E. Morelock, UAF | 49,610 |
| Study of ways to lessen the soybean's allergenic qualities, A. Wesley Burks, Larry W. Williams, Helen L. Butler and Stephen C. Fiedorek, UAMS | 23,075 |
| Development of laboratory methods for the industrial production of nitro-organic compounds, Neil T. Allison and Norbert J. Pienta, UAF | 40,740 |
| Continued development of new poultry vaccine, Craig Whitfill, John Thoma, Nicholas Roy Gyles and John K. Skeeles, UAF | 8,000 |
| **Total FY 1988 Applied Research Grants:** | **$177,943** |

# Basic Research Grants Program

Basic research is the fuel that drives the engine of economic development. Consider, for example, the innovative superconductor research being conducted by Dr. Allen Hermann and Dr. Zhengzhi Sheng at the University of Arkansas at Fayetteville. Their theoretical work in this frontier area of science may eventually yield the superconducting material that goes into the super computers, levitating trains, medical-imaging equipment, energy-storage devices and pollution-free cars of tomorrow.

Basic research like theirs often leads to applied research, research that is directed toward making things or creating situations that will serve a practical purpose. Applied research may prompt the creation of new business ventures, and these business ventures may eventually develop new products and create new jobs.

ASTA invested $238,256 in six basic research projects in FY 1988. Some of these projects may pay off fabulously; some may not. By investing Arkansas taxpayers' money in these projects, the ASTA board was voicing its confidence in both their economic potential and scientific excellence. Basic research funding provides educational enrichment for both faculty and students -- another economic benefit.

Two of ASTA's basic research projects are described in the information accompanying the art and photos on these two pages. Other projects financed by the Authority during FY 1988 were as follows:

**Study of biochemistry and biophysics using nuclear magnetic resonance spectroscopy** -- Dr. James F. Hinton of the University of Arkansas at Fayetteville is using a $94,500 ASTA basic research grant to purchase state-of-the-art equipment that will not only allow research into frontier areas of biochemistry and medicine but will also permit Arkansas students to train

*Where would we be tomorrow without the scientific explorers of today?*

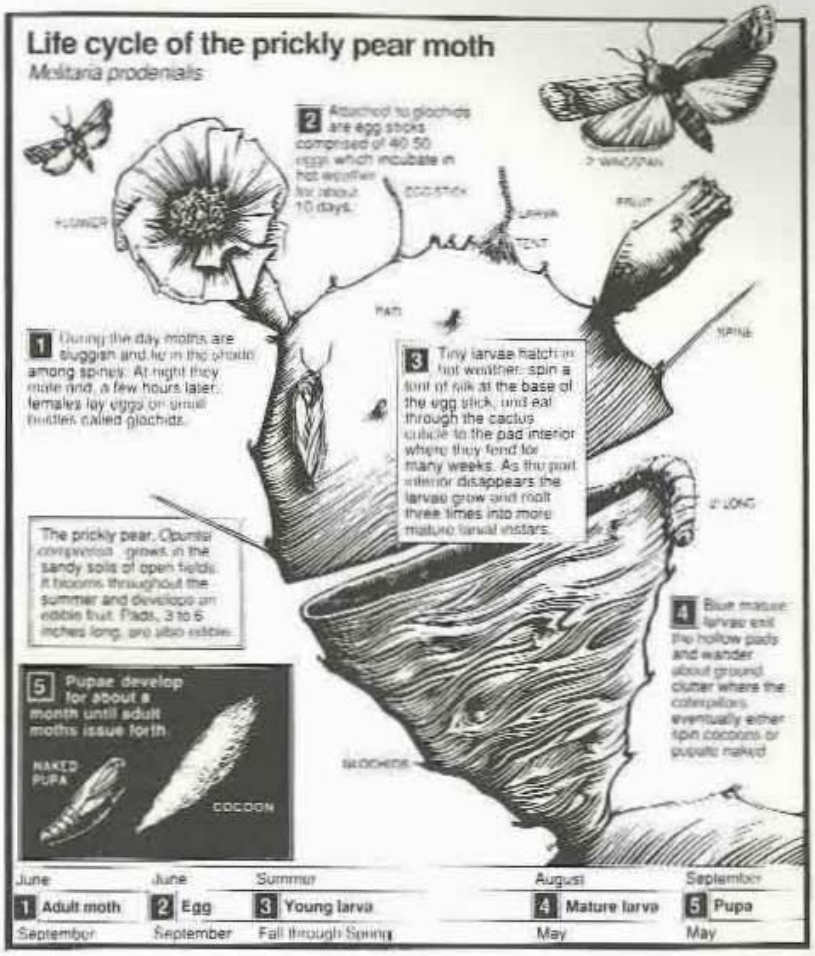
*Growing bigger catfish through genetics: Dr. Ernest Peck, Jr. (left) and Dr. James W. Hardin (right) of the University of Arkansas for Medical Sciences are using their second ASTA basic research grant to continue work on producing bigger catfish through genetic engineering. They are also trying to produce hormones that will allow farmers to control the time of spawning. They work with fish at the U.S. Department of Wildlife & Fisheries Experiment Station at Stuttgart. (Staff photos)*

for high-paying jobs in these fields.

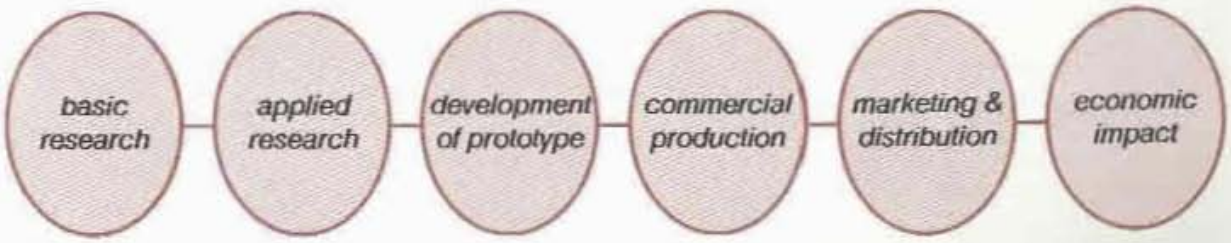
**Computer graphics and animation software to study molecular motion** -- With the assistance of an $8,900 ASTA basic research grant, Dr. William G. Harter of the University of Arkansas at Fayetteville has developed multi-color three-dimensional computer animation techniques to illustrate the complex mathematics involved in the rotation and vibration of molecules. (See cover photo.) He uses his software to help students visualize the mathematics of motion. Besides its obvious educational value, the software also has possible commercial applications.

**Use of lasers to define motion of aerosol particles in fluids** -- Dr. Darrell Keith Hutchins and Doug Wilson of the University of Arkansas at Little Rock hope to use a laser-based instrument to study the motion of nonspherical aerosol particles in fluids. (Aerosols are ultramicroscopic suspensions of fluids or solids in a gas.) Their research could have important implications for products which require aerosols for industrial or home use. It could also aid in the study and control of air-borne pollutants and viruses, which are dispersed as aerosols.

**Use of aerosol technology to deposit thin films of silicon on products** -- Dr. Roger M. Hawk, Dr. Robert Bond and Kamesh Gadepally of the University of Arkansas at Little Rock plan to study the use of aerosols in depositing thin films of silicon on semiconductors and other materials. This research could result in a more cost-effective way of manufacturing electronic components.




*Using Nature's 'herbicide' on cactus: C.E. Carlton and Dr. T.J. Kring of the University of Arkansas at Fayetteville are using an ASTA basic research grant to study the feasibility of using the cactus moth -- a natural enemy of the prickly pear cactus -- to prevent the spread of this pesky cactus in the pasturelands of North Central Arkansas. Australian farmers used a related moth to wipe out Australia's prickly pear problem. (Illustration courtesy of artist Patt. Clark and the Arkansas Gazette)*




**The Innovation Chain: How ideas move from the lab to the marketplace**

# Applied Research Grants Program

University researchers who have an idea with commercial potential can tap the joint resources of ASTA and private industry by applying for funding from ASTA's Applied Research Grants Program. In this program, the state matches private dollars pledged for practical research, either dollar for dollar or, in the case of smaller, Arkansas-based industries, two for one.

Arkansas benefits when the research yields new products or processes and new jobs and income result.

A researcher involved in innovative research may gain important insight and earn valuable professional recognition. This assists the investigator in applying for other grants. In addition, students gain from their exposure to new information and technologies.

The economic potential of such research to the sponsoring industry -- and the general economy -- is tremendous, as the accompanying table suggests. (Estimates of the potential economic benefit were supplied by industry sources.)

ASTA funded $177,943 worth of applied research in FY 1988 in the form of seven projects. Those projects not described in the information accompanying the photos are as follows:

**Supplying nitro-organic compounds to the chemical manufacturing industry** -- Drs. Neil T. Allison and Norbert J. Pienta of the University of Arkansas at Fayetteville are working with Garrison Industries, a small new chemical company in El Dorado, in refining and testing industrial methods for producing nitro-organic compounds, chemicals used by chemical companies to manufacture agricultural chemicals and pharmaceuticals.

**Growing disease-resistant spinach** -- This project, cosponsored by Allen Canning Co. of Siloam Springs, is one of ASTA's most successful. It is described on pages 4 and 5.

**Growing cotton less expensively** -- Cotton farmers often hire pilots to spray their young crops twice with nitrogen rather than taking the risk of overfertilizing the soil during the preplanting period. Overfertilization results in lush vegetation but few bolls. Dr. J. Scott McConnell of the University of Arkansas at Monticello is studying whether it is cost-effective to use Pix, a growth regulator, to slow growth after a heavy preplanting application of nitrogen to allow the plants to fruit properly. BASF Wyandotte Corporation is cosponsoring ASTA's grant.

**Developing a new poultry vaccine** -- A team of researchers at the University of Arkansas at Fayetteville (UAF) has isolated an antiviral material capable of killing several common -- and deadly -- poultry viruses. ASTA and the Arkansas Poultry Federation both believe the scientists' work is so important to the poultry industry that they awarded the researchers follow-up grants to continue work on a new poultry vaccine. The team is led by Dr. Craig Whitfill and includes John Thoma, Nicholas Roy Gyles and John

*Improving an industrial coating process: Three scientists from the University of Arkansas at Little Rock -- Dr. Al Adams, Dr. Donald C. Wold and Reagan Cole -- worked with Timex Corporation in developing a probe that could be used inside a magnetron sputtering chamber to monitor and thereby control the watch-maker's gold-coating process. ASTA and Timex each contributed $11,000 toward the research. In the photo on page 2, workers at the company's Little Rock plant inspect watch bands that have completed the coating process. In the staff photo at right, Dr. Adams, left, discusses new probe with Timex process engineer Mike Dudick.*

K. Skeeles of the Department of Animal Sciences.

**Developing high-quality steel shot** -- Daisy Manufacturing Company of Rogers came to scientists at the University of Arkansas at Fayetteville with a problem: One of its competitors had succeeded in producing a uniformly soft steel shot and was threatening to take away Daisy's share of the rapidly growing market for steel shot. (Bans on the use of lead shot are sweeping the globe as people discover the long-term hazards of lead to the environment.) What could the Arkansas gun manufacturer do to improve the process used to produce steel shot, to ensure that it remained competitive in this new market? Dr. William F. Schmidt, Dr. Harold Sreshta, Dr. Thomas Landers and Marcus Langston at UAF answered several of Daisy's technical questions and ran trials using a different treating process. Daisy is following up on their research with a private company.

## The economic potential of ASTA's FY 1988 applied research projects

| Research project | Potential jobs created | Potential jobs saved | Potential $ impact |
|---|---|---|---|
| Industrial chemicals | 15-20 jobs | | $1 million a year |
| Management of cotton | | | $500,000 a year |
| New spinach varieties | 700 jobs | 2,500 jobs | $6 million a year |
| New poultry vaccine | | | $200 million a year |
| Gold-coating process | | | better quality, lower costs |
| Better-quality steel shot | 36 jobs | | $1.2 million a year |
| **Totals** | **755 jobs** | **2,500 jobs** | **$208.7 million** |

*Making soybeans less allergenic: A medical team representing the University of Arkansas for Medical Sciences and Arkansas Children's Hospital is drawing funds from ASTA and Ross Laboratories, a leading producer of soy infant formula, to identify the allergens in soybeans that are responsible for the development of allergic reactions. The researchers hope to modify the soybean's proteins to make them less allergenic. This could benefit Arkansas, since soybeans are the state's most valuable agricultural crop. Those conducting the study are Dr. Wesley Burks, Dr. Larry Williams, Dr. Helen Butler and Dr. Stephen Fiedorek. In this staff photo, Dr. Burks supervises while nurse practitioner Annette Shirrell gives a skin test to patient Lisa Crumpton of North Little Rock.*

# SBIR Assistance Program

The Small Business Innovation Research (SBIR) Assistance Program seeks to help Arkansas businesses capture federal research and development funds -- a lucrative financial resource often ignored by Arkansas companies.

During FY 1988, ASTA provided SBIR grant information to 65 Arkansas businesses. Forty-two of those businesses responded to the information, and three submitted SBIR proposals.

Under the SBIR Program of the U.S. Small Business Administration (SBA), companies with fewer than 500 employees are eligible for federal assistance with research that is likely to develop new products, processes or services that meet the sponsoring federal agencies' needs and are commercially feasible. Phase I grants are for up to $50,000; Phase II grants range in size from $300,000 to $500,000.

Eleven diverse federal agencies participate in the SBA program.

Besides providing SBIR information and applications to Arkansas businesses, ASTA assists them in targeting their research topics and submitting their proposals. The proposals are then evaluated by the federal agencies.

# Technology Transfer Program

The Technology Transfer Program tries to match the state's scientific and technological "explorers" with interested businesses so that new technologies are put to work in solving industry problems and creating new economic opportunities.

This entails establishing and maintaining contacts with the business community and with researchers working in Arkansas' college, university and federal laboratories.

During FY 1988, ASTA worked with 22 businesses from 12 Arkansas counties. It also began work toward the establishment of an Arkansas Technology Development Network and an Arkansas Technical Resource Directory.

The network will identify and seek to link the state's technical, training and business assistance organizations so that they can bring their joint expertise to bear on problems faced by Arkansas' technology-based businesses. The directory will be in the form of an electronic data base.

Among those specifically targeted for the Authority's technology transfer efforts are those scientists participating in ASTA's Basic Research Grants Program.

The Authority is also targeting the National Center for Toxicological Research (NCTR) near Pine Bluff, which is pursuing research with economic potential. ASTA would like to become NCTR's in-state technology transfer agent.

# Special ASTA Projects

The Authority participated in several special projects during the fiscal year which promise an exciting and economically profitable future for Arkansas. Among the most promising were those to:

* Plan and implement an Arkansas Science and Technology Corridor development that would utilize the resources and economic potential of the National Center for Toxicological Research (NCTR) near Pine Bluff as well as Arkansas colleges and universities, the Veterans' Administration hospitals and existing biotech companies;

* Encourage promising superconductivity research by the University of Arkansas at Fayetteville;

* Assist residents in 11 of Arkansas' most economically distressed rural counties in drafting economic development plans for their counties as part of Governor Clinton's Rural Development Action Program;

* Assist local efforts to encourage the building of a Gamma Ray and Neutrino Detector (GRANDE) research laboratory in a barite mine in Hot Spring County, and

* Implement a federal science research coordinating office, that would work to secure and coordinate additional federal research and development funding for Arkansas.

**SBIR Assistance Program** ☐ **Technology Transfer Program** ■ **Rural Development Action Program** ▨

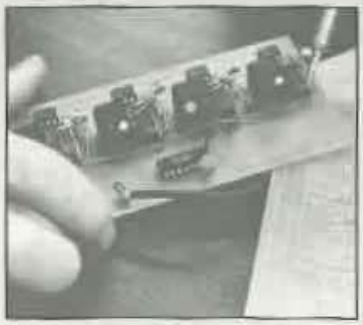
*Illustrated above are those counties affected by ASTA's Small Business Innovation Research (SBIR) Assistance Program and Technology Transfer Program and Governor Clinton's Rural Development Action Program .*

# Business Incubator Program

The Business Incubator Program seeks to foster the growth of new, technology-based business in Arkansas. The Authority presently funds five incubator facilities, which provide space, support services and ready access to the associated college or university's staff and equipment.

The Authority's first incubator, Genesis, opened in late 1986 at the University of Arkansas at Fayetteville and now has six firms employing 42 people. Later, in the spring of 1987, Little Rock Technology Center opened its quarters in downtown Little Rock. Operated by the University of Arkansas at Little Rock (UALR), it now has six firms employing 28 people.

Also that spring, North Arkansas Community College at Harrison opened the North Arkansas Business Incubator System, its rural incubator at Salem (Fulton County). The incubator has conducted business management seminars and serves one client company. Southern Arkansas University's Business Center began offering business planning workshops in the fall of 1987 and expects to open its on-campus facilities to tenant companies shortly. Arkansas State University at Jonesboro opened the East Arkansas Business Incubator System in the Jonesboro Industrial Park in early 1988 and presently has one tenant firm.



*Incubator tenants show their wares: Top, Jim Alexander (left) and Acie G. Johnson hold Laser Aim, Inc.'s high-tech weaponry products (Photo by Art Meripol); computer circuit board designed by Nthography (left), and Shiitake mushroom grown by Allied Mushroom. (Photos courtesy of Mike Donat, Interactive Technology, Inc.)*

# Hatching new business in Arkansas

*– Chick art courtesy of Michael Storey and the **Arkansas Democrat***

## Genesis

University of Arkansas at Fayetteville

**Allied Mushroom** – grows spawn for production of Shiitake mushrooms.
**Energy Techniques, Inc.** – develops computer software for energy management.
**The Citadel Research Institute** – develops medical diagnostic kits using monoclonal antibodies.
**T.C.I.S.** – develops computer software for agricultural marketing.
**Nthography** – manufactures blimp- and telescopic-camera systems for low-altitude photography.
**Interactive Technology, Inc.** – develops custom software for the photographic industry.

**42 jobs**

## North Arkansas Business Incubator System (Salem)

North Arkansas Community College at Harrison

**Ideas Unlimited, Inc.** – fabricates metal products.

**5 jobs**

## East Arkansas Business Incubator System

Arkansas State University at Jonesboro

**Microtronics, Inc.** – manufactures electronic equipment.

**5 jobs**

## Little Rock Technology Center

University of Arkansas at Little Rock

**HHW Data Corp.** – designs and packages software for undeveloped markets, including the funeral home industry.
**Laser Aim, Inc.** – uses laser technology to develop new products for sportsmen and private industry.
**Micro-Tech, Inc.** – a biomedical research and development firm that is currently developing a bedside blood analyzer.
**Energy Rated Homes, Inc.** – a nonprofit organization which produces a system for rating the energy efficiency of homes.
**Venture Resources** – provides business planning services.
**Water: Our Options** – markets water filtration and purification systems.

**28 jobs**

## The Business Center

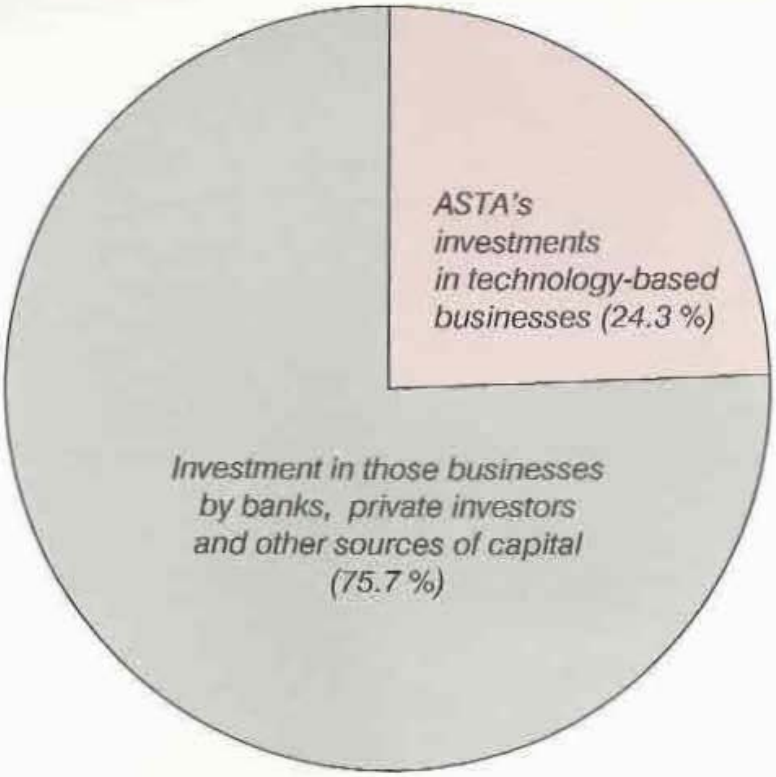
Southern Arkansas University at Magnolia

(Not open to tenants yet.)

**1 job**

# Seed Capital Investment Program

*ASTA has invested $425,000 in three technology-based businesses. Its investment leveraged $1,325,000 from other sources, for a total investment of $1,750,000 in new, technology-based enterprises.*



*Micoil Corporation's tiny inductor coils make a dime seem large. They are manufactured with state-of-the-art laser technology at Micoil's Conway plant. (Photo courtesy of Gary N. Speed)*

*Micoil president and technical director Richard D. Dunlap shows an enlarged view of tiny inductor coils, which are inscribed on a ceramic base with gold. (Staff photo)*

## Micoil, Inc. -- maker of microelectronic components

**ASTA FY 1987 Investment: $150,000; Other financing: $600,000**

Micoil Corporation of Conway employs innovative laser technology to manufacture a thin-film inductor coil for customers in the electronics industry who utilize surface-mounted technology.

Micoil plans to target defense contractors and government- and privately owned satellite communications industries.

**Current employees: 8**

## Arkansas Technologies, Inc. -- maker of computer-driven manufacturing systems

**ASTA FY 1987 investment: $150,000; Other financing: $500,000**

Arkansas Technologies, Inc. (ARTECH) of Clarksville designs, manufactures, and installs flexible, computer-integrated manufacturing systems to help upgrade and modernize manufacturing processes.

ARTECH's marketing plan targets the defense, clay brick, ceramic tile and major appliance industries and local manufacturing companies.

**Current employees: 32**

## Nthography -- maker of devices for photography to the "nth" degree

**ASTA FY 1988 investment: $125,000; Other financing: $225,000**

Nthography, based in ASTA's business incubator at Fayetteville, manufactures blimp and telescopic camera systems for low-altitude photography. This company was named one of "The Hundred Hottest Companies in the U.S. in 1987" by **Venture** magazine. Target markets include professional photographers and photojournalists and the defense and real estate industries.

**Current employees: 4**

***Nthography is a family affair:*** *At top, Greg Wirges demonstrates the firm's telescopic camera system, and at left, brother Ron works at a computerized milling machine. Their father, Gene Wirges, heads the company, which also employs son George. (Staff photos)*

# Status of funds

## Status of Capital Improvement Funds for FY 1988

| Programs / Spending categories | Basic Research Program | Applied Research Program | Total Research Funding | Business Incubator Program |
|---|---|---|---|---|
| Funds appropriated | | | $1,800,000 | $1,000,000 |
| Funds available | | | $431,100 | $0 |
| Funds awarded | $162,350 | $91,036 | $253,386 | $0 |

*ASTA's investment accounts are geographically distributed among financial institutions throughout the state.*

## Seed Capital Investment Fund for fiscal year ending June 30,1988

| | | |
|---|---|---|
| Beginning balance, money market accounts | | $248,521.72 |
| Interest and principal earned | | |
| Interest, money market accounts | $8,773.51 | |
| Interest, C.D. accounts | 93,773.85 | |
| Interest, seed capital accounts | 23,812.93 | |
| Principal, seed capital accounts | 26,457.71 | |
| Total principal and interest earned | | 152,818.00 |
| Less FY 1988 investments | | (275,000.00) |
| Ending balance, money market accounts | | $126,339.72 |
| Investments receivable | | 389,799.24 |
| Certificates of deposit | | 1,595,000.00 |
| Total Seed Capital Investment Fund balance | | $2,111,138.96 |

# Comparative financial statements

## Comparative Statement of Government Fund Revenues and Expenditures for fiscal years ending June 30, 1987 and 1988

| | FY1987 | FY1988 |
|---|---|---|
| **Revenue:** | | |
| Revenue appropriation | $559,558.00 | $791,904.00 |
| Deferments | (74,587.07) | (202,361.00) |
| **Net revenue allocation:** | **$484,970.93** | **$589,543.00** |
| | | |
| **Expenditures:** | | |
| Payroll | $203,696.27 | $253,615.66 |
| Employee benefits | 31,747.71 | 34,167.68 |
| Postage, telephone, telex | 9,239.57 | 5,586.97 |
| Printing, advertising | 5,836.97 | 4,913.52 |
| Repairs, maintenance | 1,387.87 | 526.00 |
| Utilities, rent | 30,758.82 | 36,841.11 |
| Travel, subsistence | 17,127.19 | 19,761.29 |
| Professional fees | 41,653.12 | 7,568.59 |
| Centrex telephone services | 8,894.45 | 7,295.68 |
| Conference, convention fees | 8,332.00 | 8,519.00 |
| Insurance, bonds and taxes | 525.00 | 326.00 |
| Publications, office supplies, subscriptions | 7,498.56 | 5,482.68 |
| Software | 1,938.05 | 1,894.07 |
| Equipment | 11,498.73 | 960.51 |
| **Total operating expenditures:** | **$380,124.31** | **$387,458.76** |
| Expenditures for research grants | | 162,813.00 |
| **Total expenditures:** | **$380,124.31** | **$550,271.76** |
| | | |
| **Net revenue allocation** | **$484,970.93** | **$589,543.00** |
| **Less total expenditures** | **(380,124.31)** | **(550,271.76)** |
| **Unspent allocation:** | **$104,846.62** | **$39,271.24** |

# Previous research awards

## Basic Research Grants

**Stanley E. Trauth**, ASU, transmission of parasites in bait fish, $18,971.

**D.A. Renfroe**, UAF, study of oil viscosity in new brake design, $77,816.

**Larry D. Merkle**, UAF, study of europium ions as a new laser material, $47,500.

**John W. King** and **Feng H. Huang**, UAF, development of herbicide-resistant bermuda grass, $30,010.

**Engin Yaz**, UAF, improved control of robots in factory automation, $25,181.

**James D. Wilson**, UALR, development of microprocessor-based instruments and digitized imagery for study of light's effect on plants, $24,695.

**Norbert J. Pienta**, UAF, development of new solvents for manufacturing chemical compounds, $24,615.

**Zdzislaw Jackiewicz**, UAF, mathematical approach to modeling complex systems, $16,267.

**Arthur V. Brown**, UAF, improved management of zooplankton resources in Ozark streams, $44,075.

**Malay K. Mazumder**, UALR, development of laser instrumentation for medical and industrial diagnoses, $50,003.

**Paul C. McLeod Jr.**, UALR, development of goniometer-based system for screening congenital hip disease, $16,221.

**David L. Monts**, UAF, development of techniques for laser manufacture of chemicals, $14,898.

**Tito Viswanathan**, UALR, development of building boards using rice hulls and whey resins, $51,250.

**Ernest Peck Jr.** and **James W. Hardin**, UAMS, development of catfish with improved growth and spawning characteristics, $53,200.

**Richard Webber**, UAMS, study of origin and causes of osteoarthritis, $51,330.

**Richard A. Komoroski**, UAMS, magnetic resonance imaging of metabolites or drugs, $42,442.

**Delbert Gatlin III**, UAPB, study of mineral interactions in channel catfish nutrition, $16,242.

**Roy B. VanArsdale**, UAF, determination of earthquake hazard to Enola, Arkansas (site of earthquake swarms), $16,646.

## Applied Research Grants (matched by private industry)

**Terry Siebenmorgen**, UAF, study of ways to prevent rice breakage during during and storage, ASTA, $34,655; **Riceland Foods**, $8,000; **Abbott Laboratories**, $10,000, and **DICKEY-john Corp.**, $16,720.

**Jeffrey Scott**, **Rose Gergerich** and **Wayne Montgomery**, UAF, development of disease-resistant tomato plant, ASTA, $10,500; **South Arkansas Fair & Marketing Association**, $7,500, and **Bradley County Chamber of Commerce**, $3,000.

**Collis R. Geren**, UAF, development of large-scale methods for production of monoclonal antibodies, ASTA, $63,227, and **Pel-Freez, Inc.**, $63,227.

**Craig Whitfill**, UAF, development of broad-spectrum poultry vaccine, ASTA, $10,000, and **Arkansas Poultry Federation**, $10,000.

**Scott Beasley**, UAM, study of effects of acid rain on forest ecology and products, ASTA, $31,000, and **Weyerhaeuser Co.**, $31,000.

**Monroe Goode** and **Teddy Morelock**, UAF, development of disease-resistant fall variety of spinach, ASTA, $49,610, and **Allen Canning Co.**, $164,000 (over three years).

**Joseph S. Wrobel**, UAF, development of computerized inspection system for printed circuit boards, ASTA, $47,875; **Texas Instruments**, $45,000, and **Baldwin Piano & Organ Co.**, $5,000.

# Science advisory committee

**Dr. K. David Straub** (chairman), John L. McClellan Memorial Veterans' Hospital, Little Rock.

**Dr. John W. Ahlen**, Arkansas Science & Technology Authority, Little Rock.

**Dr. Carl Cerniglia**, National Center for Toxicological Research, Jefferson (near Pine Bluff).

**Dr. R. D. Engelken**, Department of Engineering, Arkansas State University, Jonesboro.

**Dr. Tom Goodwin**, Department of Chemistry, Hendrix College, Conway.

**Dr. George J. Hammons**, Department of Chemistry, Philander Smith College, Little Rock.

**Dr. Malay Mazumder**, Graduate Institute of Technology, University of Arkansas at Little Rock.

**Dr. Ernest Peck**, University of Arkansas for Medical Sciences, Little Rock.

**Dr. Greg Salamo**, Department of Physics, University of Arkansas, Fayetteville.

**Dr. C. Dayton Steelman**, Department of Entomology, University of Arkansas, Fayetteville.

**Dr. Gary Tucker**, Department of Biological Sciences, Arkansas Tech University, Russellville.

# ASTA staff

During FY 1988, ASTA had 12 employees and one grant position. They included: Dr. John W. Ahlen, president; James T. Benham, vice president finance, Alice Rumph Smith, vice president information, and Dr. Joe Gentry, vice president research.

William E. Parks, Jr., fiscal manager; Kay Speed Kelly, communications manager; Charles H. Myers, SBIR program assistance manager; Alan A. Gumbel, technology transfer manager; Megan DeLamar, finance manager; Marion Staab, research assistant (grant position); Cassandra A. Tavorn, administrative secretary; Katherine Benefield, executive secretary, and Lynn Howell, receptionist.

# Acknowledgements

A number of people and organizations donated photography and artwork for use in the FY 1988 Annual Report, and ASTA would like to express its gratitude. Those deserving special thanks include:

Dr. William G. Harter of the University of Arkansas at Fayetteville (UAF), who provided the cover photograph; Mike Donat of Interactive Technology, Inc., who provided photos of UAF incubator tenants; Carrol Copeland and the **Southwest Times Record**, Dr. Monroe "Jack" Goode of UAF and Allen Canning Co., who each donated spinach-related photos; Patt. Clark and the **Arkansas Gazette**, who donated the cactus moth illustration; Michael Storey and the **Arkansas Democrat**, who donated the hatching chicken illustration; Gary N. Speed of the Rose Law Firm, who provided a close-up photo of Micoil Corporation's tiny inductors.

# Directory

*ASTA board of directors* ***Inside front cover***
*Letter to Governor Clinton and the Arkansas General Assembly* ***1***
*ASTA profile* ***2***
*Highlights of FY1988* ***3***
*How just one research project builds the Arkansas economy* ***4-5***
*How ASTA's programs tie into the economy* ***6***
*FY1988 research awards* ***7***
*Basic Research Grants Program* ***8-9***
*Applied Research Grants Program* ***10-11***
*Small Business Innovation Research (SBIR) Assistance Program* ***12-13***
*TechnologyTransfer Program* ***12-13***
*Special Projects* ***12-13***
*Business Incubator Program* ***14-15***
*Seed Capital Investment Program* ***16-17***
*Financial reports* ***18-19***
*Previous research awards* ***20***
*Science advisory committee, ASTA staff and acknowledgements* ***Inside back cover***