



ANNUAL REPORT 1997

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Dear Governor Huckabee
& Distinguished Legislators:

The Board of Directors and staff of the Arkansas Science & Technology Authority are pleased to submit to you the Authority's Fiscal Year '96 Annual Report. The report summarizes the scientific and technological products and services by which the Authority carries out its mission to bring the benefits of science and advanced technology to the people and State of Arkansas.

In Fiscal Year '96 the Authority continued to invest in opportunities for Arkansas to move forward in its scientific and technological endeavors, as highlighted in this report. Researchers, enterprises and industries were able to strengthen Arkansas' scientific and technological infrastructure through basic and applied research grants, technology development, technology transfer services, technology transfer assistance grants, and seed capital investment programs. In short, the Authority is engaged in science and technology advancements from laboratory concept to practical application. The progress is realized in Arkansas, for Arkansas, through the Authority.

The Authority continues to work in the challenging areas of telecommunications, telemedicine, distance learning, math and science education, and manufacturing extension. The diversification of the Authority's Board, through the addition of three directors specifically from the manufacturing sector, has helped Arkansas obtain federal support for a statewide manufacturing extension network.

Administratively, the Authority made a significant advance with its installation of new information technology tools in 1996. The new local area network and the connection to the World Wide Web are transforming the way the Authority does business.

With your foresight and ongoing support, the Authority will continue to meet the challenges of efficiently and effectively carrying out its mission.

Please take pride in our Annual Report. It is because of your support that Arkansas and its people are well positioned to benefit from scientific and technological developments.

Thank you for your support of the Arkansas Science & Technology Authority.

Yours in Service to the State of Arkansas,

Phillip L. Rayford, Ph.D.	John W. Ahlen, Ph.D.
Chair, Board of Directors	President

Providing Resources for Research

BASIC & APPLIED RESEARCH

From the humble beginnings of an idea or concept, products and services are born. The Arkansas Science & Technology Authority's Basic and Applied Research programs are designed to encourage the birth of new processes, technology and materials within the boundaries of the state.

Managed by the Authority's Vice President Research and supervised by its Board of Directors, the programs continue to provide funding of original investigations for the discovery and application of scientific and engineering knowledge.

In Fiscal Year 1997, \$744,245 in public funds were awarded to 23 projects: four in Applied Research and 19 in Basic Research. In addition, \$200,335 was used for two Experimental Program to Stimulate Competitive Research (EPSCoR) National Science Foundation Grants as match money.

Applied Research

Through this program the Authority supports science and engineering programs in Arkansas. Utilizing a 50:50 cash-matching program, the Authority stimulates the transfer of science and technology by enhancing opportunities for research partnerships between state higher education institutions and private industries.

Applied Research is considered crucial to technological advancements within the state of Arkansas.

In Applied Research, \$ 90,000 were realized in match funding from industry.

APPLIED RESEARCH GRANTS AWARDED

<u>PROPOSAL</u>	<u>INST.</u> ⁽¹⁾	<u>P.I.</u> ⁽²⁾	<u>PROJECT TITLE</u>	
	<u>AMOUNT</u>			<u>COSPONSOR</u>
<u>MATCH</u>				
97-A-05	UAF \$21,700	Cole	Optimal Bin Sizing for Focused Storage Systems HYTROL CONVEYOR COMPANY	\$25,000
97-A-06	UAMS \$39,400	Hauer-Jensen	New Methods to Monitor and Prevent Intestinal Injury in Radiation Therapy CENTRAL ARKANSAS RADIATION THERAPY	

			INSTITUTE	\$40,000
97-A-07 Peel Residue	UAF		Hollway 10,200 as a Drilling Fluid Component (Cosponsor match under negotiation)	Sweet Potato
97-A-08	UAF	Landers <u>\$21,700</u>		Design Methodology for Engineered Storage Areas with Parts Commonality GLOBAL CONCEPTS LLC <u>\$25,000</u>
				Total
		\$93,000		Total
				\$90,000

⁽¹⁾ Institution

⁽²⁾ Principle Investigator

Footnote:

The following universities received funding during FY'97 for Applied Research: the University of Arkansas, Fayetteville; the University of Arkansas for Medical Sciences.

Basic Research

The Authority is charged with encouraging, establishing and supporting Basic Research in science and engineering at Arkansas colleges and universities. Basic Research is theoretical and experimental investigations to advance scientific knowledge – often motivated by efforts to solve practical problems.

Basic Research has supported projects in a myriad of studies, including cellular & molecular biology, chemistry, computer science, engineering, geological science, health science, life science, physical science, physics, and zoology.

BASIC RESEARCH GRANTS AWARDED

<u>PROPOSAL</u>	<u>INST.</u> ⁽¹⁾	<u>P.I.</u> ⁽²⁾	<u>PROJECT TITLE</u>
	<u>AMOUNT</u>		
97-B-12 of a	UAF \$34,133	Thorton	Design and Simulation Processing Element Node for a Decoupled Multi-Threaded

Computer

97-B-14	UAF \$12,200	Henry	Enhancement of Forward Four Wave Mixing by Optical Feedback in Dye Doped Organics
97-B-19	UAMS \$28,785	Morris	Laser Optic Plethysmography in the Study of Respiratory Mechanics in Infants and Children
97-B-21	UAF \$32,886	Turbeville	The Phylogenetic Position of the Platyhelminthes Inferred from Mitochondrial Gene Arrangements
97-B-24	UAF \$29,282	Muyshondt	Three-Dimensional Particle Tracking in Air Sampling Cyclones
97-B-26	UAF \$49,500	Koeppe	Targeting Gramicidin Channels to Attack HIV
97-B-27 Structure	UAF \$68,200	Thibado	Atomic Control of
97-B-30	Hendrix \$28,953	Dunn	Platform Stabilization Using Large Ring Lasers
97-B-31	UAMS \$39,591	Dienel	Glial Cell Activity in Working Brain
97-B-32	UAMS \$40,000	Haun	ADP-ribosylation Factor Functional Specificity in Vesicular Transport

97-B-33 Hormones:	UAMS \$25,849	Thomas	Age, Gender, and Alterations in the Expression of the 24-Hydroxylase and Calbindin-D _{9k} Genes
97-B-35 Gases	Harding \$20,080	Wilson	Impact of Industrial and Hydrocarbons on Earth's Atmosphere
98-B-02	UAF \$29,495	Reynolds	Predicting the Transient, High Frequency Vibrations of Structures
98-B-03	UAF \$36,396	Turnbull	Development of a DNA Labeling Reagent
98-B-04	UAF \$54,710	Badia	Extended Relational Systems for New Application: Design & Implementation
98-B-07	UALR \$26,495	Loizou	Analysis and Development of Signal Processing Strategies for Cochlear Implants
98-B-08 Cancellation	UALR \$29,980	Wright	Active Sound (ASC) in Corporate Luxury Aircraft
98-B-09	UALR \$23,716	Leslie	High-Resolution Conodont Biostratigraphy, Sequence Stratigraphy, and Event Stratigraphy of the Middle Ordovician Joachim Dolomite in the Ozark Region of Northern Arkansas
98-B- 10	UAMS \$40,994	Grant	Molecular Interference With

the Mosquito's Vector Potential

TOTAL: \$651,245

Footnote:

The following universities and colleges received funding during FY'97 for Basic Research: the University of Arkansas, Fayetteville; the University of Arkansas at Little Rock; the University of Arkansas for Medical Sciences; Harding University; Hendrix College.

The EPSCoR Program has been very successful at promoting competitive research and the climate for science and technology in Arkansas. The *Arkansas EPSCoR Advanced Development Program* (ADP) funded by NSF, in 1992 for \$3,095,000 and matched dollar for dollar by Authority and institutional funds accomplished or addressed these goals not only by funding individual projects, but also by bringing together groups of scientists to form a critical mass. State-of-the-art equipment was purchased, groups of collaborating investigators were established, and the physical and administrative infrastructure to support competitive research was enhanced on our university campuses.

In terms of human resource development, the ADP supported a summer bridging program for the "Ventures in Education" (VIE). Eight rural schools in the Delta region of our State are currently utilizing this program. In addition to this high school program, the ADP contributed to the education of many undergraduate and graduate students interested in science and technology. ADP Funds supported the "*Human Resource Development-Statewide Undergraduate Research*" program in the second year. This program supports 50 students for a year and is so successful that it is being continued with state funds.

The Arkansas ADP has had a marked impact on the development of competitive research in Arkansas. In addition to supporting individual projects that ultimately compete for federal research funds through non-EPSCoR programs, EPSCoR has resulted in significant improvements in the scientific climate in the state. Clusters of collaborating scientists with central interests but varied technical expertise have been assembled in order to promote the competitive status of each investigator. Educational programs are being developed to ensure that high school and undergraduate students are well equipped to fulfill the job requirements resulting from our rapidly evolving technology. Finally, the presence of an *Advanced Development Program* has significantly improved the infrastructure for research in Arkansas. Research facilities have been improved, and university campuses are better equipped to support competitive research programs. The ADP grant ended February 28, 1997.

There are six federal agencies currently providing EPSCoR Funding -- Department of Defense (DoD), Department of Energy (DOE), Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), National Institutes of Health (NIH), National Science Foundation (NSF), and United States Department of Agriculture (USDA). All of these programs require matching funds or cost sharing from the state.

During the year, requests for proposals were announced for the 1997 NSF EPSCoR Grant program, the EPA EPSCoR program and the DoD EPSCoR program. Three proposals were submitted to the NSF Grant program. Two of these were funded for 24 months:

1. Dr. Michael Jennings, UAMS, *Formation of an Arkansas Center for Membrane Transport* was funded \$588,663 from NSF. \$488,485 of the required matching funding came from the Authority's general improvement funds and research funds
2. Dr. Gregory J. Salamo, UAF, *Formation of a Center for Ultra-Fast Electronic-Photonic Material and Devices*, was funded \$765,316 from NSF. \$622,090 of the required matching funding came from the Authority's general improvement funds and research funds

Dr. Richard H. Kennedy, Vice President, EPSCoR, participated in the Great Plains Consortium, composed of six EPSCoR States, Arkansas, Kansas, Oklahoma, Nebraska, North Dakota, and South Dakota. This consortium developed a proposal for funding a high bandwidth telecommunication connection for the member states. This grant was also awarded.

Fifteen preproposals from researchers of the colleges and universities of the state were received by the EPSCoR Office January 23, 1997, for the 1997 EPA-EPSCoR Program. Three of these were selected to be included in the submission to EPA March 4, 1997.

They were:

1. Dr. Vivian A. Fonesca, UAMS, collaborating with Dr. David Barnes, UAF, *Environmental Toxicant-Induced Resistance and Diabetes*;
2. Dr. Jay Gandy, UAMS, *Improved Reproductive Assessment of Elucidation of Comparative Metabolism*; and
3. Dr. David Lindquist, University of Arkansas at Little Rock (UALR), collaborating with Dr. Greg Thoma, UAF; *Regenerable Colloids for Soil and Water Remediation*.

Twenty-nine preproposals were received in response to the DoD EPSCoR solicitation. Fifteen were selected for inclusion in the \$4,700,000, June 16 submission to the agency.

Dr. Gaylord Northrop, Director of the Space Grant Consortium, and a member of the EPSCoR Committee, received checks totaling \$150,000 for matching funds for the NASA grant from Governor Huckabee in a presentation ceremony in the Governor's Conference Room, Tuesday, February 25, 1997. These grant matching funds were from the Authority's general improvement appropriation for the biennium. The Space Grant Consortium, originally composed of seven institutions of higher education around the state, is currently comprised of 13 member institutions. The Space Grant Consortium operates under the umbrella of the EPSCoR Committee.

The first EPSCoR Day at the Legislature was sponsored by the EPSCoR Committee on February 26, 1997. Invitations were sent to members of the Legislature to come for coffee and donuts, and to learn the value of competitive research to Arkansas. EPSCoR Staff members developed an exhibit showing the return on investment to the state from the projects. Exhibits from the National Science Foundation (NSF) EPSCoR Centers and the National Aeronautics and Space Administration (NASA) EPSCoR projects were displayed on the 2nd floor rotunda. NSF EPSCoR Center for Molecular and Cellular Biology of Aging's list of accomplishments included the Reynolds' Foundation \$25 million funding for the new Geriatrics Department at the University of Arkansas for Medical Sciences (UAMS), along with the accomplishments of the recruited faculty with the grant funds. The other NSF Centers, the University of Arkansas, Fayetteville's Center for Protein Dynamics and the Center for Neurobiology Research had similar exhibits. This will become a biennial event of the EPSCoR Committee.

Through the efforts of Senator Kevin Smith, with the assistance of EPSCoR staff members, NSF EPSCoR funds were released as a supplemental award to the State Systemic Initiative grant for the Arkansas program formerly known as Ventures in Education. The program is now called the ADVentures in Excellence Program. Matching funds for the program were released to UAMS, where the Program Director, Susan Collins is now housed.

Providing Resources for Business

Technology Development Program

The Technology Development Program (TDP) assists in development and commercialization of new technology-based products and processes through innovative technology development projects. The program provides financing for qualified projects possessing a well-defined, comprehensive project plan. Favored project plans utilize the benefits of science and technology to provide economic and employment growth potential in Arkansas.

TDP results are measured through new technologies, jobs and royalties. Royalty agreements will enable the Authority to collect up to five percent of net sales revenue for up to 10 years in the event that these technologies are successfully commercialized.

During Fiscal Year 1997 the TDP invested \$49,916 with the University of Arkansas at Fayetteville in a controlled solar heating siding system for residential buildings. This was the only project funded during the fiscal year.

The program currently has a portfolio of 9 projects or enterprises either paying or positioned to pay royalties on the Authority's original investments which total \$406,544 since 1993. Public funding of \$ 375,000 was appropriated for each year of the 1998-1999 biennium for both the Technology Development and Technology Transfer programs. The Authority receives a separate grant to provide funds for energy related Technology Development projects.

Technology Transfer Assistance Grant Program

The Technology Transfer Assistance Grant Program (TTAG) assists Arkansas enterprises in developing or improving products or processes through the transfer of technical solutions to technology-based, industry-driven problems. Support is realized through limited Authority financial assistance not to exceed \$3,750 with the intention of enhancing an enterprise's market competitiveness.

During Fiscal Year 1997, TTAG received 42 applications for assistance and invested \$118,174 in 34 transfers statewide, assisting 31 companies, in 22 counties. Companies participating in the program during Fiscal Year 1997 included:

- ◆ Coors / ACI of Benton;
- ◆ Shipping Systems Inc. of Crossett;
- ◆ Accurate Plastic Molding Inc. of Mabelvale;
- ◆ Alumax - Magnolia of Magnolia;
- ◆ Capstan Inland of Hazen;
- ◆ Alternative Design Manufacturing of Siloam Springs;
- ◆ Victor Midland of Springdale;
- ◆ U.S. Architecture of Malvern;
- ◆ Canon Security Group Inc. of Arkadelphia;
- ◆ Rock-Tenn Company of Conway;
- ◆ Artran Inc. of Springdale;
- ◆ Champs Sports Distribution of Maumelle;

- ◆ Engineered Specialty Plastics of Magnolia, and
- ◆ Marshalltown Tools of Fayetteville.

Public funding of \$ 375,000 was appropriated for each year of the 1998-1999 biennium for both the Technology Development and Technology Transfer programs. Since TTAG started in 1994, the Authority has leveraged its investment of \$360,337 by 40 percent to successfully solve 104 technical problems of Arkansas manufacturers. A variety of industries have received assistance from this program, including lumber and wood products, furniture fixtures, paper and allied products, fabricated metal products and wholesale trade.

Seed Capital Investment Program

The Seed Capital Investment Program (SCIP) promotes economic development through the commercialization or improvement of science and technology related products and services of Arkansas-based firms. Program funds provide working capital to support the initial capitalization or expansion of technology based companies in Arkansas.

The program has invested in a wide range of exciting technologies – including lasers, fertilizers, computer software, plastics, and the Internet – to help keep Arkansas on the frontier of new technology commercialization. Applications are evaluated on the competence of the company's management, the company's business operations, the product's or service's marketability and the benefits of science and technology to the state. Proposals are thoroughly investigated by the Authority's staff and may receive technical evaluation.

The Seed Capital Investment Programs (SCIP) portfolio is currently valued at \$2,953,292.90; it is invested in seven loan agreements and two royalty based agreements.

\$12,164,000 in matching funds have been provided by small- and medium-sized applicant firms and/or other financing sources. The program requires at least a three-to-one match on any SCIP funds provided. The Authority has averaged \$135,378.75 per project to date. The average project cost is \$895,628.75.

In 1997 the Authority was authorized to invest SCIP funds totaling \$225,000 in Venisect Inc. Venisect Inc. has exclusive worldwide ownership, marketing and distribution rights to certain biomedical YAG (yttrium aluminum garnet) laser technology, and related technology, which was developed primarily in the former Soviet Union and later refined by American scientists.

Three hundred and forty new jobs have been created in Arkansas since the program first began in 1985. It has invested in 16 start-up firms in Arkansas; currently, 14 are still in business.

Providing Resources for Manufacturing

Arkansas Manufacturing Extension Network

The Arkansas Manufacturing Extension Network strives to improve the quality, productivity and global competitiveness of Arkansas manufacturers through the provision of comprehensive technical and management assistance services.

1997 marked the first full year of operation of the Arkansas Manufacturing Extension Network. During the year the Network continued to add staff and resources. The Camden and Jonesboro field offices were opened, bringing the field staff total to eight. Two staff people were hired at ASTA to support the Network. At the beginning of FY 1997, the field engineers continued their orientation with a series of sessions at the Arkansas Center for Technology Transfer and the Genesis Business Incubator, with special emphasis placed on the field service delivery mechanism. After orientation, engineers began making initial contacts and providing technical assistance among Arkansas' 3,390 small- and medium-sized manufacturers.

The Network was well supported during the year by its federal partner, the National Institute of Standards and Technology Manufacturing Extension Partnership (NIST MEP). In November the Associate Regional Director, Ms. Kim Reynolds, presented an update on the national MEP program to the Network's governing body, the Arkansas Science & Technology Authority Board of Directors. In January, Dr. Ruth Haines, Director of NIST MEP Regional Programs, and Ms. Reynolds attended the Board of Directors meeting held in Fort Smith and presented information on the national Manufacturing Extension Partnership system.

The Manufacturing Resource Advisory Committee (MRAC) is made up of representatives from the Arkansas Manufacturing Extension Network's partner organizations. This committee advises the Arkansas Science & Technology Authority's Board of Directors on manufacturing extension activities. It also supports the Network by providing policy direction and strategic planning guidance. Several organizations represented on this committee provide the Network with financial, technical, and staff support. Eight of these organizations house Network staff. In January, the Manufacturing Resource Advisory Committee resumed its regularly scheduled monthly meetings. For several months the committee provided support as needed without convening for scheduled meetings. After a trial period, it was determined that regularly scheduled meetings provided the Network with vital support that could not be achieved by other forms of communication.

In February, the MRAC members, Network staff, and a representative from NIST MEP met at Winrock International's Conference Center for a strategic planning retreat. The retreat was facilitated by representatives of the Indiana Business Modernization and Technology Corporation (BMT). The retreat served as an opportunity to assess the Network's strengths and weaknesses in year one and identify action items to move the organization forward into year two operations.

In April, the Network completed its Year One Annual Review. This is a standard review conducted by the National Institute of Standards and Technology Manufacturing Extension Partnership (NIST MEP) for all Manufacturing Extension Partnerships. The Network partners and staff participated in the review.

The Network began developing its visual identity with the creation of a logo and common marketing materials. An eight panel brochure describing the Network, its services, and field office locations was printed and distributed to field staff and partner organizations. A portable table-top exhibit explaining the Network's purpose and services was developed for use at conferences, meetings and tradeshow. The Network exhibited its table-top display at the Northeast Arkansas Business Expo in Jonesboro, the Arkansas Quality Conference, and the Arkansas Wood Manufacturers Meeting.

The Network Director, Julie Welch, resigned in June. Bill Kraus will serve as Interim Director. Kraus is the Network's field engineer in the Jonesboro area and will divide his time between Jonesboro and Little Rock until a permanent replacement is named.

Steps were taken throughout the year to integrate the Arkansas Partnership for Technology Exchange (APTE) pilot project into the Network. The APTE project was administered by two of the Network's partner organizations, Winrock International and Henderson State University. The APTE project has successfully conducted manufacturing extension activities in the wood and metal industries for several years. With the integration of the two projects, the APTE's two specialists, one each from the wood and metal industry, joined the Network's staff and continue to provide assistance to the wood and metal industries.

Network field engineers worked with representatives from the National Aeronautics and Space Administration (NASA) Marshall Space Flight Center and the Mid-Continent Technology Transfer Center to collaborate on projects with Arkansas manufacturers. Projects were conducted in Jonesboro, Fort Smith, Camden, Magnolia, and Little Rock. Steve Jones is the new liaison working with Arkansas and has worked with Network staff on combined community outreach efforts and joint projects. During Fiscal Year 1997, 41 companies were visited by NASA and Network teams. In April, four field engineers attended a meeting at the Marshall Center to become acquainted with Marshall's laboratories and resource capabilities.

The Network's support staff continued to coordinate initial industry contacts and provide fiscal, marketing and information management support to the field engineers. In November, the Network compiled the first of a series of reports to begin gauging its impact on the state's industrial community. In June, results from the Network's first two customer satisfaction surveys were released. The surveys were conducted by a Network partner, the Arkansas Economic Development Commission (AEDC). The first two samples were inconclusive due to the small number of responses. AEDC will continue to conduct customer satisfaction surveys on behalf of the Network.

1997 Operations Report

General Revenue		Appropriation	Budget	Y-T-D	Balance	Percentage of
App/All	Character	Balances	Budget	Expense	Balance	Budget
678/01	REGULAR SAL	456,325	488,471	396,095.32	92,375.68	81.09
	EXTRA HELP	12,000	3,190	3,190.00	0.00	100
	M & O	144,204	137,134	112,769.56	24,364.44	82.23
	FRINGE	115,025	123,983	99,224.69	24,758.31	80.03
	RESEARCH	980,001	913,419	913,418.87	0.13	100
	CONFERENCE	19,294	19,294	7,104.15	12,189.85	36.82
	PROF FEES	16,800	16,800	10,945.36	5,854.64	65.15
	CAPITAL OUTLAY	25,000	8,000	7,234.50	765.50	90.43
	TECH DEV	375,000	120,674	118,174.00	2,500.00	97.93
	TOTAL ACT 386	2,143,649	1,830,965	1,668,156.45	162,808.5511	
App/All	Cash Character	Appropriation Balances	Budget	Y-T-D Expense	Balance	Percentage of Budget
A87/01	SEED CAPITAL	1,900,000	1,900,000	3.00	1,899,997.00	0
B16/02	NETWORK/ENERGY	60,366	60,366	20,328.00	40,038	33.67
B16/01	TECH DEV/ENERGY	147,126	147,126	54,916.00	92,210.00	37.33
App/All	MEP FEDERAL Character	Appropriation Balances	Budget	Y-T-D Expense	Balance	Percentage of Budget
919/02	REGULAR SAL	226,094	226,094	97,594.39	128,499.61	43.17
	M & O	245,427	245,427	40,004.92	205,422.08	16.3
	FRINGE	55,229	55,229	24,386.26	30,842.74	44.15
	GRANTS	272,502	272,502	13,000.00	259,502.00	4.77
	CONF FEES	44,402	44,402	8,637.52	35,764.48	19.45
	PROF FEES	5,000	5,000	4,739.59	260.41	
	CAPITAL OUTLAY	61,200	61,200	568.16	60,631.84	0.93
	FIELD SERVICES	985,360	985,360	228,098.36	757,261.64	23.15
	MISC FEES	496,200	496,200	2,200.00	494,000.00	0.44
	TOTAL	2,391,414	2,391,414	419,229.20	1,972,184.8011	
App/All	General Improvement Character	Appropriation Balances	Budget	Y-T-D Expense	Balance	Percentage of Budget
211	MEP	665,260	665,260	665,257	3.00	100
212	GRANTS,NASA	150,000	150,000	150,000	0.00	100
233	NSF/EPSCoR	3,000,000	1,000,000	1,000,000	0.00	100
303	NSF/MATERIAL HANDLING	600,000	50,000	50,000	0.00	
304MEP	NETWORK ENHANCEMENT	1,118,324	298,000	298,000	0.00	100
316	NSF/ENERGY EPSCOR	600,000	0	0	0.00	
317	EPA/EPSCoR	200,000	0	0	0.00	
318	VIE PILOT PROJECT	150,000	0	0	0.00	
	TOTAL ACT 676	6,483,584	2,163,260	2,163,257	3	