MINUTES

MONTANA HOUSE OF REPRESENTATIVES
54th LEGISLATURE - REGULAR SESSION

JOINT SUBCOMMITTEE ON EDUCATION & CULTURAL RESOURCES

Call to Order: By **Chairman Royal C. Johnson**, on January 26, 1995, at 8:00 AM

ROLL CALL

Members Present:
Rep. Royal C. Johnson, Chairman (R)
Sen. Daryl Toews, Vice Chairman (R)
Rep. Don Holland (R)
Sen. Greg Jergeson (D)
Rep. Mike Kadas (D)
Sen. Arnie A. Mohl (R)

Members Excused: None

Members Absent: None

Staff Present: Sandy Whitney, Legislative Fiscal Analyst
Amy Carlson, Office of Budget & Program Planning
Curtis Nichols, Office of Budget & Program Planning
Paula Clawson, Committee Secretary

Please Note: These are summary minutes. Testimony and discussion are paraphrased and condensed.

Committee Business Summary:
Hearing: Montana University System: Experimental Program to Stimulate Competitive Research (EPSCoR)
Executive Action: None

HEARING ON EXPERIMENTAL PROGRAM TO STIMULATE COMPETITIVE RESEARCH
{Tape: 1; Side: A}

Dick Crofts, Deputy Commissioner for Academic Affairs, Commissioner of Higher Education Office, spoke to the contributions that the state's universities make to Montana's research and development (R&D) efforts. **EXHIBIT 1** The major reason for R&D programs at the universities is that they are a significant part of the education of Montana students, undergraduate as well as graduate. R&D programs at the universities are equivalent to a $51 million business in the Montana economy. About $33 million of these dollars are paid in salaries to faculty, technicians, support personnel, and

students. In FY94 student salaries and stipends were almost $7.75 million. The State of Montana is seriously lacking in an industrial R&D base and, therefore, must rely on the universities to provide technology transfer and business assistance that forms the roots of economic development. Many believe that the expansion of R&D and the building of a research infrastructure is the single most important piece of economic development for Montana's future.

The Experimental Program to Stimulate Competitive Research (EPSCoR) program is a federally funded family of merit-based programs designed to enhance science and technology-related research, education and industrial capabilities of states that have traditionally received little federal R&D spending. Montana has been extremely successful in the competitive grant process, as well as in the outcomes of these programs in terms of their contribution to business and industry. The purpose of EPSCoR is to be a partnership between the state and its universities. The mechanism used in the past to secure state matching dollars has been loans to the university system. The $4.4 million of loans for the FY94/95 biennium provided part of the match for grants from federal agencies which in total has reaped the benefits of almost $18.5 million.

Programs already approved for the next biennium will require a match of $4.8 million and will secure $7 million federal dollars for building successful R&D programs. These funds provide the best way to accomplish so much so quickly in building R&D activities in Montana. The mission of the Montana University System (MUS) is not to be a vehicle for economic development; however, MUS can perform the research and development which is important for Montana's future. Students are graduating with the skills needed by the high tech firms that will be the base of future successful development of the Montana economy.

{Tape: 1; Side: A; Approx. Counter: 865; Comments: Continue on Tape 1; Side B}

Linda Reed, Governor's Office, Economic Development Policy Advisor, said that while 8,000 new jobs have been created in Montana in the past two years, the state's per capita income is still only 83% of the national average. A large number of issues the legislature is grappling with have to do with lack of affordable housing, health care and education, but in reality Montana's main concern should be the job and wage problem that make basic services unaffordable. Future prosperity will be based upon knowledge and productivity, both products of Montana's higher educational system. Strengthening the capacities of Montana's centers of higher learning, which are the most appropriate vehicles to undertake the development of new technologies, is no different from participating in the construction of roads, sewer and water systems. They are all part of an infrastructure that will support the development of a future for Montanans that includes the promise of a decent wage, work worth doing, and a special place to live. The state of

Montana has the power to continue creating an environment that encourages the development of commercial enterprises that will create jobs for this and future generations. Decisions to make the investment necessary to continue this effort are not easy because there are no guaranteed returns, but, without building a future of self-sufficiency, Montana will never solve the problems it faces today.

{Tape: 1; Side: B; Approx. Counter: 63}

Penny Copps, U.S. West Communications and Chair - Board of Governors of Montana Business Connections, said that Montana Business Connections (MBC) serves as a gateway for private businesses to access the resources and expertise of MUS. The expanded mission of MBC is to connect will all public services throughout Montana. The State of Montana is being asked to continue supporting these efforts.

{Tape: 1; Side: B; Approx. Counter: 185}

Craig Rawlings, President - Safe Shop Tools, is a proponent of economic development in Montana. MUS can and should play a central role in Montana's future economic development. MUS helps with consultants, identifying funding resources, and computer links. The subcommittee is urged to support the Universities as an integral part of economic development in Montana.

{Tape: 1; Side: B; Approx. Counter: 305}

George Torp, President - Purity Systems, explained that Purity Systems uses analytical equipment available at the universities for same day turn around on analysis, where the company used to use an out-of-state company for analysis. **EXHIBIT 2**
The University of Montana-Missoula (UM-M) assisted Purity Systems in developing technology and through this will share in Purity Systems profits. Without the UM-M research, Purity Systems would not be in Montana.

{Tape: 1; Side: B; Approx. Counter: 485}

Larry Johnson, CEO - ILX Lightware, said ILX Lightware (ILX) is facing the challenges of capturing opportunities in the fiberoptic market because of the need for technically advanced products. ILX is very good at developing a product once the technology is at hand, but is not very efficient at research. ILX invests 7% of its R&D budget in a cooperative agreement with Montana State University-Bozeman (MSU-Bozeman), which has helped ILX develop several commercial products in the past four years. ILX considers there to be a leverage factor of about five in the funds spent at MSU-Bozeman. The difference is provided by the faculty, students, the facilities, matching funds and other on-going research that exists at the universities right now. ILX was founded in Bozeman in part because of MSU-Bozeman and owes some of its success to the collaborative agreement.

{Tape: 1; Side: B; Approx. Counter: 693}

Dan Biggerstaff, Ph.D., General Manager - Western Plant Breeders, said the company is in Bozeman because Montana State University-Bozeman (MSU-Bozeman) is there. **EXHIBIT 2** Research at the university level ultimately creates jobs in Montana.

{Tape: 1; Side: B; Approx. Counter: 845; Comments: Continue on Tape 2; Side A}

Gail Abercrombie, Executive Director - Montana Petroleum Association, explained that a serious problem in older oil fields, that of hydrogen sulfite "souring" the oil, has been addressed through R&D at MSU-Bozeman. A biofilm was developed by researchers and students that possibly will be used in the world's largest oil storage field, which is in Montana. Graduate students involved in the project have benefitted by hands-on work with oil professionals as well as financial benefits from their stipends and any revenue from the patenting of the biofilm. The biofilm makes the gas fields more viable and increases the value of the oil, which in turn increases severance taxes to Montana.

{Tape: 2; Side: A; Approx. Counter: 82}

Chris Gallus, Montana Energy Research and Development Institute, Inc., said that throughout its history the Institute has relied heavily on Montana Tech and Montana University System for research and development. Research and development brings jobs, sustains private business, attracts businesses and is worthy of the legislature's support. **EXHIBIT 4**

{Tape: 2; Side: A; Approx. Counter: 147}

Jerry Bromenshenk, Research Professor in the Montana University System, read testimony from **John Murphy, Montana Power Company** in support of research and development efforts in the Montana University System. **EXHIBIT 5**

{Tape: 2; Side: A; Approx. Counter:

Judy Gobert, Native American Graduate Student in microbiology/biochemistry, said she is a Ph.D. candidate working in AIDS research whose education has been funded through National Institute of Health grants. Her program works collaboratively with many other research centers throughout the country and the Montana biotechnology research program is ranked as one of the top programs in the country.

{Tape: 2; Side: A; Approx. Counter: 452}

Randy Equall, Ph.D. student in physics at MSU-Bozeman, said typically Montana Ph.D. graduates find employment in other states because of higher salaries. He believes he is the first Ph.D. student to be hired by an in-state company straight out of the Ph.D. Program. The collaborative efforts of MUS with private companies gives students the opportunity to get practical

experience not usually available until they have entered the work force and opens the possibility of in-state employment.

{Tape: 2; Side: A; Approx. Counter: 685}

Dr. Crofts said that the success of Montana universities R&D programs are made possible through decisions made by both the universities and the legislature to allocate resources into the areas of research and economic development. The significant enterprise of R&D both indirectly and directly contribute to the state's revenue, the state's economy and the state's jobs. R&D support of private enterprises also opens jobs for graduates of Montana higher education institutions who, in previous years, would have been forced to go out-of-state to find work in their fields.

{Tape: 2; Side: A; Approx. Counter: 770}

REP. DON HOLLAND asked how long did it take Western Plant Breeders to develop the waxy barley. **Dr. Biggerstaff** answered it has been in development for about twenty-five years. Part of the reason development was slow is that barley is not a popular part of the American diet. Japan and several Asian countries are large barley consumers, and it is anticipated that within the next 50-100 years Americans will also turn to a more grain-based diet. Because of the historically good relationship between Japanese and Montanan plant researchers, Japan specifically requested the waxy barley be grown in Montana, although it has also been grown in Washington and Idaho.

{Tape: 2; Side: A; Approx. Counter: 913; Comments: Continue on Tape 2; Side B}

SEN. GREG JERGESON asked for a description of the relationship between Western Plant Breeders (WPB) and MSU-Bozeman research and what, if any, royalties MSU-Bozeman was sharing. **Dr. Biggerstaff** said the waxy barley gene has been in the literature for decades and both WPB and MSU-Bozeman have worked to create better barley. The relationship was one of communication as well as support of a graduate student by WPB. The strain of waxy barley that has just been commercialized was developed by WPB so there is no royalty going to MSU-Bozeman. The winter wheat which WPB is now trying to commercialize was developed by MSU-Bozeman and there is a licensing and royalty agreement for this product.

SEN. JERGESON asked how the universities can earn royalties on properties which are a direct result of their research. **Dr. Crofts** explained that each campus set its own policies in this area. Until recently there has not been much concern or interest, but now most R&D projects are set up with licensing agreements or partnerships with private businesses to provide research money, graduate student support and travel support. **Mr. Torp** said Purity Systems has given a portion of the company to UM-M, which, in the future, may provide profits.

REP. MIKE KADAS asked how much state matching funds are given for EPSCoR. **Bob Swenson, Vice President for Research & Creative Activities, MSU-Bozeman,** said the state has provided $5.3 million for R&D as a loan. The EPSCoR program has to repay the loan at 2.5 times, which is set up as $250,000 per year. These payback funds come from royalties and indirect cost recovery from other grants.

REP. KADAS asked which would be better for the EPSCoR program, to renew the loan at the same payback rate or to get no funds from the state. **Mr. Swenson** said there was no choice but to renew the loan since there is a lot at stake in terms of education and the quality of life in Montana.

CHAIRMAN ROYAL JOHNSON asked if the contracts that have been issued since 1993 for use of EPSCoR matching funds have been reviewed to insure that the University System has a potential return. **Dr. Crofts** said careful attention has been given to protect the University system in terms of future revenue streams. Currently profits are still quite small.

CHAIRMAN JOHNSON asked if U.S. West Communications will again do the same amount of funding for Montana Business Connections in the next biennium as in the past. **Ms. Copps** said the $300,000 grant was for three years ending in 1995. U.S. West of Montana will apply for the funds again, but there is no guarantee they will be awarded.

CHAIRMAN JOHNSON asked how effective the Montana Business Connections Board of Governors considers the program to be. **Ms. Copps** said there is great concern about funding which very much depends upon the state. At best there needs to be at least a state match. There is exploration of ways to become self-sufficient, but not all the programs lend themselves to self-sufficiency. The organization of MBC as a cooperative effort throughout the University System is very effective.

CHAIRMAN JOHNSON asked if MBC helped fund the Montana Private Capital Network (MPCN). **Ms. Copps** said MPCN has helped with some in-kind technical support, but not through actual funding. The Montana Private Capital Network is a group of venture capitalists who are interested in helping support private industry in the state. The venture capitalists are matched with entrepreneurs and assist with funds and expertise.

{Tape: 1; Side: A; Approx. Counter: 925; Comments: Continue on Tape 3; Side A}

CHAIRMAN JOHNSON asked how MBC is repaid for work done for Montana Private Capital Network and how MPCN gets their funding. **John Balsam, Missoula Regional Director, Montana Business Connection,** answered that MBC contracts with MPCN and administers the program using software purchased by MPCN. MBC gets a percentage of the funds that come in to MPCN through fees to the venture capitalists and entrepreneurs. (Venture capitalists pay

$100 each six months; entrepreneurs pay $50 each six months.) MBC has received approximately $1,500 each year since 1992 as payment. There is discussion to increase the fees somewhat because of the popularity of the program. MPCN has recently hired a part-time person to relieve some of the administrative burden from MBC.

CHAIRMAN JOHNSON told the subcommittee that he has just recently accepted an appointment to be on the EPSCoR Board of Directors and is very supportive of the program. **CHAIRMAN JOHNSON** read a letter of support from ARCO. **EXHIBIT 6**

Jeff Baker, Ph.D., Commissioner of Higher Education, said the dilemma facing R&D efforts in the University System is one of the source of funding. The Governor's Office on Economic Development is working diligently in this area to try to come forward with a fund source that makes sense without having to be a 2.5 times loan payback or tapping into sources like the coal tax funds that would then decrease support for other programs. **REP. EMILY SWANSON** is supporting legislation this session addressing these funding concerns. R&D programs are extremely important, not just to the University System, but to the state as well.

REP. KADAS asked if the University System could look at renegotiation of the terms of the 2.5 times payback of the EPSCoR loan. **Dr. Baker** said the University System is not currently in a position to request forgiveness or renegotiation. Efforts are concentrated on providing a proposal for the future which will provide a viable funding base that makes sense from a business standpoint as well as from the overall benefits that are going to accrue in a realistic framework. There will be a resource clash because Montana doesn't have the additional resources to provide support out of the general fund.

ADJOURNMENT

Adjournment: This meeting adjourned at 10:16 AM.

ROYAL C. JOHNSON, CHAIRMAN

PAULA CLAWSON, SECRETARY

RCJ/pc

[THIS MEETING WAS RECORDED ON THREE 60-MINUTE TAPES]

EDUCATION

Joint Appropriations Subcommittee

ROLL CALL DATE 1/26/95

NAME	PRESENT	ABSENT	EXCUSED
Rep. Royal Johnson, Chairman	✓		
Rep. Mike Kadas	✓		
Rep. Don Holland	✓		
Sen. Daryl Toews	✓		
Sen. Greg Jergeson	✓		
Sen. Arnie Mohl	✓		

Research in MUS

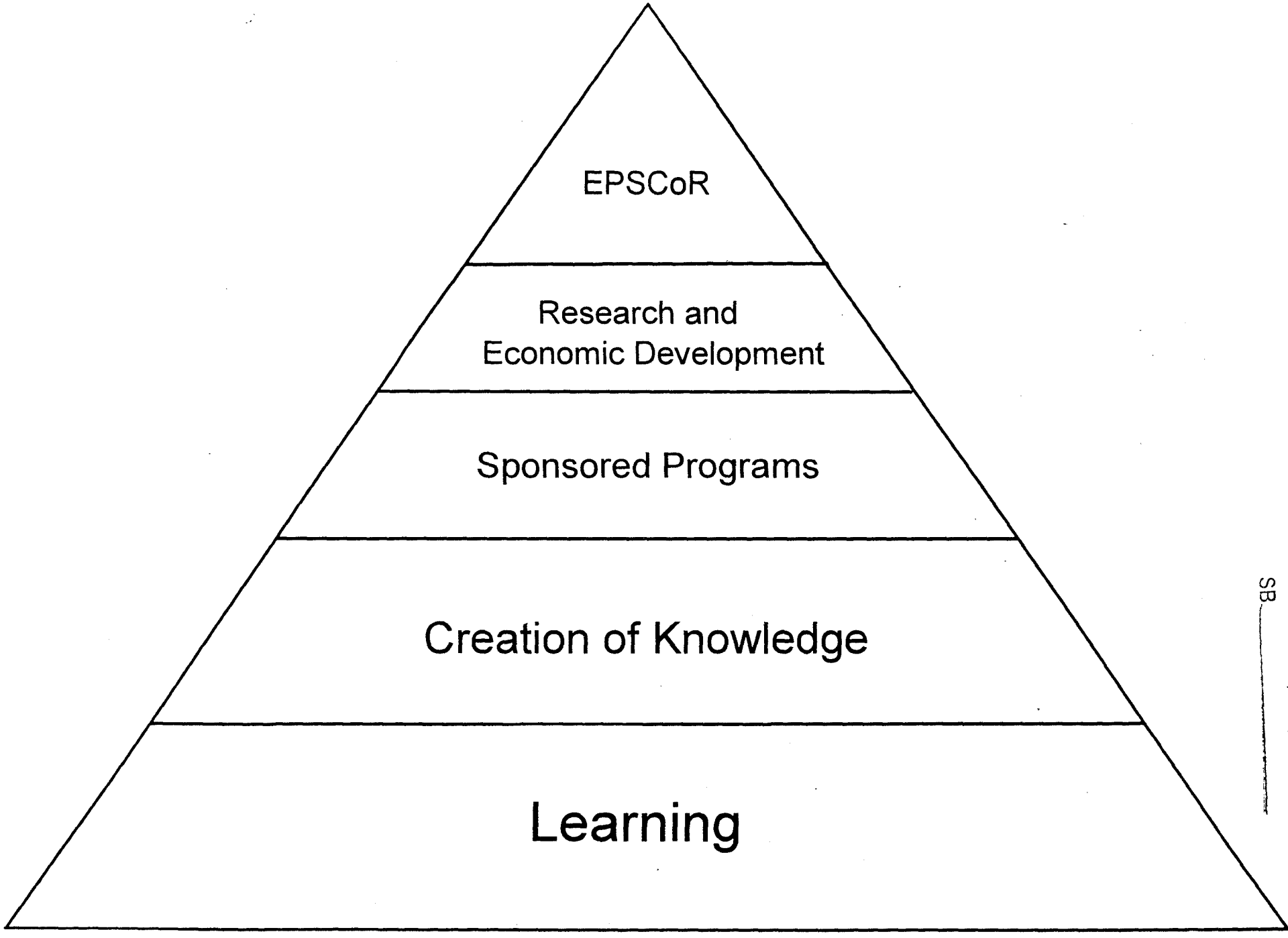

EXHIBIT 1
DATE 1/26/95
SB

MONTANA UNIVERSITY SYSTEM
GRANTS AND CONTRACTS EXPENDITURES - FY 94
BY MAJOR CATEGORY

CATEGORY		EXPENDITURE
Faculty and Professional Salaries		$17,410,905
Classified Salaries		$ 6,431,440
Graduate Student Support (Salaries, Stipends, Fees)		$ 6,222,000
Undergraduate Student Support (Salaries, Stipends, Fees)		$ 3,003,770
Supplies and Operations		$14,062,770
Equipment		$ 4,280,905
	Total	$51,411,790

EXHIBIT 1
DATE 1-26-95

MONTANA UNIVERSITY SYSTEM
GRANTS MATCHING FY 96-97

I. MATCHES FOR FEDERAL GRANTS FOR FY 96 AND 97 FOR PROGRAMS ALREADY FUNDED FOR NEXT BIENNIUM

(Figures are for the biennium. Figures are X $1,000) (All are statewide programs.)

PROGRAM AND AGENCY	AGENCY FUNDS	MATCH REQUIRED
1. NSF SI EPSCoR (funded for 5 years)	$2,900	$2,900
2. NASA EPSCoR (funded for 5 years)	$1,000	$1,000
3. NASA Space Grant (funded for 5 years)	$ 340	$ 240
4. NSF Tchr Collab STEP (funded for 5 years)	$2,400	$ 400
5. Montana AHEC (Area Health Education Center)	$ 150	$ 150
6. NASA JOVE	$ 50	$ 50
7. Office of Rural Health	$ 150	$ 150
TOTAL	$6,990	$4,890

II. EPSCoR PROGRAM OPPORTUNITIES - MATCHES ANTICIPATED

PROGRAM AND AGENCY	AGENCY FUNDS	MATCH REQUIRED
1. NSF ESI EPSCoR	$1,000	$1,000
2. DOE EPSCoR (assumes 5 states funded)	$2,500	$2,100
3. NIH EPSCoR (assumes 8 states funded)	$ 225	$ 60
4. EPA EPSCoR (assumes 4 states funded)	$ 500	$ 250
5. DOD EPSCoR (assumes each state funded)	$2,000	$1,000
6. USDA EPSCoR (assumes each state funded)	$1,000	$ 200
TOTAL	$7,225	$4,610

MONTANA UNIVERSITY SYSTEM

Presenter	Faculty Partner
Penny Copps U.S. West Communications	John Balsam, Director Montana Business Connection
John Murphy Montana Power Company	Jerry Bromenshenk, Research Professor Biological Sciences
Craig Rawlings, President Safe Shop Tools	John Balsam, Director Montana Business Connection
George Torp, President Purity Systems, Inc.	Vernon Grund, Professor Pharmaceutical Sciences
Judy Gobert, Native American Graduate Student in microbiology/biochemistry (hometown: Missoula, MT)	Tom North Division of Biological Sciences
Larry Johnson, CEO ILX Lightwave	John Carlsten, Regents Professor MSU Physics
Dan Biggerstaff, General Manager Western Plant Breeders	Tom McCoy MSU Dean of Agriculture
Gail Abercrombie Executive Director Montana Petroleum Assn.	Bill Costerton, Director MSU Center for Biofilm Engineering and Joe Figueira, Associate Dean Research and Graduate Studies (Montana TECH of UM)
Don Peoples, President & CEO Montana Technology Companies - Butte	Bill Costerton, Director MSU Center for Biofilm Engineering and Joe Figueira (Montana TECH of UM)
Randy Equall, PHD Student MSU Physics (hometown: Worden, MT)	John Carlsten, Regents Professor MSU Physics

EXHIBIT 1
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Research in MUs

EXHIBIT 2
DATE 1/26/95
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Purity Systems Incorporated

OVERVIEW

December, 1994

Purity Systems was formed in July, 1987, by Mr. George Torp and Dr. Philip Barney of Missoula, MT. The company's charter is to develop and produce advanced filter materials for preferentially removing heavy metals dissolved in liquid streams, specifically - potable water and waste water.

The initial motivation to develop such materials resulted from publicity on the adverse effect of lead in drinking water. By the late 1980's the scientific data documented the diminished IQ performance in children with sub-clinical (asymptomatic) lead intoxication levels. This resulted in passage by the U.S. Congress of the Lead Contamination Control Act of 1988. This act targeted water supplies in the nation's schools, followed by public water systems. The act is consistent with the national effort to remove lead from gasoline, and paint, and now water. In recent years, this effort has been extended to the control of levels of other metal contaminants, such as cadmium, mercury and other metals often found in drinking water. On the other end of the water-use spectrum, government regulations are closing in on the concentration and total amount of heavy metals allowed in municipal, commercial and industrial waste streams which reenter the environment. The tendency in regulation of industrial waste water is toward a goal of "drinking water in, drinking water out".

Technology Development

For some time prior to the formation of PSI, another Missoula company, Chromatochem, Inc., was developing high performance affinity liquid chromatography silica packing material for purifying mixtures produced in the biotechnology and pharmaceutical fields. Chromatochem is noted for its proprietary technology for modifying silica particles while maintaining high physical integrity of the gel during operation and at Ph extremes. In addition, these modified silicas exhibit remarkably low non-specific binding of dissolved organic material. Initial experiments in 1988 demonstrated that Chromatochem technology could be effective in removing heavy metal ions, but it also removed calcium and magnesium ions, severely limiting capacity and a problem similar to other chelating materials with limited heavy metal binding.

In late 1989 Chromatochem was contracted to develop a material that was effective at selectively removing lead and other heavy metals from water in the presence of calcium and magnesium. A Pasadena-

based chemist and consultant, Dr. Ronald Gamble, was recruited to monitor the research and contribute to the technical and business development. Although the basic goals of high selectivity and capacity were achieved, the materials developed still suffered various leaching effects which made them unsuitable for potable water applications. In addition, the projected costs of material production restricted the range of applications.

In 1990, Dr. James Smart, a visiting associate at Caltech was brought into the project to evaluate the technology acquired by Chromatochem. A research effort was initiated in late 1990 with Dr. Ed Rosenberg in the Chemistry Department at California State University Northridge (CSUN), to address the issues of leaching and cost. Dr. Rosenberg has extensive experience in synthetic inorganic and organo-metallic chemistries and in NMR spectroscopy. Consultant Dr. James Smart, now with the Technology Transfer Program at UCLA, and Dr. Rosenberg and his graduate students developed alternate synthesis methods which avoid high cost-intensive chemistries used in the original Chromatochem technology.

In mid-1993, Dr. Rosenberg joined the Chemistry faculty at the University of Montana (UM), Missoula. The research contract with PSI was continued and expanded with the addition of a full-time chemist, Mr. David Pang. Mr. Pang has extensive experience in the organic surface chemistry of silica from previous experience at Chromatochem.

By the fall of 1994, our efforts have resulted in a new metal ion removal material. The surface-modified silica is easy to synthesize, uses limited organic solvents (which can be recycled), exhibits higher metal binding capacity with lower leaching, and costs considerably less to produce than earlier materials. In addition to removal of cationic metal ions, other related modified silica can remove certain anionic forms of metals, such as chromate and arsenate.

A patent application has been initiated through the University of Montana. Current efforts are toward scale-up considerations, including fine-tuning the synthetic protocols, reducing organic solvents used in manufacture, and increasing metal binding capacity. Outside material testing is currently made in 0.5 to 1 kg batches. This level of production has allowed sufficient quantities of material to be sent to other laboratories for evaluation, as well as building the in-house performance data base.

Business and Investment

Purity Systems was formed as a chapter-S corporation in 1987 by Mr. Torp and Dr. Barney. With the initial intent to develop and prove the technology before significant investment was placed in a formal

EXHIBIT 2
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organization, Mr. Torp and Dr. Barney supported the Chromatochem and the university activities through research agreements. Consultants were recruited on an as-needed basis to set research priorities, review the progress, and contribute to technical and business development. To date over $500,000 have been invested in R&D by PSI investors.

In the fall, 1994, technical success in developing a viable material for removing heavy metals places PSI in a transition phase. The main focus will move from sponsored research to manufacturing and marketing issues. The company will be converting to a C-type corporation, scheduled for early 1995.

The near term goals include:

- R&D:
  - produce sufficient material for two near-term customers
  - work with an engineering/manufacturing firm on specifications of a 4 kg regenerative test bed in response to a request-for-proposal
  - identify additional ligands for removing specific organic matter

- Search and recruitment of a executive level person to oversee current operations, address the market, find near-term customers, interact with possible investors, and to determine the optimum means for manufacturing product and meeting market needs

- Market survey and issues

  - In 1989 and 1990, a consultant was hired full time to identify and meet with several of the major parties involved in purifying water for human consumption. Their interest was great, but the requirements for filter material exceeded what PSI had available at the time (metal removal was excellent, but a slight odor was deemed unacceptable). The parties will be re-contacted and presented with new evaluation material as needed.
  - On the waste water side, the markets appear to be more fragmented and poorly defined. This occurs, in part, to the fact that each waste water problem has unique aspects which may require several clean-up technologies. In the private arena, information from possible customers is not readily forthcoming. This is in part due to the fact that clean water regulations do not add value to a manufacturer's product, and only increases the cost of goods. It appears to be more productive to work with

companies already offering some type of water remediation service and offer product through existing channels. On the other hand, information on waste water problems from government agencies is more open, and direct interaction with specific sites may be possible.

- Review costing and manufacturing options

    - In 1992 and 1993 a significant amount of effort was placed in understanding the nature of scaling the production of modified silica to several hundred kg/yr. A chemical engineering consultant, with experience in particulates, was hired to review the protocols for earlier materials that were then in place, make recommendations as to the type of equipment required, determine building and utility requirements, and, finally, to estimate the cost of such a facility. The new protocols would reduce these costs somewhat.

    - These costs need to be reviewed in view of the near-term markets in order to determine the relative value developing an in-house production capability as compared to contracting near term production to a custom synthesis house.

- Develop business plan

    - An energy/water consortium in Montana has offered to help develop a business plan based on PSI's technology. This group is interested particularly in water emanating from mining sites, but it also has responsibility to develop or acquire water clean-up methods which can be used by the DOD and DOE on an as-needed basis throughout the U.S. The business plan will form the basis for the investment arm of the consortium to evaluate their possible investment in PSI.

    - The above business plan will be modified to include the broader scope of PSI technology and market interests, both for the near-term and long-term.

EXHIBIT 2
DATE 1-26-95

Purity Systems, Inc.

Investors and Scientists

Mr. George Torp, Investor and President of PSI (1987 - present)
- B.S. Pharmacy, 1964, U of Montana, Missoula
- Pharmacist, retail, 1964-76
- Construction and Land Development, 1972-1988
- Business entrepreneur and Investor, 1988 - present

Dr. Philip L. Barney, Investor (1987 - present)
- B.S. Zoology, 1960, Univ. of Montana, Missoula
- B.S., Medicine, 1962, Univ. of N. Dakota School of Medicine, Grand Forks, ND
- M.D., 1964, Univ. of Penn. School of Medicine, Philadelphia, PA
- Assoc. Pathologist, Northwestern Memorial Hospital, Chicago, IL, 1969-73
- Assoc. Dir. of Laboratories, Kadlec Hospital, Richland, WA, 1974-77
- Dir. of Laboratories, Kennewick General Hospital, Kennewick, WA, 1977-82
- Director of Laboratories, and Pathologist, Community Medical Center, Missoula, MT, 1982 - present

Dr. Ronald C. Gamble, Consultant (1989 - present)
- B.S. Chemistry, 1968, Purdue
- Ph.D. Biophysical Chemistry, 1975, MIT
- Post-doctoral, Chemistry, 1975-79, Caltech
- Sr. Res. Sci., JPL, 1979-81
- Technical founder, Chief Sci., Vestar, Inc., San Dimas, CA 1981-88 (pharmaceuticals, NASDAQ"VSTR")
- V.P. Development, Chromatochem, Inc, 1988-89
- Independent consultant, 1990 - present
  - to start-up and on-going companies and patent firms
- 25+ publications and book chapters, 10 issued U.S. Pat., 5 appl. pend.

Dr. Edward Rosenberg, Co-investigator, research @ UM (1991 - present)
- B.S., Chemistry, 1966, City College of New York
- Ph.D., Chemistry, 1970, Cornell Univ.
- Post-doctoral, Chemistry, Univ. of London, 1970-72
- Post-doctoral, Chemistry, Caltech, 1972-73
- Visiting Professor, Chemistry, USC, 1974-76
- Professor, Chemistry, Cal. State, Northridge, 1976-1993
- Professor, Chemistry, Univ. of Montana, MT, 1993-pres.
- 70+ publications, book chapters, invited papers

Mr. David C. Pang, Co-investigator, research @ UM (1993 - present)
- B.S., Chemistry, 1973, National Chung-Hsing Univ., Tai-Chun, Taiwan
- M.S., Organic Chemistry, 1986, Univ. of Montana, Missoula, MT
- Owner, small business, Missoula, MT, 1980-89
- Res. Sci., Chromatochem, Inc., 1986-93
- Staff Sci., Univ. of Montana, 1993-present
- 10+ publications

Dr. James C. Smart, Consultant (1991 - present)
- B.S., Chemistry, 1968, UC, Riverside
- Ph.D. Inorganic Chemistry, 1973, MIT
- Assist. Prof., Chemistry, UC, Berkeley, 1973-78
- Group Superv., National Renewable Energy Laboratory (NREL), Golden, CO, 1978-88
- Group Superv., JPL, 1988-90
- Visiting Assoc., Chemistry, Caltech, 1990-91
- Technology Transfer Officer, UCLA, 1991-present
- 30+ publications and invited papers

Dr. LeRoy L. Richer, consultant (1992 - present)
- B.A. Chemistry, 1968, Winona State Univer., Winona, MN
- Ph.D. Biochemistry, 1973, N. Dakota State Univ., Fargo, ND
- post-doctoral, Chemistry, 1974-76, Caltech
- Res. Biochem. USDA, Meat Animal Research Center, Clay Center, NE, 1976-82
- Sr. Res. Dir., Vestar, Inc., San Dimas, CA, 1982-91
- independent consultant, 1992-present
- 10+ publications and patents

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Western Plant Breeders

"Breeders of WestBred™ Varieties"

EXHIBIT 3
DATE 1/26/95
SB

To: The JOINT SUBCOMMITTEE of House Appropriations and Senate Finance and Claims for Education and Cultural Resources

From: Western Plant Breeders, Inc.

Date: January 26, 1995

Subject: Comments in support of matching funds for university R & D

Western Plant Breeders, Inc. (WPB) is a private plant breeding company working primarily in the eleven westernmost states. WPB currently serves the cereal breeding needs of 22 Associate seed companies in those states. Our headquarters is Bozeman, MT, and we staff branch offices in Phoenix, AZ, and Fargo, ND. Seventy percent of our staff is in Bozeman and over 75% of our total budget is spent in Montana.

Western Plant Breeders and our four Montana Associate seed companies ask your support of matching funds for university R & D. There can be no better investment of public funds than university research, especially when such research can be translated into commercial growth in Montana.

Two recent events involving university research and our company illustrate the direct result of public investment in research.

On January 5, 1995, over 7,000 metric tons (340,000 bushels) of waxy, hulless barley, all produced in Montana, departed Portland for Japan. This is the first commercial shipment of U.S. food barley to Japan. This event is the direct result of many years of joint research between Montana State University and private industry.

The second event is the launch of a new hard white winter wheat (Experimental number: MT 7811) for Montana. This new wheat was developed by MSU and is now being marketed by our firm on an exclusive basis. About 500 acres of MT 7811 were planted in Montana last October. Royalties generated by sales of this wheat will be returned to MSU to fund additional research.

Respectfully,

DRBiggerstaff

Dan R. Biggerstaff, Ph.D
General Manager

2111 Tinkerline Dr. • Bozeman, Montana 59715 • (406) 587-1218 • FAX 1-406-586-8247

EXHIBIT 4
DATE 1/26/95
SB

Montana Energy Research and Development Institute, Inc.

energy

Post Office Box 3809
Butte, Montana 59702
(406) 782-0463

January 25, 1995

Honorable Royal Johnson, Chairman
Appropriations Joint Education Subcommittee
State Capitol
Helena, Montana 59620

Dear Representative Johnson & Members:

This is a letter requesting your strong support for research and development funding in the Montana University System. Although I realize the fiscal constraints faced by the state, research and development funding is paramount to the economic well being of the state, our private sector businesses, students and competitiveness. It is a sound investment and worthy of your support.

Since its inception in 1974, MERDI has relied upon a strong relationship with Montana Tech and the entire university system. I can tell you, that without Montana Tech and the other units we would have been hard pressed to grow a technology business that now employs over 300 in Butte, Billings and Helena. As my company moves further toward implementation of a variety of waste remediation technology programs I see our continued partnership with the Montana University System as vital to our prosperity. Successful business development, diversification, and growth opportunities rely heavily on a sound university system program that can be an active partner in our endeavors.

Research and development in Montana's university system provides many opportunities for economic development by making our communities attractive to relocating and expanding technology based businesses. A major reason's the Butte area was attractive to MICRON, Inc. was the reputation of Montana Tech. The factors important to MICRON are also important to small technology firms. A strong research and development component at our university system is vital to their success, and thus, important to technology related economic diversification opportunities in Montana.

Thank you for your consideration of this important matter. Providing the matching funds to continue attracting research and development funding to Montana is a sound investment in our current system and an even sounder investment in the future economic success of our economy. If you have any questions or would like to speak in more detail about our relationship with the Montana University System please feel free to call me.

Sincerely,

Don Peoples

Donald R. Peoples
President

EXHIBIT 5
DATE 1/26/95
SB

FAX 444-3036

Representative Royal Johnson - Capitol Building Room 312

Committee considering formation of a long-term funding mechanism for Research and Development in Montana.

The following is testimony I planned to present to you this morning. I apologize for my absence and hope that you will accept my comments. If you have questions, please call me at (406) 723-5454 Ex. 72751.

Members of the Committee:

My name is John Murphy. I reside at 908 West Fifth Street in Anaconda. I have been involved in economic development since 1979. I am testifying today as a concerned citizen and I would like to share with you some observations that I have made over the last several years. My activities related to science and Research and Development includes work on the Science and Technology Implementation Plan as Chair of the Energy Focus Group; I served on the Board of Governors of the Biotech Center and I am currently on the Board of the Montana Business Connections (formerly the Entrepreneurship Center). Most recently, I worked on the core group of Montanans trying to attract Micron to Montana. My wife and two children are currently students in the Montana University System. I am not a scientist but have had a lifelong interest in science.

attract "high-tech" industry to Montana. This project brought me into contact with the Biotech center and through that association I was able to meet several Montana university researchers in this field. Further, I learned about past accomplishments of researchers working here. I was awestruck at the caliber of research and researchers in Montana. Cancer researchers from around the world convened in Big Sky and I was proud as a Montanan when our researchers presented their papers and debated science with this world renowned group. Montana's efforts were second to none! I soon learned that this was true in many fields. It was then I also learned about the struggle to fund these endeavors.

When we approached hi-tech companies about relocating to Montana, the first question they usually asked was; What are the universities doing in our field and how will they complement our business? They viewed this from two angles. The first was having resources and colleagues available with whom they could consult and discuss ideas; the second was having quality education available for continuing education for the employees of the firm and their children. Micron made it clear in their questions about Montana that quality education and access to continuing education is a key factor in their consideration of a new site. With Micron and others, the connection is simple -- no programs - no interest in relocating.

The development of the Montana Science and Technology Policy and Plan Document and the publication of the Implementation Plan received national attention.

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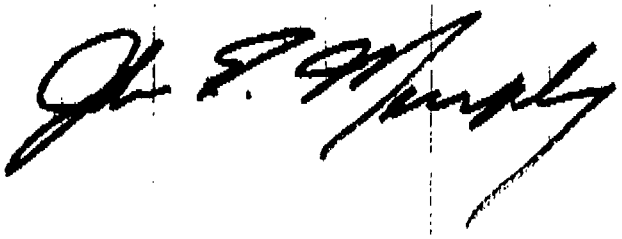
Montana was perceived as a well-organized progressive state in the R & D field. Many times we used these documents and two catalogs that discussed the growing number of high-tech companies that were located in Montana as promotional materials to discuss Montana with other companies. Usually the prospects were amazed and pleasantly surprised at what was being done in Montana. The fact there was a foothold of high-tech businesses in Montana and they were being helped through cooperative programs with university researchers caused some prospects to take a second look at Montana. Several of those businesses have moved to the state and created new jobs for Montanans.

At the same time, funding for R & D was becoming cumbersome. Still, the efforts moved forward and research money was attracted to programs like the Center for Biofilm Engineering and EPSCoR that allowed for new research and provided the opportunity for Montana's graduate students to do meaningful research without leaving their home state. The Entrepreneurship Center in locations across Montana became an important instrument in Economic Development by becoming a focal point of information transfer . Its databases developed through public-private partnerships are providing instantaneous access to information vital in developing new businesses. Efforts are underway to improve technology transfer and protect intellectual property to benefit the State and help business by providing quick access to reasearch .

Montana needs a sustainable source of funding both matching and direct to keep Montana moving forward in

the area of Research and the economic development that it attracts. Research and development will continue to happen whether funded by private industry or through government grants. It is my hope that a sustainable mechanism can be developed in Montana so that the work can continue in Montana and our children will have access to jobs and benefits that come from research. As Montana slowly moves away from the extractive jobs that have characterized the century that is drawing to a close, we must focus on the creation of jobs for the twenty-first century. It is research , development and technology that will provide the twenty-first century jobs. I urge you to provide the mechanisms that will allow Montana to be a player by providing a sustainable funding mechanism.

Thank you.



ARCO

307 East Park Street, Suite 400
Anaconda, Montana 59711
Telephone 406 563 5211
Facsimile 406 563 8269

EXHIBIT 6
DATE 1/26/95
SB

January 25, 1995

Joint Subcommittee
House Appropriations and Senate
Finance and Claims for Education
and Cultural Resources
c/o Royal Johnson
Capitol Station
Helena, Montana 59620

Re: University Research and Development Funding Legislation

Gentlemen:

This letter is in support of the University Research and Development Investment Fund. I encourage your adoption of a bill to provide State funds to match Federal research grant opportunities and partially support the operation of Montana's Centers of Excellence.

ARCO has worked with several Montana University Research and Development Centers and we have found that the faculty involved in these centers are current in their fields and offer opportunities for expert advice and consultation.

The students working on research and development are exceptionally well educated, talented, and provide creative ideas.

Thank you for your consideration.

Yours truly,

Sandra M. Stash, P.E.
Montana Facilities Manager

HOUSE OF REPRESENTATIVES
VISITORS REGISTER

Education SUB-COMMITTEE DATE 1/26/95

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NAME AND ADDRESS	REPRESENTING	Support	Oppose
Lynda Hunt			
RICHARD CROFTS	OCHE		
JOHN BALSAM	MT Educ Coop.		
JOHN CARLSTEN	MSU		
CRAIG RAWLINGS	SAE Shop Tools ~~MT Forest Extension~~		
Joe Figueira	Montana Tech		
LARRY JOHNSON	ILX LIGHTWAVE CORP		
Randy Equall	MSU		
Penny Copps	Montana Bus Connections		
Ray Mann	U of MT.		
Jerry Bromenshenk	U of MT		
[illegible]	Fluent Systems		
Gail Abercrombie	MT Petroleum Assn		

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HOUSE OF REPRESENTATIVES
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NAME AND ADDRESS	REPRESENTING	Support	Oppose
Bob Swenson	MSU		
Dan Biggerstaff	Western Plant Breeders		
Chris J. Hallus	MERDC		
Jim Molini	Mt. Pressurized Concrete Assn.		
Gene House	Billings Special Transportation		
KATHY FRANTZREB	MT BUSINESS CONNECTIONS		

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