STATE OF UTAH

DEPARTMENT OF
COMMUNITY AND
ECONOMIC
DEVELOPMENT

NORMAN H. BANGERTER
Governor

STANLEY B. PARRISH
Executive Director

CENTERS·OF
EXCELLENCE

324 South State
Suite 200
Salt Lake City, Utah 84111
801 538-8770

G. MICHAEL ALDER
Director

UTAH

CENTERS OF EXCELLENCE PROGRAM

Report to the Legislature

1 October 1990

UTAH CENTERS OF EXCELLENCE PROGRAM
Advisory Council

Larry H. Brim, Ph.D., Director of Research/Development
Hyclone Laboratories
Logan, Utah

Ladd E. Christensen, President
Whitehall Corporation
Salt Lake City, Utah

Ben V. Cox, Ph.D., Director of Advanced Technology
Unisys
Salt Lake City, Utah

Gary L. Crocker, President
Research Industries, Inc.
West Valley City, Utah

Elbert Dansie, M.D., Medical Director
IHC Health Care
Salt Lake City, Utah

Jerrold L. Foote, President
Questronics, Inc.
Salt Lake City, Utah

Thomas A. Henrie, Ph.D.
Consultant
Orem, Utah

E. Cordell Lundahl, President/CEO
Ezra C. Lundahl Inc.
Logan, Utah

Arthur A. Robbins, Manager Process Engineering
Signetics, Inc.
Orem, Utah

Gerald W. Sharp, Ph.D.
TRW
Ogden, Utah

John M. Simonsen, Ph.D.
Consultant
Provo, Utah

James Lee Sorenson, President
Deseret Research, UBTL, DataChem (CEO)
Salt Lake City, Utah

Rex S. Spendlove, Ph.D., President
Hyclone Laboratories
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Utah Centers of Excellence Program
Financial Return Summary

Ratio of Matching Contract to State Funds:

1989-1990 Matching Funds	$ 31,687,445
Current State Funding	$ 2,204,000
Ratio	14:1
1989-1990 Cumulative Matching Funds	$120,093,284
Cumulative State Funding	$ 12,145,704
Ratio	10:1

Number of jobs created x average estimated income:
(Assume $20,000 average salary)

1305 x $20,000 = $26,100,000
1521 x $20,000 = $30,420,000*

Annualized Economic Impact
(Assume 1.5 as a conservative multiplyer)

1.5 x $26,100,000 = $39,150,000
1.5 x $30,420,000 = $45,630,000*

Annual Return to the State:
(Assume State & Local taxes at 12.5%)

$39,150,000 x 12.5% = $4,893,750
$45,630,000 x 12.5% = $5,703,750*

*Includes graduated centers

Utah Centers of Excellence Program

The hypothesis upon which the Utah Centers of Excellence Program (COEP) was originally funded by the Legislature in 1986 was that there existed within Utah universities a high level of technical development that could be a major source of new technology based business opportunities for economic development within the State of Utah. This past year has continued to prove the validity of that hypothesis. At the date that this report was printed, there were approximately ten new venture capital financings being discussed in the high technology sector in the state (five of those are directly related to the COEP). In addition, ten new companies have been created by our Centers of Excellence this past year. This brings to a total of 53 companies that have either been created by COEP technology or that use COEP technology in their day to day operations in a major way. The most important result is the number of jobs that have been created. In the five years since the Utah Centers of Excellence Program began, a total of 1,305 jobs have been created. Three new centers have been created this year. The Center for Chemical Technology at Weber State University, the Center for Software Science at University of Utah and the Center for Advanced Composite Manufacturing and Engineering at BYU represent dramatic new opportunities for the state in important targeted industries. The program has also graduated four centers. The plan has always been to develop a center with three to five years of funding while they work towards becoming independent. Three planning grants have also been awarded. Planning grants should lead to successful applications for fully funded centers in the near future.

During the fifth anniversary year of the COEP, it has been determined that a program review to examine the Utah Centers of Excellence Program at the state level should be undertaken. An expert who founded the Ben Franklin Partnership in Pennsylvania and has also participated in the development of 30 other technology support programs has been contracted to conduct this review. In addition to seeing how the Utah program compares to other programs throughout the nation, the study will also examine just how efficiently we are managing our effort. Due to the increase in activity in Business Creation and Centers of Excellence, an assistant director is being sought to further expand the efforts of this office to help industry and university technology, develop into business opportunities for economic development in the state.

This year we decided to take a new reporting approach and exclude the statistics of graduated centers not receiving state funding. While this reduces cumulative matching funds and jobs created statistics from previous annual reports, we feel the current data reflects a more conservative and useful measurement of progress among our centers. Interestingly enough, while not including supporting statistics from graduated centers, current figures still reflect an increase in every major reporting category over last year's legislative report.

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Utah Centers of Excellence Program
Definition of Terms

Benefiting Utah Companies

All Utah companies that have been created by or are in a substantial way, using technology from centers.

Center of Excellence

Located at a Utah institution of higher learning, a "Center" is a designated location where specific research and development is conducted and technology transfer takes place, leading to commercialization of the products of that research.

Faculty, Graduate Student and Post Doctorates employed

Positions being salaried directly as a result of centers activity.

Industry jobs created

Those jobs that have directly or indirectly resulted from centers activity.

New Companies

New Utah companies formed using the research and development of the specific technology at the institution since the centers program began.

Principal Investigator

The center director who has instigated the research and is responsible for the direction of all affairs of that center.

State Contract

Dollar amount of commitment to the center by the State Department of Community and Economic Development. State monies are not released until invoices are received for actual expenses and documentation of match funds.

UTAH CENTERS OF EXCELLENCE PROGRAM SUMMARY

As of September 30, 1990

CENTER BY AREA OF TECHNOLOGY	FY 91 STATE CONTRACT	CUMULATIVE STATE CONTRACT	FY 91 MATCHING FUNDS	CUMULATIVE MATCHING FUNDS	INDUSTRY CREATED JOBS	FACULTY GRAD STUD POST DOC EMPLOYED	COMPANIES CREATED THIS YEAR	TOTAL EMPLOYEES
AEROSPACE & MANUFACTURING								
Advanced Composites BYU*	$ 50,000	$ 65,000	$ 133,803	$ 133,803	10	7	3	17
Aerospace Technology WSU	105,000	490,000	324,386	1,412,381	80	5	1	85
Engineering Design U/U	100,000	763,000	1,233,875	11,746,503	115	4	1	119
Materials & Microelectronics U/U	100,000	759,780	1,356,588	11,053,577	102	37	-	139
Quality & Integrity Design U/U	50,000	260,000	261,650	939,800	3	1	0	5
Space Engineering USU	100,000	1,050,000	4,394,945	5,891,154	149	10	1	159
Utah Research Institute USU-U/U-BYU-WSU	25,000	838,000	484,980	5,643,980	-	18	-	18
BIOMEDICAL TECHNOLOGIES								
Artificial Heart U/U	$100,000	$475,000	$3,462,776	$10,089,795	-	48	-	48
Biocatalysis USU	120,000	740,000	55,168	1,549,430	5	22	1	27
Biopolymers U/U	170,000	670,000	1,265,452	3,089,787	11	27	-	38
Controlled Chemical Delivery U/U	100,000	546,000	895,844	8,045,204	41	45	1	86
X-Ray Imaging BYU	100,000	460,000	810,466	1,330,555	8	24	-	32
INFORMATION TECHNOLOGIES								
Communications Research U/U	-	$170,120	$ 493,841	$ 2,456,709	7	13	-	20
Computer Based Education BYU	$100,000	325,500	172,000	1,134,300	33	7	-	40
Information Technologies USU	150,000	436,325	5,528,701	7,150,000	64	34	1	98
Inverse Problem Imaging & Tomography*	90,000	135,000	297,785	782,340	8	24	-	32
Signal Processing BYU	130,000	776,334	1,544,744	4,096,928	41	14	-	55
Software Science U/U*	100,000	100,000	795,075	795,075	-	13	-	13
Utah Supercomputing Institute U/U	200,000	675,000	2,967,600	26,377,000	-	29	-	29
NATURAL RESOURCES								
Advanced Combustion Eng. BYU	-	$500,000	$2,437,720	$11,969,237	3	125	1	128
Biotechnology USU	$100,000	800,000	409,402	3,453,375	-	22	-	22
Chemical Reactors U/U	-	75,000	391,652	664,500	-	8	-	8
Chemical Separations BYU	140,000	746,645	373,963	1,466,120	9	6	-	15
Chemical Technology WSU	74,000	74,000	89,686	89,686	15	5	-	20
Coal Research U/U	-	215,000	1,505,313	3,232,045	44	9	-	53
TOTALS	$2,204,000	$12,145,704	$31,687,445	$124,593,284	748	557	10**	1,305

Planning Grants:
- Center for Cancer Genetic Epidemiology
- Center for Drug Discovery
- Center for Rural Manufacturing

Graduated Centers:
- CAD/CAM - USU
- Laser Institute - U/U
- Supercritical Fluid - BYU
- Pyrometallurgical U/U

*New Centers

**See pages 13, 19, 27, 34 for complete listing of companies formed by Centers of Excellence

Utah Centers of Excellence Program
Spin-off Companies Formed During 1989-1990

CENTER	COMPANY
Center for Adv. Combustion Engineering	Reaction Engineering International (SLC)
Center for Advanced Composites	Fiber Dynamic (Murray) Haelan (SLC) Pro Design Corporation (Orem)
Center for Aerospace Technology	Simulacrum, Inc. (SLC)
Center for Biocatalysis	Whetstone (Logan)
Center for Controlled Chemical Delivery	Insutech, Inc. (SLC)
Center for Engineering Design	Sarcos Medical Corporation (SLC)
Center for Information Technology	Effective Instructional Technology (Logan)
Center for Space Engineering	Medcom, Inc. (SLC)

Aerospace and Manufacturing

Center for Advanced Composites Manufacturing and Engineering

(New center July 1990)

Dr. A. Brent Strong/Brigham Young University/Provo, Utah

Overview

Current State Contract	$50,000
Matching Funds	$133,803
Industry Jobs Created	10
Center Related Jobs	7
Benefiting Utah Companies	9
Pro Design Corp. - Orem Fiber Dynamics - Murray Haelan - Salt Lake City (plus 25 other Utah companies that are members of a consortium)	
Patents Applied	1
Patents Issued	--
License Agreements	--

Technologies

*Basic composite manufacturing methods:

-filiment winding
-pultrusion
-lay-up/laminating
-resin transfer molding (RTM)
-spray up
-molding
-resin technology
-fibers
-ceramic composites
-metal matrix composites
-automated manufacturing
-repair/logistics

Status

*Offered three technician training classes to college students (8 students placed in Utah companies).
*Approximately 8 Utah companies have developed active working relationships with center.
*Center developed full manufacturing capability in filament winding, RTM, and layup with autoclaving

Economic Impact

*Created 3 new companies:
-Pro Design Corporation
-Fiber Dynamics
-Haelan
*UV testing on product helped Vectra Plastics (a Utah company) secure a major contract and reach previous year's sales by June of this year.
*Received contract from Tooele Army Depot and identified appropriate repair procedures for Army vehicles.
*Study underway with Thiokol to develop machining of composites

Center for Aerospace Science Technology

Professor Robert J. Twiggs/Weber State University/Ogden, Utah

Overview

Current State Contract	$105,000
Matching Funds	$324,386
Cumulative	$1,412,381
Industry Jobs Created	80
Center Related Jobs	5
Benefiting Utah Companies	
Simulacrum, Inc.	
Intraspace, Inc. No.S.L.	
Patents Applied	--
Patents Issued	--
License Agreements	--

Technologies

*Small satellite design including features such as
- -particle detector
- -color camera
- -light detection for ozone mapping
- -magnetometer
- -microcomputer
- -packet radio communications

*Development of sun angle detector

*Satellite Doppler beacon

Status

*Webersat satellite launched January 1990. Operatoinal in polar orbit demonstrating advanced small satellite technology

*Availability of new launch opportunities

*Working with Southern Calif Edison in studying special application of satellite for power utility

*Working on space projects with University of Alabama at Huntsville

*Designed sun sensor to be used on Navy satellite

Economic Impact

*Magnetometer developed by center has been licensed by Orchid Engineering of Huntsville, Utah

*Helped move new company to Utah, Intraspace with 40 jobs and $6 million in contracts.

*Designed sun sensor to be used on Navy satellite

*Development of small satellite is attracting business to Utah for aerospace design and manufacturing

*New spin-off company, Simulacrum, Inc.

*Working with PacifiCorp to establish a Utah company to manufacture ground stations for small satellite applications

Center for Engineering Design

Dr. Stephen C. Jacobsen/University of Utah/SLC, Utah

Overview

Current State Contract	$100,000
Matching Funds	$1,233,875
Cumulative	$11,746,503
Industry Jobs Created	115
Center Related Jobs	4
Benefiting Utah Companies	
IOMED, Inc.	
Animate Systems	
Sarcos Research Corporation	
Sarcos, Inc.	
Sarcos Medical Corporation	
Patents Applied	5
Patents Issued	2
License Agreements	--

Technologies

*Drug delivery systems

*Physiological signal monitor

*Robotics

*Microelectro systems

*Micromechanical systems

*Artificial Limbs

*Artificial Kidneys

Status

*Robots with 54 degrees of freedom

*Artificial limbs now widely sold

*Working on development of miniature motor with rotor the diameter of human hair

*New contracts with Disney, Merck and Navy Dept.

*2 Licensing Agreements

*2 Patents Issued

*8 Research papers published or submitted nationally

Economic Impact

*Have created 3 companies with sales totalling $15 million annually and 15% pretax profit

*Have created 65 jobs including 35 professional engineers

*Two more new companies emerging with annual sales potential of $100 million each

*New robot contract will introduce technology to Europe

Center for Advanced Materials and Microelectronics

Dr. Gerald B. Stringfellow/University of Utah/SLC, Utah

Overview

Current State Contract	$100,000
Matching Funds	$1,356,588
Cumulative	$11,053,577
Industry Jobs Created	102
Center Related Jobs	37
Benefiting Utah Companies Thiokol, IBM, Evans & Sutherland, Hercules, Westscot Corp, Ceramatec	10
Patents Applied	--
Patents Issued	--
License Agreements	1

Technologies

*Multiple layer epitaxy

*Microprocessor design

*III/V compound chip design

*Ceramics as solid electrolytes

*Composite materials

Status

*Focus on III/V compounds, composites & ceramics estb. Advanced material for infrared detection in 8-12 micron range designed & disclosed to patent office

*Leading edge research in bismuth oxide fuel cells

*Close collaboration with local composites manufacturers

*$100K grant from Exxon Chemicals for polymer modeling work

*Image analysis system for failure diagnosis available for use by local industry

*Unique combined thermogravimetry/mass spectrametry facilities available

*6 presentations /manuscripts representing COE technology

Economic Impact

*Option on infrared detection chip license taken by Space Eng. Inc., Logan, Utah

*Bonneville Microelectronics start-up to commercialize products from center research

*Center heavily involved helping move a branch of IBM, Philips or Hewlett Packard to Utah

*Ceramatec, Beta Power Inc. and Edo Western are successful small high tech ceramics firms

*Commercial sales of the Tripos "Sybil" stimulation program ($24,000) include Hercules BASF and B.F. Goodrich

Center for Quality and Integrity Design

Dr. David W. Hoeppner/University of Utah/SLC, Utah

Overview		Technologies	Status	Economic Impact
Current State Contract	$50,000	*Structural Integrity Design	*2 inventions disclosed	*$207,000 post doc fellowship from Rolls Royce is now being finalized
Matching Funds	$261,650	*Structural Fatigue analysis for airplanes/trains/buildings	*License agreement pending with FASIDE International, Inc.	*Over $9.4 billion spent annually in US for outside training industry
Cumulative	$939,800	*High temperature SEM fatigue testing	*Inventions: 1. High temperature adaptation for in site scanning election microscopy fatigue stress 2. Dual actuated fatigue system attached to a scanning electron microscope	*Annual revenues for FASIDE are projected to exceed $3.4 million by 1994
Industry Jobs Created	3	*Industrial Training		*Expected to yield a return to the state greatly in excess of 30% from 1988 to 1994
Center Related Jobs	1	*Addressing reliability and maintain ability of country's aging commercial aircraft fleet		
Benefiting Utah Companies	FASIDE International Inc.	*Reduce wear phenomenon existing as a major problem in key industrial applications		
Patents Applied	2			
Patents Issued	--			
License Agreements	1			

Center for Space Engineering Research

Dr. Frank Redd/Utah State University/Logan, Utah

Overview

Current State Contract	$100,000
Matching Funds	$4,394,945
Cumulative	$5,891,154
Industry Jobs Created	149
Center Related Jobs	10
Benefiting Utah Companies	
Globesat Holding Co.	
Interactive Resources Co.	
ICOMP, Inc.	
Globesat, Inc.	
Medcom, Inc.	
Space Dynamics Lab/USU	
Space Systems Engineering	
Patents Applied	4
Patents Issued	--
License Agreements	1

Technologies

*Infrared instrumentation
*Sensor calibration
*Upper atmosphere measurements & modeling
*Plasma diagnostics
*Data analysis
*Image compression
*Cryogenics
*Program management
*New technology developments in space remote and in-situ sensing systems
*Storage of medical imagery
*Anticipating NASA contract for a commercial remote sensing small satellite
*Satellite - borne imaging systems for commercial and military applications
*Video phones and direct satellite broadcast TV
*Contracted to develop "Micro Satellites" from McDonnell Douglas

Status

*Increased annual operating budget to $20 MM
*Successfully competed to win $20 MM contract for critical SDI satellite (1992 launch)
*Now host annual small satellite conference (natl)
*Have flown 350 payloads, 75 of which involved cryogenics
*Have become a space grant university with U of U, BYU & Denver U.

Economic Impact

*Image compression technology demonstration will facilitate new concept in video phones(market size equal to VCR's)
*A total of 23 jobs now being directly supported by projects resulting from this center.
*Serving as a nucleus for developing further expansion in the space industry in Northern Utah.
*Development of space cryogenic technology promises expansion in economic opportunities

Utah Research Institute

Dr. David Norton/Utah State University/Logan, Utah

Overview		*Technologies*	*Status*	*Economic Impact*
Current State Contract	*$25,000*	**Computer Aided Logistics Systems (CALS)*	**Proposal to General Motors & foreign governments for $10 M submitted*	**Successful bidder on CALS/PODS program for Ogden Air Logistics Command ($4.5 M)*
Matching Funds	*$484,980*	**Parts on Demand Systems (PODS)*	**Defining statement of work with Ogden Air Logistics Command for maintenance of Air Force weapons systems.*	**Definition of statement of work on Air Force Weapons System Maintenance should yield $1 M contract*
Cumulative	*$5,643,980*	**Software for maintenance systems*	**Opportunity to work as a subcontractor with BDM corporation in a Design Engineering Program Phase II for the Ogden Air Logistic Center*	**Awarded $380,000 contract to provide software engineering services to the Air Force Software Technology Support Center (STSC). Significant long term opportunity within the Air Force and Department of Defense*
Industry Jobs Created	*--*	**Concepts for business creation*	**USAF contract anticipated for spare parts production and reprocurement support system (SPARES)*	
Center Related Jobs	*18*			
Benefiting Utah Companies *Ogden Air Logistic Center* *USAF Software Technology Support Center*				
Patents Applied	*--*			
Patents Issued	*--*			
License Agreements	*--*			

Aerospace & Manufacturing

Start-up or Benefiting Companies Using COEP Technology

CENTER	COMPANY
Center for Aerospace Technology	Intraspace (SLC) Simulacrum, Inc. (SLC)
Center for Space Engineering	Globesat (Logan) ICOMP, Inc. (Logan Interactive Resources (Logan) Medcom, Inc. (SLC) Space Dynamics Lab (Logan) Space Systems Engineering (Logan)
Center for Engineering Design	Animate Systems, Inc. (SLC) Iomed (SLC) Sarcos, Inc. (SLC) Sarcos Medical Corporation (SLC) Sarcos Research Group (SLC)
Center for CIM	CAM Software, Inc. (Provo) CIM Training Center (Orem) Echo Solutions (Orem) Edge Foundations (Provo) Edge, Inc. (Provo) Ozone Saver Industries (SLC) Smartware (SLC) Utah Pods Mfg. Co-op (Orem)
Center for Advanced Composites	Fiber Dynamics (Murray) Haelan (SLC) Pro Design Corporation (Orem)

Biomedical Technologies

Center for Total Artificial Hearts & Biomedical Devices			***Dr. Donald B. Olsen/University of Utah/SLC, Utah***
Overview	*Technologies*	*Status*	*Economic Impact*
Current State Contract — *$150,000* *Matching Funds* — *$3,462,776* *Cumulative* — *$10,089,795* *Center Related Jobs* — *48* *Industry Jobs Created* — *--* *Benefiting Utah Companies* — *--* *Patents Applied* — *2* *Patents Issued* — *--* *License Agreements* — *2*	**Engineering-miniature hydraulics, device design, design analysis, CNC machining capability, computer machining capability, device fabrication, polymers, plastics, metallics and QA/QC* **Electrical design & fabrication* **Integrated circuits & VLSI* **Device testing* **Animal experimentation-surgery, radiology, hematology, immunology, biochemistry, pathology, device retrieval analysis*	**Have established shared leadership in electric artificial heart projects* **Have only system with motor backup capabilities* **Considered world leader in artificial organ research* **Conducting animal studies for fully implantable electric artificial heart*	**$10 million backlog in research* **Looking for the right kind of industry linkage*

Center for Biocatalysis

Dr. Linda Powers/Utah State University/Logan, Utah

Overview

Current State Contract	$120,000
Matching Funds	$55,168
Cumulative	$1,549,430
Industry Jobs Created	5
Center Related Jobs	22
Benefiting Utah Companies	
WhetStone	
CSA	
HyClone, Inc.	
Patents Applied	--
Patents Issued	--
License Agreements	1

Technologies

*Parallel processing electronics

*Biocatalysis

*High speed high pulse lasers

*Infrared imaging

*Molecular design

*Bioanalytical instrumentation

*Molecular components and portable instrumentation for specialized monitoring

*Elucidate bio-catalytic processes involving metals and develop synthetic analogs

*New technology in automation and data analysis and handling

Status

*New breakthrough in infrafred imaging

*Approximately $1M in equipment installed

*Patent applied for "TransAcq" parallel processing module (powers up a PC to be equal to a VAX 8650)

*Software written linking module to standard X windows format

*Two-color photothermal spectroscopy developed

Economic Impact

*"TransAcq" module being licensed to CSA, a Provo Co.

*Breakthrough in infrared imaging could make significant contribution in early detection of cancer

*New company formed: "WhetStone;" will use technology in risk assessment management

Center for Biopolymers at Interfaces

Dr. Karin D. Caldwell/University of Utah/SLC, Utah

Overview

Current State Contract	$170,000
Matching Funds	$1,265,452
Cumulative	$3,089,787
Center Related Jobs	27
Industry Jobs Created	11
Benefiting Utah Companies	
Protein Solutions, Inc.	
Silicon Graphics, Inc.	
Deseret Medical	
Patents Applied	2
Patents Issued	--
License Agreements	--

Technologies

*Biosensors

*Purification of materials

*Diagnostics

*Artificial organ and implant production

*Contact lenses and diagnostic devices

*Researching surface interactions to assist the following industries:
+Food processing
+Medical devices
+Scientific instruments
+Pharmaceuticals
+Cosmetics

Status

*4 Utah companies are current center members

*23 member organizations representing the largest biomedical companies in the world

*Semi-annual meetings hosted in Salt Lake City bring attendees from around the country

*12-15 projects funded annually after internal reviews are conducted

*Interdisciplinary approach; member scientists come from 4 different colleges representing eight academic departments

*2 patents pending; 1 disclosure filed

Economic Impact

*Utah companies receive membership privileges at 1/3 price of membership dues

*Service labs are offering specialized analysis services to outside companies and organizations on a fee basis

*New company formed: Protein Solutions, Inc.

*Silicon Graphics, Inc. moved to Utah as a result of center technology (7 employees)

*Center is working vigorously to help move a member company here or to expand an existing Utah company using CBI technologies

Center for Controlled Chemical Delivery

Dr. Sung Wan Kim/University of Utah/SLC, Utah

Overview

Current State Contract	$100,000
Matching Funds	$895,844
Cumulative	$8,045,204
Center Related Jobs	45
Industry Jobs Created	41
Benefiting Utah Companies	13
Insutech	
TheraTech, Inc	
Research Medical	
Patents Applied	9
Patents Issued	1
License Agreements	3

Technologies

*Membrane transport

*Novel hydrogels

*Polymeric surfactants

*Macromolecular drugs

*Heparin removal filters

*Insulin delivery systems

*Design of nonthrombogenic surfaces

*Oral delivery of peptides (insulin)

*Biodegradable polymeric prodrugs

*Colon targeting

Status

*Secured eight US patents and currently has five more pending

*CCCD is the world center in medical polymers and drug delivery systems

*Sponsors international symposium on drug delivery systems every other year

*Eight patents licensed to two Utah companies

*3 new license agreements

*9 new patents

*Over 50 researchers toured CCCD facilities to discuss future research collaboration and joint research

*Anticancer systems have been chemically modified to make them targetable to cancer cells

Economic Impact

*TheraTech Inc. spinoff has 41 employees with $2.5 M in sales in 1990

*New spin-off company, Insutech/TTI formed to specialize in insulin delivery systems

*Ciba-Geigy funding large projects with patents filed (royalty bearing to U/U)

*Research Medical, another Utah company now funding centers research on heparin filter

*Heparin removal filter should produce sales of $50 million/year

Center for X-Ray Imaging

Dr. Larry Knight/Brigham Young University/Provo, Utah

Overview		*Technologies*	*Status*	*Economic Impact*
Current State Contract	*$100,000*	**Atomic Layer Epitaxy (ALE)*	**Spin-off company MOXTEK created with 8 jobs & sales of $400K to date*	**MOXTEK has received four Phase I SBIR grants and one Phase II SBIR*
Matching Funds	*$810,466*	**MultiLayer X-ray Optics*	**10 years of experience in a difficult research area. Have become leaders with little or no competition*	**Near term market for large & small X-ray windows is $6 million annually*
Cumulative	*$1,330,555*	**Leading edge technology in X-ray imaging*	**Can create multi-layer reflectors with film thicknesses between 3 and 20A*	**$100 million markets possible in medical & non-destructive testing areas*
Industry Jobs Created	*8*	**X-ray laser technology*		**MOXTEK negotiating with venture capital companies for expansion*
Center Related Jobs	*24*	**Thin film technology and diagnostics*		
Benefiting Utah Companies				
MOXTEK				
Patents Applied	*5*			
Patents Issued	*3*			
License Agreements	*1*			

Biomedical Technologies

Start-up or Benefiting Companies Using COEP Technology

CENTER	COMPANY
Center for Biocatalysis	CSA (Provo) Whetstone (Logan) HyClone, Inc. (Logan)
Center for Biopolymers	Protein Solutions, Inc. (SLC) Silicon Graphics, Inc. (SLC)
Center for Controlled Chemical Delivery	Insutech, Inc. (SLC) Research Medical Industries (SLC) Thera Tech, Inc. (SLC)
Center for Laser Institute	HGM Corporation (SLC) Innovative Imaging Sciences (SLC)
Center for Advanced Supercritical Fluid	Chromatography Conferences (Orem) Lee Scientific (Provo) Sensar Corporation (Provo)
Center for X-Ray Imaging	MOXTEK (Provo)

Information Technologies

Center for Communications Research			Dr. Craig Rushforth/University of Utah/SLC, Utah
Overview	Technologies	Status	Economic Impact
Current State Contract --	*Multiple access communications	*Technology transferred as it is developed to Unisys	*Unisys using products for expansion of its Utah operations
Matching Funds $493,841 Cumulative $2,456,709	*Coded modulation systems	*2 patents granted on decoding algorithms	*TechniScan a spin off company has been awarded a Phase II SBIR for $500,000 with $200K subcontract to Center for Communications Research
Industry Jobs Created 7	*High performance medical imaging	*TechniScan startup to commercialize computer imagery	
Center Related Jobs 13	*Vector quantization		
Benefiting Utah Companies Unisys Corporation	*Adaptive digital filters		
Patents Applied --	*Neural networks		
Patents Issued 4			
License Agreements 1			

Center for Computer Based Education

Dr. Frank Otto & Dr. Gordon Stokes/Brigham Young University/Provo, Utah

Overview		Technologies	Status	Economic Impact
Current State Contract	$100,000	*Video disc	*World leader in and have over 47 products for foreign & English as a Second Language (ESL) instruction	*Have created a private company Cali, Inc. to distribute products
Matching Funds	$172,000	*Digital video interactive systems	*Recognized as a world leader in language acquisition technologies	*Sales of products were $650K for 1990 (up 33% over 1989)
Cumulative	$1,134,300	*Computer authoring systems	*Developed and supports a consortium of over 350 public, private & governmental agencies using sophisticated technologies for foreign language and ESL instruction	*Project growth in 1991 to $2 million sales
Industry Jobs Created	33	*Computer adaptive testing	*Advanced to field test Beta test sites include Utah universities and school districts, Ohio State, Univ of Michigan, Duke, John Hopkins Univ., etc.	*Currently 33 employees anticipating growth in 1990-91
Center Related Jobs	7	*Computer based instruction		
Benefiting Utah Companies	CALI, Inc.	*Interactive audio/video technologies		
Patents Applied	--	*CDROM		
Patents Issued	--			
License Agreements	1			

Center for Information Technology (Handicapped Education)

Dr. Alan Hofmeister/Utah State University/Logan, Utah

Overview		Technologies	Status	Economic Impact
Current State Contract	$150,000	*Video Disc	*Produced over 15 special education products using expert systems	*$1.8 million from outside sources incl. SC, WY, Wash, FL, VA, MD
Matching Funds	$5,528,701	*Digital video interactive systems	*Video disc products in science and mathematics	*Helped create Systems Impact, a Salt Lake City company annual sales of $5-7 million and 16 employees
Cumulative	$7,150,000	*Expert systems	*Recognized nationally as leading technology center for sophisticated use of technology and quality of instructional design	*2 new spinoffs: Effective Instructional Tech Systems Impact Inc.
Industry Jobs Created	64		*Leading educational group using artificial intelligence for special education administration	*Brought more than $5 million in research and development monies to the state in 3 years
Center Related Jobs	34		*Have developed special education products for the State of Utah that dramatically increased the effectiveness of educators	*Responsible for Systems Impact Inc. moving research facilities to SLC
Benefiting Utah Companies: Systems Impact, Effective Instructional Technology				
Patents Applied	--			
Patents Issued	--			
License Agreements	--			

Center for Inverse Problems, Imaging and Tomography

Steven A. Johnson/University of Utah/SLC, Utah

Overview		Technologies	Status	Economic Impact
Current State Contract	$90,000	*Medical Ultrasound imaging	*New ultrasound scaner construction	*New U of U spinoff company using technology (TechniScan)
Matching Funds	$297,785			
Cumulative	$782,340	*Bottom and Subbottom sonar	*U. S. Navy grant	*1 company discussing contract
Industry Jobs Created	8		*Contract with major oil co	
Center Related Jobs	24	*Ultrasound non destructive testing	*5 patents issued	*New company pending formation
Benefiting Utah Companies TechniScan, Inc. Thiokol, Ogden		*Geotechnical imaging *Optical instrumentation	*5 patents disclosed or pending *Utah Energy office contract	*Medical market of 1 billion *Other markets of similar size
Patents Applied	5	*Single and multiphase flow measurement		
Patents Issued	5		*SBIR Phase II subcontract	*TechniScan negotiating venture capital to expand operations
License Agreements	1	*Process control		

Center for Signal Processing

Dr. Richard W. Christiansen/Brigham Young University/SLC, Utah

Overview		Technologies	Status	Economic Impact
Current State Contract	$130,000	*VLSI research	*Initial image compression products now being marketed through Eyring Research Institute	*New company ASTECH with 24 employees created from center technology
Matching Funds Cumulative	$1,544,774 $4,096,928	*Image compression	*ICON donated one of their largest computers and operating capital to CSP	*Deseret Digital Designs, another new startup from center technology
Industry Jobs Created	41	*Speech processing	*Rights to hearing aid technology now licensed	*Soft Solutions, an Orem, Utah company has licensed center technology to expand their product base
Center Related Jobs	14	*Robotics controls for manufacturing	*CCT transferred to Unisys for use in DOD and gov't work in synthetic radar image formation applications	*Vector Technologies, another new company, was formed to market image processing products from the center
Benefiting Utah Companies Unisys, USU, Softsolutions, Deseret Digital Design, Eyring Research Institute	5	*Optimal estimation theory research	*Data compression software licensed to two Utah corporations	*Digital hearing aid potential market $8 million to $12 million in US
Patents Applied	3	*Computational Compression Techniques (CCT)		
Patents Issued	1	*Human hearing model incorporated into a digital hearing aid		
License Agreements	7			

Center for Software Science (New Center July 1990)

Dr. Robert Kessler/University of Utah/SLC, Utah

Overview		Technologies	Status	Economic Impact
Current State Contract	$100,000	*Operating systems - define capabilities and features of the next generation operating system	*Research primarily focused on workstations but will also be adaptable to PC's	*Future spin-off company could be a reality with an increase in software distribution
Matching Funds	$795,075		*Have identified first product for Apple PC	
Cumulative	$795,075	*Parallel Lisp to solve problems using networked workstations	*Breakthrough in August on Parallel Lisp	
Industry Jobs Created	--	*Distributed computing allows network connected computers to perform larger tasks more rapidly than on single computer systems		
Center Related Jobs	13			
Benefiting Utah Companies				
Patents Applied	0			
Patents Issued	--			
License Agreements	--			

Utah Supercomputing Institute

Dr. David M. Grant/University of Utah/SLC, Utah

Overview		Technologies	Status	Economic Impact
Current State Contract	$200,000	*Fully operational site	*IBM 3090 600 installed at University of Utah (operational)	*IBM has contracted for $13MM in matching funds
Matching Funds	$2,967,600	*Developing infrastructure associated with a high speed communications network and numerically intensive computing resources	*Increasing cooperative use between universities	*Negotiating on printer technology with IBM (potential $2MM)
Cumulative	$26,377,000		*Newsletter published giving information on access and use	*Also negotiating visualization package worth approximately $2 million
Industry Jobs Created			*UNIX operating system under Beta Test	
Center Related Jobs	29	*Application of computer codes to scientific and engineering problems requiring numerically intensive high end visualization computer resources	*Designated as a large memory competency center by IBM	
Benefiting Utah Companies IBM, Thiokol, Hercules, Evans & Sutherland, CSA				
Patents Applied	--			
Patents Issued	--			
License Agreements	--			

Information Technologies

Start-up or Benefiting Companies Using COEP Technology

CENTER	COMPANY
Center for Signal Processing	Astech (Provo) Deseret Digital Systems (Orem) Vector Technologies (Riverton)
Center for Materials/Microelectronics	Bonneville Microelectronics (SLC) Ceramatec, Inc. (SLC) Space Engineering Inc. (SLC) Westscot Corporation (SLC)
Center for Communications Research	Techniscan (SLC)
Center for Computer Based Education	Cali, Inc. (Orem)
Center for Information Technology	Effective Instructional Technology (Logan) Systems Impact (SLC)

Natural Resources and Agriculture

Center for Advanced Combustion Engineering Research

Dr. L. Douglas Smoot/Brigham Young University/Provo, Utah

Overview

Current State Contract	--
Matching Funds	$2,437,720
Cumulative	$11,969,237
Industry Jobs Created	3
Center Related Jobs	125
Benefiting Utah Companies Geneva, Utah Power & Light, Questar, Hercules, and Reaction Engineering International	
Patents Applied	1
Patents Issued	--
License Agreements	20

Technologies

*Combustion process strategies

*Fuel structure reaction mechanisms

*Fuel minerals

*Mechanisms for pollutant formation and control

*Reacting, turbulent flows

*Comprehensive model development

*ACERC 3-dimensional computer simulation of combustion process code (computer-aided design combustion technology)

Status

*Center recognized as leading the world in combustion research

*Focus on national status as consortium of excellence in combustion

*Continue to host national meetings & guest speakers

*True collaboration between universities

Economic Impact

*$12 million grant from National Science Foundation from 1989-1994

*Annual budget of $900,000 indirect grants and stipends from industry

*$1,800,000 in supporting contracts

*New spin-off company: Reaction Engineering International

*Annual direct and supported research within the state is $4-5 million per year

*125 university related jobs funded

Center for Biotechnology

Dr. Steven Aust/Utah State University/Logan, Utah

Overview

Current State Contract	$100,000
Matching Funds	$409,402
Cumulative	$3,453,375
Industry Jobs Created	--
Center Related Jobs	22
Benefiting Utah Companies	
Utah Power & Light	
Thiokol	
NPI	
Patents Applied	1
Patents Issued	1
License Agreements	1

Technologies

*Fermentation biology

*Microbiology

*Molecular biology

*Monoclonal antibodies

*Data analysis

*Biological hazardous waste management

*Macromolecular synthesis and analysis

*Recombinant DNA tech implant breeding & development

*Microbiologicals in agriculture

*Monoclonal antibodies to control animal diseases

Status

*White rot fungus renders PCP's & PCB's harmless in the laboratory

*Treatment of creosote contaminated water has shown effective cleanup in the laboratory

*Bioremediation of explosives in contaminated water & soil

*Soil contaminated with oil

*Biodegradation of plastics

*Ability to degrade cyanide

*Dupont donated a mass spectrometer

*AirForce contract through Spectrum Sciences

*One patent awarded and one filed for biological hazardous waste management

Economic Impact

*Patent issued for fungus used for environmental clean-up

*Market for cleaning up contaminated sites is extremely large

*USU Biotechnology Building is now completed

*Discussing commercialization of white rot fungus with Utah company

*Market study underway

Center for Chemical Reactors

A. Lamont Tyler/University of Utah/SLC, Utah

Overview		Technologies	Status	Economic Impact
Current State Contract	--	*Development of fluid-bed technology for catalytic reactions	*Proposals to apply technology to the retorting of oil shale have been submitted to federal agencies	*Projected royalty income from low-profile fluid-bed catalytic cracker exceeds $2 billion for the first 15 years
Matching Funds	$391,652	*Biological leaching technology for recovery of gold from refractory ores	*Biological leaching of refractory gold ores is supported by two Utah firms: Kennecott and EIMCO	*Shale oil retorting and recovery of gold from refractory ores is substantial
Cumulative	$664,500		*Start up and operational testing of the low profile fluid-bed catalytic cracker begins in November, 1990	*Untapped market in providing economic fluid-bed catalytic cracking capacity to small refineries
Industry Jobs Created	--			
Center Related Jobs	8			
Benefiting Utah Companies Process Innovators, Inc. Kennecott EIMCO Western Zirconium - a subsidiary of Westinghouse Corp.				
Patents Applied	--			
Patents Issued	--			
License Agreements	--			

Center for Chemical Separations

Dr. Reed Izatt/Brigham Young University/Provo, Utah

Overview

Current State Contract	$140,000
Matching Funds	$373,963
Cumulative	$1,466,120
Industry Jobs Created	9
Center Related Jobs	6
Benefiting Utah Companies	IBC Advanced Technologies, Inc.
Patents Applied	19
Patents Issued	2
License Agreements	2

Technologies

*Pilot plant scale up for individual separations

*Individually designed macrocycles for molecule separations

*Patented technique for attaching macrocycles to solid substrate allows for reuse

*Ligand bonded silicagel (superlig TM) technology

*Researching use of superlig materials to remove selected components from highly acidic radioactive waste

*Set up pilot plants in 4 of the largest precious metal refineries in the USA. Metals of interest are rhodium, platinum and palladium

*Negotiations nearly completed for a grant from Thiokol to develop materials for the removal of ppm amounts of halocarbons from culinary and waste water streams

Status

*Methodology for precious metals separations developed

*Selling product to industry

*One patent issued 13 applied for

*Need to develop capability in gas, high purity materials and biological separations

*Capability in environmental, analytical & precious metals markets

*Battelite Pacific Northwest Laboratories are funding radioactive cleanup studies

*19 patent applications filed

*12 patent applications being prepared

*2 patents issued

*Work progressing well on $150,000 SBIR Grant

*Superlig TM materials capable of making quantitative separations

Economic Impact

*Created spin-off company IBC with 6 jobs & sales projected $800K in 1990

*Company attracting many sources of growth capital

*Process for separating platinum rhodinum represents a 40-60% cost reduction to the industry

*Enables highly trained scientists, engineers and executives to remain in Utah

*Potential for developing multi-million dollar system to clean up accumulated nuclear waste

Center for Chemical Technology *(New center July 1990)*

Edward B. Walker/Weber State University/Ogden, Utah

Overview		Technologies	Status	Economic Impact
Current State Contract	$74,000	*Naturally occurring antibiotics	*New patent issued for tar sands extraction	*Company looking to move to Utah to take advantage of tar sands patent
Matching Funds	$89,686	*Bacteria anti-adherance factor	*New bacteria adherence inhibitor product introduced July 1990	*15 jobs created this year due to center technology
Cumulative	$89,686	*Low temperature tar-sand extraction methodology using biodegradable surfactant	*New environmentally safe solvent introduced	*Envirosolve product developed
Industry Jobs Created	15	*Partitions/separations technology		
Center Related Jobs	5	*Environmentally-safe solvents to replace CFC-based cleaners		
Benefiting Utah Companies Solaray, Inc Monarch Labs Western Zirconium Buenaventura Industrial Research, Inc.		*Reverse osmosis system validation		
Patents Applied	--			
Patents Issued	1			
License Agreements	--			

Center for Coal Research

Dr. Larry Anderson/University of Utah/SLC, Utah

Overview		Technologies	Status	Economic Impact
Current State Contract	--	*Coal slurry transport	*Patent applied for on new method of extracting resin from coal	*New patent important to proposed joint venture that will produce 50,000 tons of resin per year (using 2.5 million tons of Utah coal)
Matching Funds	$1,505,313	*Resin extraction from Utah's unique high resin coal	*One of the top three centers for coal research in the nation	*Research supports small ink business in Price, Utah
Cumulative	$3,232,045	*Differential liquifaction	*9 patents issued	*Has potential for 1,000 jobs in 5 yrs
Industry Jobs Created	44	*Pyrolysis/differential liquefaction		*New company created: Advanced Processing Technologies
Center Related Jobs	9	*Coal/liquid slurry technology and coal preparation		*State's coal reserves total 24 billion tons; high in fossil resin and heat content and low in pollution
Benefiting Utah Companies Advanced Processing Technologies, SLC				
Patents Applied	1			
Patents Issued	9			
License Agreements	--			

Utah Centers of Excellence Program
Planning Grants Summary
(Since 1986)

1.	Biotechnology	$10,000
2.	Water Information Science & Control	10,000
3.	Advanced Fossil Fuel	15,000
4.	Advanced X-Ray	7,500
5.	Communications	10,000
6.	Microelectronics	10,000
7.	Non-Intrusive X-Ray	7,500
8.	Developing Heavy Oils to Asphalt	10,000
9.	Tar Sand Binders	15,000
10.	Quality and Integrity Design	10,000
11.	Rural Manufacturing	10,000
12.	Cancer Genetic Epidemiology	10,000
13.	Drug Discovery	10,240
	Subtotal	135,240
	Recovered	15,000
	Total	$120,240

Natural Resources and Agriculture

Start-up or Benefiting Companies Using COEP Technology

CENTER	COMPANY
Center for Advanced Combustion Engineering	Reaction Engineering International (SLC)
Center for Coal & Oil Research	Advanced Processing Technologies (SLC) CPS (Price)
Center for Chemical Separations	IBC Advanced Technologies, Inc. (Provo)
Center for Quality & Integrity Design	Faside International, Inc. (SLC)